MCQ's

Topic # 1:

Wave and particles properties of light interference.

Multiple Choice Questions

Circle the letter that corresponds to the best response. Unless otherwise indicated, each question has only one answer.

1. Which of the following is the same for all kinds of electromagnetic waves?

a. frequency
b. speed
c. energy
d. wavelength
e. transmission through the atmosphere

2. What is the velocity of a wave if the distance between the crests is 8 ft and 20 waves go by every 10 seconds?

a. 32 ft/sec
b. 16 ft/sec
c. 8 ft/sec
d. 4 ft/sec
e. 160 ft/sec

3. Sound waves with low frequency

a. have large amplitudes if they are loud.
b. travel at the same speed as sound waves with high frequency.
c. have long wavelengths.
d. have low pitches.
e. all of the above

4. Which of the following is associated with 440 Hz?

a. the tuning of a musical instrument to middle A
b. an AM radio station
c. broad band television
d. a car rental desk
e. seismograph data

5. Bats navigate by emitting high pitched sound waves and

a. scattering all objects in their path.
b. attracting insects toward the sound.
c. listening for an echo.
d. calculating wave crests per second.
e. none of the above

6. Which waves are outside the range of a human's ability to detect?

a. AM and FM waves
b. ocean waves
c. sound waves with frequencies less than 20 Hz
d. sound waves with wavelengths greater than 3 cm
e. All of the above can be detected by humans.

7. Constructive interference is to destructive interference as

a. a + a is to (-a) + (-a).
b. a + a is to (+a) + (-a).
c. rough is to smooth.
d. b & c
e. a & c

8. Which wave does not move in a medium?

a. ocean wave
b. sound wave
c. X-ray
d. seismic wave
e. All of the above require a medium for transfer.

9. The Doppler effect

a. is used by birds to navigate at night.
b. describes sound wave frequency from a moving source.
c. describes sound wave frequency from a resting source.
d. is used to interpret the electromagnetic spectrum.
e. describes light wave refraction through a prism.

10. What causes an electromagnetic wave to be emitted?

a. wind on the water
b. earthquakes
c. bat echoes
d. the acceleration of an electric charge
e. all of the above

11. Albert Michelson was the first U.S. scientist to win the Nobel Prize for

a. his studies of light.
b. his research into Greek history.
c. proving Maxwell's equations.
d. his discovery of the solar wind.
e. his work with radioactive particles.

12. How fast can light travel in one second, if it is moving through a vacuum?

a. 186,000 feet
b. 30,000 meters
c. 18, 600 miles
d. 300,000 kilometers
e. 3,000,000 miles

13. What is a practical use of infrared radiation detection?

a. night vision for nocturnal animals
b. to monitor volcanoes
c. to find heat in homes
d. to search for lost people
e. all of the above

14. The frequency of a wave appears to change if there is motion between the wave source and the observer. This phenomenon is known as

a. the Doppler effect.
b. the wavelength paradox.
c. electromagnetic radiation.
d. solar wind.
e. destructive interference.

15. If you are standing in the path of a light moving toward you, the Doppler effect predicts that the light will be

a. red shifted.
b. blue shifted.
c. shadowed.
d. transmitted.
e. radiated.

16. Light passing through a window is like

a. an image seen in a mirror.
b. water being taken up by a sponge.
c. radio waves passing through the air.

d. a spectrum of colors in a glass pyramid.
e. the greenhouse effect.

17. Which is associated with radio waves?

a. amplitude modulation
b. 530 to 1600 kHz
c. wavelengths longer than Earth's radius
d. frequency modulation
e. all of the above

18. Which is the same for all types of electromagnetic waves?

a. amplitude
b. speed
c. frequency
d. length
e. energy

19. A light wave propagates itself through

a. disturbances in the ether.
b. reflecting gamma radiation.
c. energy in shifting magnetic and electric fields
d. the seismic energy of the sun.
e. all of the above

20. Compared to microwave radiation, infrared radiation

a. has shorter wavelengths and higher energy.
b. has longer wavelengths and lower energy.
c. is neither felt nor absorbed by our skin.
d. has longer wavelengths and faster velocity.
e. is detected by all living things.

21. Which radiation can be used to sterilize equipment?

a. microwave radiation
b. ultraviolet radiation
c. fluorescence
d. infrared radiation
e. radio waves

22. The fundamental difference between electromagnetic waves and other types of waves is that electromagnetic waves

a. move more slowly than all other types of waves.
b. are radioactive.
c. are all invisible.
d. can transfer energy without transferring mass.
e. have the same wavelength.

23. What practical use has been found for gamma rays?

a. detecting the speed of a traveling car
b. controlling destructive interference
c. cooking food
d. treating cancerous tissues
e. carrying radio signals

24. The ability of microwave ovens to cook food depends partly upon the fact that microwaves

a. are absorbed quickly by water molecules.
b. are repelled by water molecules.
c. are reflected by the interior of an oven.
d. in ovens are significantly different from microwaves used for communication.
e. are scattered by water molecules.

25. Which statement best describes transverse waves?

a. Transverse waves are a special type of longitudinal wave.
b. A water ripple is a transverse wave.
c. The transverse wave moves floating particles in the direction the wave is moving.
d. The energy of the transverse wave moves perpendicular to the wave direction.
e. Echoes are formed from transverse waves.

26. Light waves reinforce or neutralize each other in very much the same way as ________________waves.

- Ultraviolet
- Light
- Sound
- All of above
- None of above

27. Light from distinct sources has too many random differences to permit interference patterns.

- Interference
- Reflection
- Attraction
- all of above
- None of above

28. Huygens' theory of light refraction, based on the concept of the wave-like nature of light, held that the velocity of light in any was inversely proportion to its refractive index.

- Reflective
- Refractive
- Straight
- all of above
- None of above

29. Reflection involves a change in direction of waves when they bounce off a barrier.

- Interference
- Reflection
- Attraction
- all of above
- None of above

30. Refraction of waves involves a change in the direction of waves as they pass from one medium to another.

- color
- direction
- wavelength
- all of above
- None of above

31. Reflection involves a change in direction of waves when they bounce off a barrier.

- color
- direction
- wavelength
- all of above
- None of above

32. When light encounters an obstacle in its path, the obstacle blocks the light and tends to cause the formation of a shadow in the region behind the obstacle.

- blocks
- pass
- change direction
- all of above
- None of above

33. A wave doesn't just *stop* when it reaches the end of the medium.

- Medium
- Wavelength
- Direction
- all of above
- None of above

34. Light consists of transverse waves having components that are perpendicular to the direction of propagation.

- Medium
- Wavelength
- Direction
- all of above
- None of above

35. When a beam of light travels between two media having different refractive indices, the beam undergoes refraction.

- Reflection

- Refraction
- Interference
- all of above
- None of above

36. German physicist Philip Lenard became interested in these observations, which he termed the photoelectric effect.

- Effect
- Theory
- Practical
- all of above
- None of above

37. The properties of light work together and allow us to observe the beauty of the universe.

- Properties
- Differences
- Simulative
- all of above
- None of above

38. These observations were some of the first links between atoms and light, although the fundamental impact was not understood at the time.

- Sound
- Direction
- Light
- all of above
- None of above

39. All waves are known to undergo reflection or the bouncing off of an obstacle.

- reflection
- refraction
- attraction

- all of above
- None of above

40. The exact nature of visible light is a mystery that has puzzled man for centuries.

- Nano
- Sound
- visible
- Micro
- None of above

41. One characteristic of wave reflection is that the angle at which the wave approaches a flat reflecting surface is equal to the angle at which the wave leaves the surface.

- Wave
- Color
- Repulsion
- all of above
- None of above

42. Lenard also discovered a link between wavelength and energy.

- Frequency
- Wavelength
- Nature
- all of above
- None of above

43. Einstein's theory was solidified in the 1920s by the experiments of American physicist Arthur H. Compton, who demonstrated that photons had momentum.

- khashif
- bhor
- Einstein's
- All of above
- None of above

44. Einstein's famous formula relating mass and energy to include Planck's constant:

$E = mc^2 = h□$

- Kh
- h□
- bv
- all of above
- None of above

45. Reflection involves a change in direction of waves when they bounce off a barrier.

- color
- direction
- wavelength
- all of above
- None of above

Topic # 2:

WAVE AND PARTICLE PROPERTIES OF LIGHT DIFFRACTION.

1. All of the following statements are true of light waves, sound waves, and radio waves EXCEPT:

A. Their wavelengths depend upon the medium in which they are traveling.
B. They belong to the electromagnetic spectrum.
C. They undergo refraction in accordance with Snell's law.
D. For point sources, they obey the inverse-square law of intensity.
E. They can produce interference patterns.

2. The critical angle for light passing from crown glass to air is 42^o. Total internal reflection would occur at a glass-air interface if light approached the interface from the

A. air at an angle of incidence of less than 42^o
B. air at an angle of incidence of precisely 42^o

C. air at an angle of incidence of greater than 42^o
D. glass at an angle of incidence of less than 42^o
E. glass at an angle of incidence of greater than 42^o

3. Light travels as a

(**a**) parallel beam in each medium

(b) convergent beam in each medium

(c) divergent beam in each medium

(d) divergent beam in one medium convergent beam in the other medium

4. The phases of the light waves at *c, d, e* and *f* are Φ_c, Φ_d, Φ_e and Φ_f respectively.

It is given that $\Phi_c \neq \Phi_f$.

(a) Φ_c cannot be equal to Φ_d

(b) Φ_d can be equal to Φ_e

(c) $(\Phi_d - \Phi_f)$ is equal to $(\Phi_c - \Phi_e)$

(d) $(\Phi_d - \Phi_c)$ is not equal to $(\Phi_f - \Phi_e)$

5. Speed of light is

(a) the same in medium -1 and medium -2

(b) larger in medium -1 than in medium -2

(c) larger in medium -2 than in medium -1

(d) different at *b* and *d*

6. We commonly observe light travels in a straight line but sound does not. Which of the following reasons accounts for this?

a) Freq of light is much higher than sound
b) Wavelength of light much shorter than sound
c) Speed of light much higher than sound

7. A student prepared a Young's double slit by drawing two parallel lines (with a separation less than a millimeter) on a smoked glass plate. [For smoking, the plate was held above the flame of a kerosene lamp]. Accidentally he used two different pins to draw the lines so that the widths of the slits (regions from where smoke was removed by the pin) were in the ratio 4:1. What will be the ratio of the intensity at the interference maximum to that at the interference minimum?

(a) 4 (b) 2 (c) 3 (d) 6 (e) 9

8. A single slit diffraction pattern is obtained on a screen using yellow light. If the yellow light is replaced by blue light without making any other changes in the experimental set up, what will happen to the diffraction bands?

(a) Bands will disappear

(b) Bands will become broader and farther apart

(c) Bands will become broader and crowded together

(d) Bands will become narrower and farther apart

(e) Bands will become narrower and crowded together

9.If white light is used in Young's double slit experiment, what will happen to the interference bands?

(a) No bands will be obtained

(b) Many bands will be obtained as in the case of monochromatic light, but they will be coloured except the centre of the central band which will be white

(c) Very few bands will be obtained, but they will be coloured except the centre of the central band which will be white

(d) Many bands will be obtained as in the case of monochromatic light, but all of them will be white

(e) Very few bands will be obtained, but all of them will be white

10. In an arrangement for Young's double slit experiment, the separation between the slits is 1 mm. It is found that 8 bands of the double slit interference pattern can occupy the central maximum of the single slit diffraction pattern produced by one of the slits. What is the width of each slit?

(a) 0.2 mm

(b) 0.25 mm

(c) 0.3 mm

(d) 0.35 mm

(e) 0.4 mm

11. Five photons have the following energy values. Which one represents the visible light photon?

(a) 24.8 eV

(b)12.4 eV

(c) 6.2 eV

(d) 2.48 eV

(e) 1.24 eV

12. When electromagnetic radiations of wave length λ is incident on a photosensitive surface, the kinetic energy of the photoelectrons emitted from the surface is 2 eV. When the wave length of the incident radiations is 2λ, the kinetic energy of the photoelectrons emitted from the surface is 0.5 eV. The *threshold wave **length*** (maximum wave length) for photoelectric emission from the surface is

(a) λ/2

(b) λ

(c) 3λ/2

(d) 2λ

(e) 3λ

13. Two laser beams of the same wave length and intensities 9I and I are superposed. The minimum and maximum intensities of the resultant beam are:

(a) 8I and 10I

(b) 0 and 10I

(c) 4I and 16I

(d) 0 and 16I

(e) 4I and 10I

14. In a double slit experiment, the separation between the slits is 1 mm and the distance between the double slit and the screen is 1m. If the slits are illuminated by monochromatic light of wave length 6000 Ǻ, what is the

separation between the 2nd dark bands on either side of the central band?
(a) 0.9 mm

(b) 1.2 mm

(c) 1.8 mm

(d) 3 mm

(e) 4.2 mm

15. The width of a single slit if the first minimum is observed at an angle 2º with a light of wave length 6980 Å is
(a) 0.2 mm

(b) 2×10^{-5} mm

(c) 2×10^{5} mm

(d) 2 mm

(e) 0.02 mm

16. The maximum number of possible interference maxima for slit separation equal to twice the wave length in Young's double slit experiment is

(a) infinite

(b) five

(c) three

(d) zero

17. A transparent film of refractive index 1.5 is viewed in reflected monochromatic light of wave length 6000 Å. If the angle of refraction in to the film is 60º, what is the smallest thickness of the film to make it appear

dark?
(a) 4×10^{-4} mm

(b) 5×10^{-4} mm

(c) 6×10^{-4} mm

(d) 7×10^{-4} mm

(e) 8×10^{-4} mm

18. Two beams of light having intnsities I and 4I interfere to produce a fringe pattern on a screen. The phase difference between the beams is π/2 at point A and π at point B. Then the difference between the resultant intensities at A and B is
(a) 2I

(b) 4I

(c) 5I

(d) 7I

19. When a thin sheet of transparent material of thickness 4×10^{-3} mm is placed in the path of one of the interfering beams in Young's double slit experiment, it is found that the central bright fringe shifts through a distance equal to four fringes. What is the refractive index of the transparent material? (Wave length of light used is 5893 Ǻ).
(a) 1.378

(b) 1.432

(c) 1.523

(d) 1.546

(e) 1.589

20. Covering up one of the slits on a double slit experiment would have which of the following effects?

a. The larger pattern would get slightly smaller.
b. The small pattern within the larger pattern would get slightly larger.
c. The larger pattern would disappear.
d. The smaller pattern within the larger pattern would disappear.
e. The small angle approximation would no longer be valid.

21.light is composed of _____ .

a) atoms b) elementary particles c) compound particles d) molecules e) matter

22. A particle is a discrete unit of matter having the attributes of _____, momentum (and thus kinetic energy) and optionally of electric charge

a) velocity b) weight c) potential energy d) mass e) kinetic energy

23. Wave is characterized by ______ and frequency.

a)wavemeter b) motion c) intantenious velocity d) dual nature e) wavelength

23. Light has sometimes been viewed as a _____ rather than a wave.

a) Energy b) molecules c) particle d) packets e) straight line

24. Young's double slit experiment described ______.

a) Interference b) refraction c) all options d) reflection e) diffraction

25. In Young's double slit experiment, under the wave model of light, these light and dark areas can be explained with constructive and destructive _____ of waves

a) Diffraction b) refraction c) interference d) reflection e) collision

26. In Young's double slit experiment, he made ____ slits on a barrier and allowed monochromatic light (light of a single wavelength) to pass through.

a) 3 b) 5 c) 4 d) 6 e) 2

27. In 1905, Einstein proposed ______.

a) E=Sv b) E=hv c) E=Ma d) E=ha e) E=av

28. Photoelectric effect is the ______ emission caused by light.

a) Proton b) electron c) neutron d) none e) photon

29. _______ proposed (in his doctoral thesis) that just as light possesses particle-like properties, so should particles of matter exhibit a wave-like character.

a) Einstein b) Newton c) Louis DeBroglie d) Shakespeare e) Rutherford

30. Diffraction is the bending of waves when they ______ with obstacles in their path

a) b and c b) collide c) pass through d) none e)intersect

31. Diffraction is known as a wave _____ effect.

a) Collision b) refraction c) interference d) reflection e) diffusion

32. Energy packets are called ______.

a)electrons b) photons c) neutrons d) rays e) protons

33. Diffraction also occurs with matter and can be studied according to the principles of ______mechanics.

a)classical b) celestial c) none d) quantum e) fluid

34. ______ principle is a method of analysis applied to problems of wave propagation

a) dark-light b) uncertainty c) fermat's d) none e) huygen's

35 . The angular spacing of the features in the diffraction pattern is _______ proportional to the dimensions of the object causing the diffraction

. a) Directly b) inversely c) not

36 . The diffraction ______ depend only on the ratio of the wavelength to the size of the diffracting object.

a) angle b) width c) range d) b and c
e) pattern

37. When the diffracting object has a periodic structure, the features generally become ______.

a) sharper b) obvious c) a and b d) blur

38. If the distance to each source is an integer plus one ______ of a wavelength, there will be complete destructive interference

a) third b) quarter c) only d) hundered e) half

39. When there is a need to ______ light of different wavelengths with high resolution, then a diffraction grating is most often the tool of choice

a) mix b) separate c) produce d) show e) have

40.Light, or visible light, is ___________________of a wavelength that is visible to the human eye.
(a)Electropositive radiation (b) Electronegative radiation **(c) Electromagnetic radiation** (d) Electrodynamics

41. Three primary properties of light are, Intensity, ___________ or wavelength and
Polarization.

a. Time Period **(b) Frequency** (c) Magnitude (d) Amplitude

42. Frequency is defined as a number of _________ per unit time.
(a) Rotations (b) Revolutions (c) Cycles **(d) Cycles or Periods**

43. Wavelength is the _________ between repeating units of a propagating wave of a
given frequency.

(a) Path **(b) Distance** (c) Length (d) Width

44. Examples of wave-like phenomena are light, water waves, and __________.

(a) Longitudinal waves (b) air waves **(c) Sound waves**

6. In a wave, a property varies with the __________.

a. Amplitude **(b) Position** (c) Length (d) Distance

45. Polarization (*Brit.* polarization) is a property of ________________.
(a) Sound waves (b) Water waves (c) Longitudinal waves **(d) Transverse waves**

46. In the 1660s, _____________ published a Wave theory of light.
a. Augustine (b) Newton **(c) Robert Hooke** (d) Christian Huygens

47. Thomas Young's two-slit experiment shows the ___________ of light.
a. Reflection **(b) Diffraction** (c) Intensity (d) Refraction

48. Young's experiments supported the theory that light consists of ________.
a. **Waves** (b) Particles (c) Neutrons (d) Photons

49. Newton's corpuscular theory implied that light would travel faster in ___________.
a. Wave (b) Plane Medium (c) Particles **(d) Denser Medium**

50. The speed (v) is the rate at which the crests (or troughs) move ________.
a. Fast (b) Backward **(c) Forward** (d) In a Single Path

51. For light waves, the rays always point in the direction of the __________.
a. Crest (b) Trough (c) Straight Path **(d) Motion**
52. Diffraction is the process in which light is ___________.
a. Reflected back (b) Moved away from the Path **(c) Bend**

53. The bending of light is due to ______________.
a. **Wave theory** (b) Particle theory (c) Quantum theory (d) Thomas Young's Experiment

54. The intensity of visible light can be increased or decreased only by changing the number of _________ present.
a. Electrons **(b) Photons** (c) Neutrons

55. Each _________ takes on some of the characteristics of a physical particle.
a. Wave (b) Neutron (c) Electron **(d) Photon**

56. _____________ tells us that every particle exhibits wave properties. (a) Newton's Experiment (b) Wave Theory (c) Particle Theory **(d) Quantum Theory**

57. Diffraction of matter waves is only visible for small particles, like __________.
a. Electrons (b) Neutrons (c) Atoms & Molecules **(d) all of these**

58. The concept that all matter exhibits both wave-like and particle-like properties is called, ____________.
a. Wave property (b) Particle Property **(c) Wave Particle Duality**

59. The first to make sufficient accurate measurement of the speed of light was, _____________.
a. Christian Huygen (b) Augustin_Jean **(c) Leon Foucault** (d) Michelson

60. The speed of light accurately measured in the year, _______.
a. 1795 (b) 1830 (c) 1890 **(d) 1850**

61. _________ provide a useful representation for describing the motion of light waves.
a. Longitudinal waves (b) Crests (c) Plane Waves **(d) Rays**
62. The electrically neutral particles tend to travel in straight lines, without being affected by _____________.
a. Electric field (b) Magnetic field **(c) Magnetic or Electrical field**

63. Any single photon has a ___________ level.

Fixed energy level (b) many energy levels (c) Discrete energy level **(d) Fixed, Discrete energy level.**

64. A single slit diffraction pattern is obtained on a screen using yellow light. If the yellow light is replaced by blue light without making any other changes in the experimental set up, what will happen to the diffraction bands?

(a) Bands will disappear (b) Bands will become broader and farther apart

(c) Bands will become broader and crowded together

(d) Bands will become narrower and farther apart

(e) Bands will become narrower and crowded together

65. A student prepared a Young's double slit by drawing two parallel lines (with a separation less than a millimeter) on a smoked glass plate. [For smoking, the plate was held above the flame of a kerosene lamp]. Accidentally he used two different pins to draw the lines so that the widths of the slits (regions from where smoke was removed by the pin) were in the ratio 4:1. What will be the ratio of the intensity at the interference maximum to that at the interference minimum?

(a) 4 (b) 2 (c) 3 (d) 6 (e) 9

66. The position of final image formed by the given lens combination from the third lens will be at a distance of

(a) 15 cm (b) 23cm (c) 45 cm (d) 30 cm (e) 35 cm

67. A slit of width 'a' is illuminated by red light of wave length 6500 Å. If the first minimum falls at $\theta = 30^o$, the value of 'a' is

68. 6.5×10^{-4} mm (b) 1.3 micron (c) 3250 Å (d) 2.6×10^{-4} mm (e) 1.3×10^{-4} mm

69. Two beams of light of intensity I_1 and I_2 interfere to give an interference pattern. If the ratio of maximum intensity to minimum intensity is 25/ 9, then, I_1/ I_2 is

(a) 5/3 (b) 4 (c) 81/ 625 (d) 16 (e) ½

70. All of the following statements are true of light waves, sound waves, and radio waves EXCEPT:

A. Their wavelengths depend upon the medium in which they are traveling.
B. They belong to the electromagnetic spectrum.
C. They undergo refraction in accordance with Snell's law.
D. For point sources, they obey the inverse-square law of intensity.
E. They can produce interference patterns

71. Regarding diffraction:

a. it is best explained with the wave theory of light

b. it occurs when there is an obstruction to the light

c. both constructive and destructive interference occurs

d. it increases with longer wavelength

e. it prevents the formation of a point image from a point source

72. The Airy's disc:

a. is formed by diffraction

b. contains a central bright disc that receives 90% of the luminance flux

c. is surrounded by concentric light and dark rings

d. is proportional to the wavelength of the light

e. is proportional to the diameter of the pupil

73. The Huygens-Fresnel principle tells us to pretend that each point of a wavefront in a slit or aperture is a point source of light emitting a spherical wave. Is this true only for points inside the slit? What if there is no slit? The Huygens-Fresnel principle really applies

a to any point anywhere in a beam path.
b to any point in a beam path where matter is present.
c. only in slits or apertures. d none of them e all of the

74. Light waves from two point-like sources arrive at the circular aperture of a telescope simultaneously. The telescope will resolve the two sources if which of the following condition is satisfied?

a the Fresnel approximation
b the Fraunhofer approximation
c. the Huygens-Fresnel principle
d. the Rayleigh criterion

(11) Two waves, y_1 and y_2, have the same wave number, k, amplitude, A, and frequency, ω but different phase:

$y_1(x,t) = A \cos(kx-\omega t)$

$y_2(x,t) = A \cos(kx-\omega t+\pi/2)$

75. What is the amplitude, A_{tot}, of the superposition of the two waves?

(a) $A_{tot} = 0$
(b) $A_{tot} = 2A\cos(kx-\omega t+45°)$
(c) $A_{tot} = \text{sqrt}(2)A$
(d) $A_{tot} = 2$ A
(e) $A_{tot} = 4$ A

75. Laser light is incident normally on a diffraction grating with 400 lines/cm. The central diffraction peak and the 4^{th} order (m = 4) diffraction peak are 10.34 cm apart on a screen that is 1.44 m away (see sketch). The screen is perpendicular to the ray that makes the central peak. What is the wavelength of the light (to within 1%)?

(a) 400 nm
(b) 450 nm
(c) 500 nm
(d) 550 nm
(e) 700 nm

76. What happens to the pattern you observe for single-slit diffraction as the width of the slit is slowly reduced (keeping all other quantities the same) ?

(a) The diffraction pattern does not change at all.
(b) The diffraction pattern remains at the same width, but gets dimmer overall.
(c) The diffraction pattern spreads out and gets dimmer overall.

(d) none of these

77. If the wave length of the light is changed from 450 nm to 600 nm, what happens to the width of the central maximum?

(a) It becomes wider.
(b) It becomes narrower.
(c) It remains the same. (d) none of these

78. If the wavelength of the light sources is changed to 650 nm, what happens to the resolution of the two light sources?

(a) They become better resolved.
(b) They are no longer resolved.
(c) There's no change. (d) none of these

79. To observe diffraction the size of the obstacle

(a) should be of the same order as the wavelenght

(b) should be much larger than the wavelenght

(c) has no relation to wavelenght

(d) should be exactly half the wavelenght

80. bright colour ex posed by spider web is due to

(a) interfernce (b) rsolution (c) diffraction (d) polarization

81. the phenomenon of difraction of light was discovered by

(a) newton (b) hygens (c) grimaldi (d) fresnel

82. In diffraction fringes pattern

(a)equally spaced (b) wider near the obsticle and narroweraway from it (c)narrower near the obsticle and away from it (d) none of these

83. diffraction is based on

(a) wave theory of light (b) particle theory of light (c) both of them (d) none of them

84. the bending of light around the edges of an obstacle

(a) diffraction (b) polarization (c) interference (d) spectroscopy

85. light posses

(a) wave property (b) particl property (c) both (d) none

86. velocity of light

(a) constant every where (b) changes with place (c) changes with time (d) none of these

87. which of the following has longest wavelenght

(a) red light (b) blue light (c) yellow light (d) voilet light

Topic # 3:

WAVE AND PARTICLE PROPERTY OF LIGHT POLARIZATION

1. Polarization of light:

a. depends on the refraction index of the material
b. depends on the angle of incidence
c. is used in the operating microscope

d. light reflected from plane surfaces is partially polarized
e. is used in pleoptics

2. With regard to optical radiation:

a. the wavelengths of visible light lies between 400nm and 780nm

b. ultraviolet A has a shorter wavelength than ultraviolet C

c. the shorter the wavelength the higher the energy of an individual quanta (photon)

d. the crystalline lens is better at absorbing shorter than longer wavelengths

e. eclipse burn is caused by infrared radia

3. The following are true about colour vision:

a. deuteranomaly is more common than deuteranopia

b. blue pigment gene is found on chromosome X

c. red-green defect is common in acquired optic nerve disease

d. blue-yellow defect is common in glaucoma

e. blue cone is sensitive to shorter wavelength than green cone

4. A single disturbance that moves from point to point through a medium is called a ___.

a. period

b. periodic wave

c. wavelength

d. pulse

5. If the particles of the medium are vibrating to and fro in the same direction of energy transport, then the wave is a ____ wave.

a. longitudinal

b. sound

c. standing

d. transverse

6. When the particles of a medium are vibrating at right angles to the direction of energy transport, then the wave is a ____ wave.

a. longitudinal

b. sound

c. standing

d. transverse

.7 As a pulse travels though a uniform medium, the speed of the pulse ____.

a. decreases b. increases c. remains the same

8. Light which is vibrating in a single plane is referred to as _____ light

a. electromagnetic b. transverse c. unpolarized d. polarized

9. Light which is vibrating in a variety of planes is referred to as _____ lighta. electromagnetic b. Transverse c. Unpolarized d. polarized

10. Light usually vibrates in multiple vibrational planes. It can be transformed into light vibrating in a single plane of vibration. The process of doing this is known as ____.

a. translation b. interference c. polarization d. refraction

11. Light is passed through a Polaroid filter whose transmission axis is aligned horizontally. This will have the effect of ____.

a. making the light one-half as intense and aligning the vibrations into a single plane.

b. aligning the vibrations into a single plane without any effect on its intensity.

c. merely making the light one-half as intense; the vibrations would be in every direction.

d. ... nonsense! This will have no effect on the light itself; only the filter would be effected.

12 Light is passed through a Polaroid filter whose transmission axis is aligned horizontally. It then passes through a second filter whose transmission axis is aligned vertically. After passing through both filters, the light will be ______.

a. polarized b. unpolarized c. entirely blocked

d. returned to its original state.

12. Which of the following are effective methods of polarization? Include all that apply.

a. Passing light through a Polaroid filter.

b. Reflection of light off a nonmetallic surface.

c. Passing light from water to air. d. Passing light through a birefringent material such as Calcite. e. Turning the light on and off at a high frequency.

f. Interfering light from one source with a second source.

13. The three primary colors of light are ____.

a. white, black, gray b. blue, green, yellow

c. red, blue, green d. red, blue, yellow

e. ... nonsense! There are more than three primary colors of light.

14. The three secondary colors of light are ____.

a. cyan, magenta, green b. cyan, magenta, and yellow

c. orange, yellow, violet d. red, blue, yellow

e. ... nonsense! There are more than three secondary colors of light.

15. Which of the following best describes the image formed by a plane mirror?

a. virtual, inverted and enlarged

b. real, inverted and reduced
c. virtual, upright and the same size as object
d. real, upright and the same size as object

16. Which of the following best describes the image formed by a concave mirror when the object is located somewhere between the focal point (F) and the center of curvature (C) of the mirror?

a. real, inverted and reduced

b. virtual, upright and reduced   c real, inverted and enlarged

17 Pleochroism in gems is caused by

a) diffraction. b) dispersion.
c) absorption of different wavelengths of light in different direction.
d) the presence of more than one chromophore.
e) the absence of an optic axis.

18 The amount of bending light undergoes when passing through a gem or mineral depends on

a) the angle at which it enters.
b) the refractive index of the gem or mineral.
c) the wavelength (color) of the light.
d) all of the above
e) b and c

19 Dispersion is

a) a phenomenon that produces play-of-color.
b) an optical property that can be measured with a refractometer.
c) related to the difference in the speed of red and blue light in a gem or mineral.
d) something that only occurs in anisotropic materials.
e) c and b

20 Optically anisotropic minerals differ from isotropic minerals by

a) having low critical angles.

b) being able to polarize light.

c) having high critical angles.

d) being fluorescent in ultraviolet light.

e) none of the above.

21 Light within a gemstone that strikes a facet at an angle less than the critical angle of the gem will

a) exit the gem.

b) be internally reflected.

c) be refracted parallel to the facet.

d) be split into two plane polarized rays.

e) none of the above

22 Light that travels through an anisotropic material is always

a) split into 2 rays

b) polarized

c) doubly refracted

d) diffracted

e) none of the above

23 Light that travels through an isotropic material is always

a) split into 2 rays

b) polarized

c) doubly refracted

d) diffracted

e) none of the above

24 A gem that looks black every 90o of rotation in a polariscope must be

a) anisotropic

b) isotropic

c) monoclinic or triclinic

d) hexagonal or tetragonal

e) none of the above

25 An optic axis is defined as a unique direction in a mineral along which light traveling

a) will be split into two rays

b) will be polarized into two directions

c) will pass through without being split or polarized

d) will be most strongly absorbed

e) none of the above

Topic # 4:

- Waves must require a medium.

a). Yes b). No c). Don’t Know

- Concept of information related to:

a). Communication b). Connection c). Both

- Following are not the information carrier

a). Cell Phones b). GPS receiver c). Radio Controlled toys

- Microphone in mobile phone converts:

a). Voice into electrical signals b). Signals into waves c). None of the above

- Microchip converts:

a). Voice into electrical signals b). Signals into waves c). None of the above

- Radio Transmits since wave into space with:

a). Antenna b). Modem c). None of the above

- Pulse Modulation is not common but its example is radio controlled clocks in

a). US b). UK c). Germany

- Cell Phones Uses:

a). Frequency Modulation (FM) b). Amplitude Modulation (AM) c). Pulse Modulation (PM)

- RADAR stands for

a). Radio Detection & Ranging b). Radio Determination & Ranging c). None of the above

- Air Traffic controls uses _________ to track planes

a). Radar b). Radio c). None of the above

- NASA uses radar to map

a). Track Satellites b). Planes c). None of the above

- Radars of uses in grocery stores to track

a). Culprits b). Owners c). None of the above

- Display is must in radar system

a). True b). False c). None of the above

- Processing of radars start with

a). Transmitter b). Switch c). None of the above

- Switch switches the control b/w

a). Antenna & Receiver b). Antenna & Recorder c). None of the above

Topic # 5:

Oscillation and concept of feedback

In S.H.M:

A. Force/ acceleration=constant **B.** F/M = constant

C. Acceleration=constant **D.** Displacement/acceleration=constant

Motion of a simple pendulum is said to be simple harmonic because

A. it is simple in const ruction **B.** It oscillates Ina very simple way

C. It acceleration is proportion To the displacement from The mean position **D.** It depend on the mass of the body

When mercury tube is disturbed, its motion is called:

A. Simple harmonic motion **B.** Vertical motion

C. Horizontal circular motion **D.** None of these

Which of the following is necessary and sufficient condition for simple harmonic motion

A. Constant acceleration
B. Proportionally between acceleration and displacement from equilibrium
C. Constant speed
D. Proportionally between restoring force and displacement from equilibrium position

Acceleration of a body executing S.H.M is:

A. Zero at the extreme positions and maximum at the mean position
B. Zero at the mean position and max at the extreme
C. It remains constant throughout the motion
D. All are true

The total energy of a particle executing S.H.M IS:

A. Velocity in equilibrium position
B. Time period of oscillation
C. Displacement in equilibrium position
D. Square of amplitude of motion

The period of the oscillation of a simple pendulum is doubled when:

A. The mass of the bob is doubled
B. The mass of the bob and the length of the pendulum are doubled
C. The length is made four times
D. The amplitude is doubled

If a hole is drilled in the earth passing through its center and a ball is dropped in it,then

A. It will appear at the other end
B. It will stop at the centre of the earth
C. It will stop execute S.H.M about the centre of the earth

D. It depends upon the chances availed

The period of oscillation of a simple pendulum of constant length at a place inside a

Coal mine is approx

A. less than it is on the surface of the earth
B. more then it is on the surface of the earth
C. the same it is the surface of the earth
D. the same it is on the surface of the moon

Which of the following does not exhibit harmonic motion?

A. A hanging spring supporting a weight
B. The balance shell of a watch
C. The pistons of an automobile engine
D. The string of a violin

If the period of oscillation of a mass m **suspended** from a spring is one second then the period of 4m will be

A. 4sec
B. ¼ sec
C. 2 sec
D. 8 sec

A body executing S.H.M has time period T and amplitude A here

A. Tend A are in depend of each other

B. T Varies in proportional to A^2

C. **T** varies in proportion to ^{A3}

D. **T** Varies inversely to A2

Which of the following is wrongabout a S.H.M?

A. the frequency of the oscillation is always indepentof the mass of the oscillation
B. energy of the oscillation is proportional to square of amplitude of frequency
C. time period depends on the length of the pendulum
D. all are true

S.I unit of frequency is:

A. Hertz

B. Ampere

C. Coulomb

D. Watts

In a swinging pendulum, the K.E in zero at:

A. Mean position
B. Extreme position
C. Between on earn and extreme
D. None of these

The number of vibration per second is called

A. time period
B. frequency
C. amplitude
D. phase

The _______ of the body executing S.H.M remains constant at any distance, position of equilibrium and at extreme position

A. Mean position
B. P.E
C. Total energy
D. Phase

If there is no frictional effects the mechanical energy of a system executing S.H.M

A. Changes with time
B. Is variable
C. Is not conserved
D. Is constant

When a particle existing S.H.M remains constant at any distance position of equilibrium and at extreme position

A. the frequency depends upon the amplitude
B. the period depends upon the amplitude
C. the period and frequency are indepent of the amplitude
D. the period and frequency are independent of over another

The total energy of a particle existing S.H.M with amplitude a is proportional to

A. a^1
B. a^2
C. a
D. $1/a^2$

Simple harmonic motion (SHM) is a technical term used to describe a certain kind of idealized oscillation. Practically all the oscillations that one can see directly in the natural world are much more complicated than SHM. Why then do physicists make such a big deal out of studying SHM?

It is the only kind of oscillation that can be described mathematically.

Any real oscillation can be analyzed as a superposition (sum or integral) of SHM with different frequencies.

Physics is concerned mainly with the unnatural world.

Students are too stupid to appreciate the real world.

It is good torture for students.

Simple harmonic motion (SHM) is a technical term used to describe a certain kind of idealized oscillation. A simple harmonic oscillation has

a) Fixed frequency and fixed amplitude.

b) Fixed frequency and variable amplitude.

c) Variable frequency and fixed amplitude.

d) Variable frequency and variable amplitude.

A simple harmonic oscillation of a given system can be specified completely by stating its

a) Amplitude, frequency and initial phase.

b) Amplitude, frequency and wavelength.

c) Frequency and wavelength.

d) Frequency, wavelength and initial phase.

We can't get very far in talking about SHM without doing a little mathematics, so it its important to be able to recognize some equations which can represent SHM.
In the equations below, A, B, □ and □are constants; y and t are variables; t represents time. Only one of the following equations does not represent SHM. Which one is that?

a) $y = A\sin(\omega t)$

b) $y = B\cos(\omega t)$

c) $y = A\sin(\omega t) + B\cos(\omega t)$

d) $y = A\sin(\omega t + \phi)$

e) $\boxed{y = A\sin(\omega t) + B\cos(2\omega t)}$

This is just a question about names. This equation represents a SHM:

$$y = A\sin(\omega t + \phi).$$

Which part of the expression on the right hand side is called the phase?

a) $A\sin(\omega t + \phi)$

b) $\sin(\omega t + \phi)$

c) $\boxed{\omega t + \phi}$

d) ϕ

e) A

It is possible to tell theoretically if a mechanical motion will be SHM through a careful analysis of the forces in the system. An object will execute SHM with displacement coordinate x.

a) All the forces involving x are conservative.

b) The total force can be equated with – kx .

c) All the forces involving x have equal and opposite reactions.

d) The sum of all the forces involving x is zero.

e) The total force on the object is always zero.

An object swinging on the end of a string forms a simple pendulum. Some students (and some texts) often cite the simple pendulum's motion as an example of SHM. That is not quite accurate because the motion is really

a) Approximately SHM only for small amplitudes.

b) Exactly SHM only for amplitudes that are smaller than a certain value.

c) Approximately SHM for all amplitudes.

A pendulum is timed as it swings back and forth. The clock is started when the bob is at the left end of its swing. When the bob returns to the left end for the 90th return, the clock reads 60.0s. a) What is the period of vibration? b) What is the frequency of vibration?

a) $\boxed{\textbf{1.50 s, (b) 0.667 Hz}}$
b) 0.667 s, (b) 1.50 Hz
c) 60 s, (b) 0.0167 Hz
d) 0.0167 s, (b) 60 Hz

According to Hook's Law F

a) Kx^2
b) $\boxed{\mathbf{Kx}}$
c) 1/2kx
d) kx^3

Which of the following is not an example of free oscillations?

a) Swinging pendulum
b) Ice cube bobbling up and down in water
c) vibrations on a drum skin after it has been hit
d) light rays in space traveling from sun to earth.
e) Tidal variations in sea level.

The wave from of S.H.M is given by

Square wave
Saw tooth wave
$\boxed{\textbf{Sine wave}}$
Pulsed wave

The total energy of a body executing S.H.M is

3/2 Kx^2
1/2 k xo
$\boxed{\textbf{Constant} = 1/2\ \mathbf{Kx^2}}$

Zero

The time period of the simple pendulum depends upon

Mass of pendulum
Nature of thread
$\boxed{\textbf{Length of pendulum}}$
None of the above

The length of second pendulum is

99cm
2cm
$\boxed{\textbf{99.2}}$
None of the above

For simple pendulum the graph b/w L &T^{-2} is a

Curve
Straight
$\boxed{\textbf{Parabola}}$
None of these

If the length of the second pendulum becomes 4 times then its time period become

Four time
Five time
$\boxed{\textbf{Two time}}$
No change

If a spring is cut into two identical halves, then extension becomes

Constant
Double
Half
0

The no. of vibrations passing through a given point in one second is called

Time period
Amplitude
Frequency
Bell

The force responsible for vibratory motion of simple pendulum is

Tension
Mg sin
Mg cos
Mg tan
The unit of frequency is

Radian
Hertz
Henry
Slug

The maximum displacement of a particle from the equilibrium when the particle is executing SHM is called

Frequency
Amplitude
Displacement
Velocity

Time required to complete one oscillation (cycle) is

Force

Frequency

Period

Both b & c

Simple harmonic motion is a type of

Irregular motion
Spin motion
Periodic motion
None of them

If there is no friction effects, the mechanical energy executing system SHM

Is independent of amplitude

Depends on amplitude

Is independent of mass

Is conserved

Which of the following does not exhibit SHM

A hanging spring supporting a weight

The balance wheel of a watch

The wheel of an automobile

The string of a violin

If go on increasing the stretching force on a wire in a guitar, then its frequency.

Increases

Decreases
Become zero
Remains unchanged

The velocity of sound is greatest in
Air
Space
Water
Steel

If more weights are added to mass attached with a vibrating spring, its time period.

Increases
Decreases
Remained constant
Becomes zero

Topic # 6:

The Zeroth Law of Thermodynamics

- The study of transformation of heat energy to other types of energies is called…………..

a) Entropy **b) Thermodynamics**

c) Electrostatic d) None of the above

- Thermodynamics state of gas is represented by its

a) Pressure b) Volume

c) Pressure, Volume, Temperature **d) All of these**

- General properties which deals with the heat and its transformation into work are called…………….

a) Newton's Law b) Ampere's Law

c) Law of thermodynamics d) None of the above

- There are ………………… Laws of Thermodynamics.

a) One b) Two

c) Three **d) Four**

- First law of thermodynamics can be written mathematically as:

a) $\Delta U = \Delta Q + \Delta W$ b) $\Delta Q = \Delta U + \Delta W$

c) $\Delta Q = \Delta U + \Delta W$ d) $\Delta W = \Delta Q + \Delta U$

- Which law of thermodynamics says that heat is a form of energy?

a) 0^{th} **b) 1^{st}**

c) 2^{nd} d) 4^{th}

- The first law is associated with……….

a) Temperature b) Entropy

c) Internal Energy d) None of the above

- The Second law of thermodynamics states that:

a) Heat is neither created nor destroyed **b) Heat can be converted to other form of energies**

c) Heat flow from hot to cold body d) The mechanical equivalent of heat is the amount of energy that must be spend in order to

produce heat

- The second law is associated with…………

a) Temperature **b) Entropy**

c) Internal Energy d) Heat

- ¨As a system approaches absolute zero, all processes cease and the entropy of the system approaches a minimum value¨, this is a statement of……..

a) Third law of thermodynamics b) Second law of thermodynamics

c) Zeroth law of thermodynamics d) First law of thermodynamics

- ¨Two bodies are in Thermal Equilibrium with the third body¨ is the statement of:

a) First law of thermodynamics b) Second law of thermodynamics

c) Third law of thermodynamics **d) Zeroth law of thermodynamics**

- The concept of -------------------------------- derived from the zeroth law of thermodynamics?

a) Temperature b) Heat

c) Entropy d) None of the above

- There are …………. scales for measure of temperature.

a) Two **b) Three**

c) Four d) Five

- One of the principal parameters of thermodynamics is ……….

a) Entropy **b) Temperature**

c) Heat d) Thermal Equilibrium

• Zeroth law comes into being in…………

a) 1920's

b) 1930's

c)1910's

d) 1940's

• Zeroth law of thermodynamics was given by………..

a) Ralph H. Fowler

b) Jhon Mikel

c) Sadi Carnot

d) None of these

• The zeroth law of thermodynamics

a) Is the restatement of Law of conser-vation of energy

b) Is the basic for definition of temperature

c) Is the basic for definition of Internal energy

c) None of the above

• Thermometer work on the principal of ……………

a) Zeroth Law of thermodynamics b) First law of thermodynamics

c) Second law of thermodynamics d) Third law of thermodynamics

• The Zeroth Law of Thermodynamics concerns bodies A, B, and C, and the relation “is in Thermal equilibrium with.” Suppose each of the following relations is substituted for “is in thermal equilibrium with.” For which relation will the Zeroth Law fail?

a) “Communicates via email with,” b) “is as tall as,”

c) **“Works in the same building with,” (assume one job for each),**

d) “Owns the same model car as” (assume one car for each).

• Engineers design city sidewalks using blocks of asphalt separated by small gap to prevent them from cracking. Which of the following laws best explains this practice?

a) The 0th Law of Thermodynamics b) The 1st Law of Thermodynamics

c) Law of thermal expansion d) None of thes

The Zeroth Law of Thermodynamics concerns bodies A, B, and C, and the relation “is in Thermal equilibrium with.” Suppose each of the following relations is substituted for “is in thermal equilibrium with.” For which relation will the Zeroth Law fail?

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Engineers design city sidewalks using blocks of asphalt separated by small gap to prevent them from cracking. Which of the following laws best explains this practice?

(a) The Zeroth Law of Thermodynamics

(b) The First Law of Thermodynamics

(c) The Second Law of Thermodynamics

(d) The law of thermal expansion

(e) Conservation of charge

When water freezes, its molecules take on a more structured order. Why doesn’t this contradict the Second Law of Thermodynamics?

(a) Because the density of the water is decreasing

(b) Because the water is gaining entropy as it goes from liquid to solid state
(c) Because the water’s internal energy is decreasing

(d) Because the surroundings are losing entropy

(e) Because the surroundings are gaining entropy.

How many "laws of thermodynamics" are there?

(a) 4
(b) 3
(c) 5
(d) 6

Which law of thermodynamics says that heat is a form of energy?
(a) 1st
(b) 2nd
(c) 3rd
(d) 4th

Topic # 7

First law of thermodynamics

1. Thermodynamics deals with:
❖ Isolated systems
❖ The interactions among various parts of the system
❖ The microscopic behavior of system
❖ The interaction between system and surrounding

2. In an isochoric process there is no:
❖ Internal energy changes
❖ Temperature changes
❖ Volume changes or work done
❖ Pressure changes

3. In general work done on or by a gas depends on:
❖ The initial state only
❖ The final state only
❖ The initial state, final state and path
❖ The initial and final states

4. The specific heat of a gas at constant pressure is always greater than the specific heat at constant volume because:
❖ The efficiency of a constant pressure is greater
❖ Only a constant pressure process is reversible
❖ In addition to raise the temperature, the heat supplied at constant pressure must be used up in doing some external work.
❖ The constant pressure process is irreversible

5. The actual path traced out in P-V diagram of a process must be known in order to evaluate
❖ The work done
❖ The work done and the heat change

- The heat exchanged
- The internal energy change

6. The first law of thermodynamics is an expression of:
- The theory of heat exchange
- The idea of the heat death of the universe
- The conservation of energy
- All the thermal interaction

7. The first law of thermodynamics can be expressed mathematically by the relation:
- $\Delta W=\Delta Q+W$
- $\Delta U=\Delta Q-W$
- $\Delta Q=\Delta W-\Delta U$
- $\Delta Q=\Delta U-\Delta W$

8. Thermodynamics concerns itself primarily with:
- The measurement of quantity of heat
- The physical effects of temperature change
- The motion of heated bodies
- The conversion of heat to other energy forms

9. The first law of thermodynamics states that:
- The total work in a closed system is conserved
- The total energy in a closed system is conserved
- All of the above
- None of these.

10. When a P-V diagram (the graph plotted between volume and pressure) represents a thermodynamic process, the area under the curve represents:
- Work
- Presence
- Power
- Efficiency of a heat engine.

11. In an isobaric process there is no:
- Pressure changes
- Internal energy changes
- Volume changes or works done
- Heat changed

12. A heat engine in interaction with its surroundings always undergoes the process of:
- Absorbing heat from a source
- Performing mechanical work
- Releasing heat to its surroundings
- All of the above

13. In an isothermal process, there is no:

- ❖ Pressure changes
- ❖ Volume changes or work done
- ❖ Internal energy or temperature change
- ❖ Neat exchanged

14. In an adiabatic process there is no:

- ❖ Work done
- ❖ Internal energy changes
- ❖ Temperature changes
- ❖ Heat exchanged

15. Heat added to a gas is equal to:

- ❖ The increase in internal energy of the gas
- ❖ The external work done by the gas
- ❖ The sum of the increases in internal energy and the external work did by the gas
- ❖ The external work done on the gas

16. In a continuous cyclic process, the internal energy of the system:

- ❖ Increases over the cycle
- ❖ Decreases over the cycle
- ❖ Remains the same
- ❖ None of these

17. The property of a system, which remains constant during and adiabatic change, is:

- ❖ Volume
- ❖ Pressure
- ❖ Temperature
- ❖ Entropy

18. The so called "heat death of the universe will occur"

- ❖ When the thermal energy of the universe will be maximum
- ❖ When the temperature difference among the objects of the universe will be minimum
- ❖ When the temperature difference among the objects of the universe will zero
- ❖ Never

19. Heat transferred to or from a ___ is directly proportional to the temperature of the hot or cold body:

- ❖ Carnot engine
- ❖ Steam engine
- ❖ Information's are insufficient
- ❖ None of these

20. Any device, which converts heat into mechanical energy, is called:

- ❖ Thermostat
- ❖ Heat converter
- ❖ Heat engine
- ❖ Heat transmit

21. The thermodynamics process in which change in volume of the system is zero tell that:

- ❖ The work done on or by the system is zero
- ❖ The work done by the system is maximum
- ❖ The work done on the system is maximum
- ❖ The work done by the system is minimum

22. A cyclic heat engine is capable of taking heat from a ___ and performing and equivalent amount of work

- ❖ Source
- ❖ Sink
- ❖ Source first and the from a sink
- ❖ None of these

23. The statement that "*THE CHANGE IN INTERNAL ENERGY OF A SYSTEM IS EQUAL TO THE HEAT ADDED TO THE SYSTEM MINUS THE WORKD DONE BY THE SYSTEM*", is known as the:

- ❖ 1st law of thermodynamics
- ❖ 2nd law of thermodynamics
- ❖ Law of entropy
- ❖ None of these

24. It is impossible to cause heat to flow from a cold body to a hot body without the

- ❖ Expenditure of energy
- ❖ Change of temperature
- ❖ Increase in kinetic energy
- ❖ Increase in volume

25. The 1st law of thermodynamics states that:

- ❖ 100% conversion of mechanical work into heat is not possible
- ❖ 100% conversion of heat into mechanical work is not possible
- ❖ The max efficiency of an ideal engine can never be more than 50%
- ❖ None of these

26. The mathematical form of first law of thermodynamics is

(a) $\Delta U = Q+W$

(b) $W = \Delta U+Q$

(c) $W = Q-\Delta U$

(d) $Q = \Delta U-W$

27. The first law of thermodynamics is merely a statement of
(a) Law of conservation of momentum
(b) Law of conservation of mass
(c) Law of conservation of energy
(d) Charle’s law

28. A bicycle pump provides a good example of
(a) first law of thermodynamics
(b) second law of thermodynamics
(c) third law of thermodynamics
(d) zeroeth law of thermodynamics
(e) none of these

29. The process which is carried out at constant temperature is known as
(a) adiabatic process
(b) isothermal process
(c) isochoric process
(d) Isobaric process

30. which equation expresses the isothermal process
(a) $PV\gamma$ = constant
(b) VT = constant
(c) $Q = W$
(d) $Q = W + \Delta U$

31. For the adiabatic process, the first law of thermodynamics can be written as
(a) $Q = W$
(b) $PV\gamma$ = constant
(c) $Q = W + \Delta U$
(d) $W = -\Delta U$

32. In which process the condition for the application of boyle’s law on the gas is fulfilled
(a) Isochoric process

(b) Adiabatic process
(c) Isothermal process
(d) Isobaric process

33. In case of an ideal gas, the P.E associated with its molecule is
(a) maximum
(b) zero
(c) minimum
(d) not fixed

34. The curve representing an isothermal process is called
(a) adiabat
(b) isotherm
(c) fixed temperature
(d) none of them

A process in which no heat enters or leaves the system is called

(a) Isochoric process

(b) Isothermal process

(c) Adiabatic process

(d) Isobaric process

In an adiabatic process the work is done at the expense of the

(a) Energy supplied to the system

(b) Energy gained from the surroundings

(c) Internal energy

(d) None of them

In an adiabatic expansion, the temperature of a gas

(a) Increases

(b) Becomes zero

(c) Increases rapidly

(d) Decreases

In an adiabatic compression, the temperature of the gas

(a) Increases

(b) Becomes zero

(c) Decreases

(d) Decreases rapidly

Adiabatic change occurs when the gas

(a) Expands

(b) Compressed

(c) Expands or compressed rapidly

(d) Expands or compressed

The mathematically expression for adiabatic process is

(a) Q = W

(b) $PV\gamma$ = constant

(c) PV = constant

(d) P/T = constant

14) Which of the following is not an example of adiabatic process?

(a) The rapid escape of air from a burst tyre

(b) The rapid expansion and compression of air through which a sound wave is passing.

(c) Cloud formation in the atmosphere

(d) None of them

The curve representing an adiabatic process is called

(a) isotherm

(b) Adiabat

(c) Adiable

(d) None of them

Under isochoric process

(a) The volume of the system remains constant

(b) The temperature of the system remains constant

(c) The pressure of the system remains constant

(d) The energy of the system remains constant

First law of thermodynamics tells us that heat energy can be converted into equivalent amount of work, but it is silent about

(a) How heat is absorbed

(b) How heat is extracted

(c) How this conversion takes place

(d) None of them

When the pressure is constant the process is called __________.

(Adiabatic, ***isobaric***, isochoric, isothermal)

In _________ process the work is done at the cost of internal energy.

(***Adiabatic***, isobaric, isochoric, isothermal)

In isothermal process the amount of ___________ is equal to zero.

(Internal energy, work done, external energy, power)

In adiabatic process the amount of ________is equal to zero.

(***Q,*** U, W, S)

When the pressure is constant the process is called______

(Adiabatic, isobaric, ***Isochoric***, isothermal)

"Heat energy can be transfer into another form of energy and another form of energy into heat energy" this is the law of ___________.

(***First law of thermodynamics***, Newton's first law second law of motion, second law of thermodynamics, law of inertia)

When the temperature is constant the process is called ________

(Adiabatic, Isobaric, Isochoric, ***Isothermal***)

The P—V graphical diagram of ____________ process is a curve.

(Adiabatic, Isobaric, Isochoric, ***Isothermal***)

The process in which heat energy neither escapes nor absorbs from the system

In isochoric the amount of__________ is zero.

(Q, U, ***W***, S)

The law which resembled with the law of conservation of energy is known _____________.

(***First law of thermodynamics***, Newton's first law second law of motion, second law of thermodynamics, law of inertia)

The P—V graphical diagram of ____________ process is s horizontal straight curve.

(Adiabatic, ***Isobaric***, Isochoric, Isothermal)

When the piston moves initial state to final state is called_______.

(Internal energy***, work done***, external energy, power)

The P—V graphical diagram of ____________ process is vertical straight curve.

(Adiabatic, Isobaric, ***Isochoric***, Isothermal)

Q will be positive when the amount of heat energy_____________ to the system.

(***Provided***, Rejected, Released)

W will be positive when the work is done ____________.

(***By the system***, on the system, of the system)

Q will be negative when the amount of heat energy ____________ to the system.

(Provided, ***Rejected***, Released).

Q is negative when the work is done ____________.

(By the system, ***on the system***, of the system)

Body A and body B are in thermal contact and are in thermal equilibrium. Which of the

following is true? In thermal equilibrium, (a) the total amount of energy due to atomic motion
is the same in A as it is in B, (b) each of the atoms in A and in B have exactly the same amount
of energy, at any instant, (c) the atoms in both A and B stop moving, (d) the average amount
of energy transferred by atomic collisions from A to B is the same as the average amount
transferred from B to A from instant to instant.

Two closed containers both contain 1 mole of the same ideal gas. The gas in container A has a volume of 1 liter and a pressure of 1 atm. The gas in container B has a volume of 1/2 liter and a pressure of 2 atm. When the containers are placed in good thermal contact with each other
which of the following changes occur?
(a) The pressure in A increases.
(b) The pressure in B
increases.
(c) There are no changes in either container.
(d) There isn't enough information to
determine what happens.

You want to raise the temperature of an ideal gas to a maximum value with a fixed *Q* joules
of heat. Which of the following is the best process for doing so? (a) Hold the volume constant.
(b) Hold the pressure constant. (c) Hold the internal energy constant. (d) Is doesn't matter
because all processes will yield the same final temperature.

Two different reversible processes connect the same two equilibrium states. Which of the
following must be the same for the two processes? (a) D*U* and D*T*, (b) *Q* and *W*,
(c) *Q* and D*T*, (d) D*U* and *W*.

Topic # 8

1. The second law of thermodynamics asserts that heat will always flow

"downhill", i.e., from an object having a higher temperature to one having a

lower temperature.

a) higher temperature, lower temperature

b) higher temperature, higher temperature

c)lower temperature, lower temperature

d) none of the above

e) a and b both

2. The second law is satisfied if k is a positive parameter.

a) negative

b) positive

c) a and b both

d) none of the above

3. Thermodynamics in terms of their connection to the second law of thermodynamics, and the distinction between the role of energy radiation

and entropy radiation.

a. First law of thermodynamics

b. Second law of thermodynamics

c. Third law of thermodynamics

d. none of the above

e. a and b both

4. The second law of thermodynamics for irreversible processes is briefly reviewed and extended to a system moving at a relative velocity.

a. instantaneous velocity

b. average velocity

c. relative velocity

d. none of the above

e. b and c both

5. The concept of minimum entropy production is applied to a thermodynamic system which is in relative motion.

a. maximum entropy

b. minimum entropy

c. none of the above

d. a and b both

6. Second law of thermodynamics was based on two methods one is Celsius and second is Kelvin.

a. Celsius and Kelvin

b. Newton's

c. momentum

d. none of the above

e. b and c both

7. The application of the second law of thermodynamics is shown to impose non-negativity constraints on the defined diffusion coefficients.

a. first law of thermodynamics

b. second law of thermodynamics

c. third law of thermodynamics

d. none of the above

e. a and b both

8. The second law of thermodynamics states that the Suniverse is positive for every real process. This means that:

a) the universe becomes more ordered with every reaction which occurs.

b) the universe is in equilibrium.

c) the first law of thermodynamics does not hold in universal considerations.

d) the universe is increasing in energy.

e) overall, the universe becomes more random with every reaction which occurs.

9. Heat cannot be transferred from a colder to hotter body.

a. hotter to colder body

b. colder to hotter body

c. none of the above

d. a and b both will b correct.

10. Entropy is the measure of the disorder of the randomness of energy and matter in a system.

a. entropy

b. electro static

c. charge

d. none of the above

e. b and c both.

11. In thermodynamics it is impossible to convert all the heat extracted from the reservoir into useful work.

a. electro static

b. thermodynamics

c. electric flux

d. none of the above   e. b and c both

12. The second law is expressed mathematically in terms of the concept of <u>entropy</u>.

a. electro static

b. charge

c. electric flux

d. entropy

13. If an amount of heat Q flows from a hot to a cold body, the total entropy increases.
a. decreases

b. increases

c. a and b both will

d. none of the above

14. In ideal reversible processes entropy remains constant.
a. variable

b. constant

c. none of the above

d. a and b both

15. The entropy gained by the low temperature reservoir is equal to the entropy lost by the high temperature reservoir.

a. not equal

b. equal

c. none of the above

d. infinite

e. finite

16. In all real physical processes entropy increases.

a. decreases

b. increases

c. none of the above

d. equal

e. finite

17. The cold body gains more entropy than the hot body loses.

a. less

b. more

c. nothing

d. none of the above

e. a and b both.

18. The two versions of the second law of thermodynamics can be shown to be entirely equivalent.

a. equivalent

b. not equivalent

c. none of the above

d. a and b both

19. J. E. Clausius, states that a transformation is impossible whose only final result is to transfer heat from a body at a given temperature to a body at higher temperature.

a. Clausius

b. Kelvin

c. Newton

d. Columb’s

e. none of the above.

20. A closed cycle consisting of two isothermal and two adiabatic transformations is called a Carnot cycle.

a. two, two

b. three, three

c. four, four

d. two, three

e. none of the above.

21. The French physicist Sadi Carnot, who first discussed the implications of such cycles.

a. Chinese

b. French

c. Japanese

d. English

e. none of the above

22. When a body absorbs an amount of heat Q from a reservoir at temperature T, the body gains and the reservoir loses an amount of entropy S=Q/T.

a. S=Q/T

b. S=T/Q

c. S=Q*T

d. S=T*Q

e. S=T+Q

23. The statement that heat never flows from a cold to a hot body can be generalized by saying that in no spontaneous process does the total entropy decrease.

a. increase

b. decrease

c. equal

d. finite

e. none of the above.

24. Thermodynamics comes from two root words “thermo” means heat and “dynamic” means power.

a. heat, power

b. heat, work

c. power, work

d. none of the above

e. work, torque

25. The second law of thermodynamics is commonly known as the law of increased entropy.

a. same as first law of thermodynamics

b. same as third law of thermodynamics

c. law of increased entropy

d. none of the above

e. a and b both.

The second law of thermodynamics asserts that heat will always flow "downhill", i.e., from an object having a higher temperature to one having a lower temperature.
a. higher temperature, lower temperature b. higher temperature, higher temperature c. lower temperature, lower temperature d. none of the above e. a and b both

The second law is satisfied if k is a positive parameter.
a. negative b. positive c. a and b both d. none of the above

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a. first law of thermodynamics b. second law of thermodynamics c. third law of thermodynamics d. none of the above e. a and b both

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a. instantaneous velocity b. average velocity c. relative velocity d. none of the above e. b and c both

The concept of minimum entropy production is applied to a thermodynamic system which is in relative motion.

a. maximum entropy b. minimum entropy c. none of the above d. a and b both

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universe is in equilibrium. C) the first law
of thermodynamics does not hold in universal
considerations. D) the universe is increasing in energy. E) overall, the universe becomes more
random with every reaction which occurs.

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a. hotter to colder body b. colder to hotter body c. none of the above d. a and b both will b correct.

Entropy is the measure of the disorder of the randomness of energy and matter in a system.
a. entropy b. electro static c. charge d. none of the above e. b and c both.

IN thermodynamics it is impossible to convert all the heat extracted from the reservoir into useful work.
a. electro static b. thermodynamics c. electric flux d. none of the above e. b and c both

The second law is expressed mathematically in terms of the concept of entropy.

a. electro static b. charge c. electric flux d. entropy e. none of the above.

If an amount of heat *Q* flows from a hot to a cold body, the total entropy increases.
a. decreases b. increases c. a and b both will d. none of the above

in ideal reversible processes entropy remains constant.
a. variable b. constant c. none of the above d. a and b both

The entropy gained by the low temperature reservoir is equal to the entropy lost by the high temperature reservoir.
a. not equal b. equal c. none of the above d. infinite e. finite

In all real physical processes entropy increases.
a. decreases b. increases c. none of the above d. equal e. finite

the cold body gains more entropy than the hot body loses.
a. less b. more c. nothing d. none of the above e. a and b both.

The two versions of the second law of thermodynamics can be shown to be entirely equivalent.
a. equivalent b. not equivalent c. none of the above d. a and b both

J. E. Clausius, states that a transformation is impossible whose only final result is to transfer heat from a body at a given temperature to a body at higher temperature.
a. clausius b. Kelvin c. Newton d. columb's e. none of the above.

A closed cycle consisting of two isothermal and two adiabatic transformations is called a Carnot cycle.
a. two, two b. three, three c. four, four d. two, three e. none of the above.

the French physicist Sadi Carnot, who first discussed the implications of such cycles.
a. Chinese b. French c. Japanese d. English e. none of the above

When a body absorbs an amount of heat *Q* from a reservoir at temperature *T,* the body gains and the reservoir loses an amount of entropy *S=Q/T.*
a. S=Q/T b. S=T/Q c. S=Q*T d. S=T*Q e. S=T+Q

The statement that heat never flows from a cold to a hot body can be generalized by saying that in no spontaneous process does the total entropy decrease.
a. increase b. decrease c. equal d. finite e. none of the above.

thermodynamics comes from two root words “thermo” means heat and “dynamic” means power.
a. heat, power b. heat, work c. power, work d. none of the above e. work, torque

the second law of thermodynamics is commonly known as the law of increased entropy.
a. same as first law of thermodynamics b. same as third law of thermodynamics c. law of increased entropy d. none of the above e. a and b both.

Topic # 9:

electromagnetic waves

MCQS ABOUT ELECTROMAGNETIC WAVES:

1. Microwaves are used in **telecommunication** as well as for cooking food.

2. The velocity of electromagnetic waves in a vacuum is approximately **186,000** miles per second or **300,000** kilometers per second
3. The **amplitude** of electromagnetic waves relates to its intensity.
4. **Electromagnetic waves** are transverse waves, similar to water waves.
5. **Gamma rays** are dangerous rays coming from nuclear reactors and atomic bombs.
6. Electromagnetic waves are formed when an electric field

couples with a **magnetic field**.

7. **Wavelength** in the electromagnetic spectrum of about 1/10,000,000.

8. **Visible light** waves are the radiation you can see with your **eyes.**
9. **Infra red** rays are the deep red rays you get from a heat lamp.
10. Ultra violet rays are used in **black light** that makes object glow.
11. Those waves which can travel in a vacuum called **electromagnetic waves**.
12. In a vacuum all electromagnetic waves travel with speed of 3 X 10-8 m/sec.

13. 1. Which of the following is correct in order of lowest to highest energy?

14. None **A) X-rays, Visible Light, Microwave**

B) Ultraviolet, Visible Light, Gamma-rays

C) Microwave, Visible Light, Gamma-rays

D) VisbleLight , Microwave ,Gamma-rays

E) X-rays, Microwaves, Visible Light

15.

16. 2. The photons that make up radio waves travel at the same speed as the photons that make up visible light.

17. None **A) True**

B) False

C) We don't know

18.

19. 3. The electromagnetic spectrum can be expressed in terms of energy, wavelength, or frequency.

20. None A)True

B) False

C) We don't know

21.

22. 4) Low energy photons are waves. High energy photons are particles.

23. None A) True

B) False

24. C) We don't know

25.

26. 5. Electromagnetic radiation can be described in terms of a stream of -------

27. A) Photons B) Energy

28. B) Energy C) Particle

29. C) Particle

30.

31.

32. 6. Electromagnetic waves are produced by

33. A) Stationary electron D) Light

34. B) Electrons E) Accelerated electrons

35. C) Particle

36.

37. 7. In space, microwaves are used by astronomers to learn about the structure of _ _ _ _

38. A) Sun B) Galaxies

39. C) Light D) Electrons

40. E) None

41.

42. 8. Speed of radio waves in vacuum

43. A) 3×10^{3} D) 4×10^{3}

44. B) 3×10^{2} E) 5×10^{3}

45. C) 3×10^{4}

46.

47. 9) Which of the following is not affected by electric and magnetic fields

48. A) Cathode rays B) Beta rays

49. C) Alpha rays D) Electromagnetic waves

50.

51. 10) Radio waves and visible light in vacuum have

52. A) Same wavelength but different velocities

53. B) Same velocity but different wavelength.

54. C) Different velocities and different wavelength.

55. D) Same velocities and same wavelength.

56. E) None

57.

58. 11) Electromagnetic radiation of frequency 3×10^3 MHz lies in the

59. A) Visible region B) Radio region

60. C) Infrared region D) Microwave region

61. E) Ultraviolet region

62.

63. 12) An electromagnetic wave has wave length 10cm .it is in the

64. A) Visible region B) Radio region

65. C) Ultra violet region D) X – ray region

66.

67. 13) Electromagnetic waves

68. A) Longitudinal wave B) Transverse wave

69. C) Light wave D) None

70.

71. 14) Electromagnetic radiation is a continuous spectrum of

72. A) Wavelengths B) Light

73. C) Particle D) None

74.

75. 15) Electromagnetic radiation which has the lowest frequency, the longest

76. A) Wavelength B) Light

77. C) Particle D) None

78.

79. 16) The --------- propagate in the direction perpendicular to both electric and magnetic field vectors
80. A) Light B) Sound
81. C) Longitudinal wave D) Electromagnetic waves
82.
83. 17) The longer wavelength of visible region is
84. A) 500nm B) 700nm
85. C) 600nm D) 100nm
86.
87. 18) The shorter wavelength of visible region is
88. A) 500nm B) 700nm
89. C) 400nm D) 100nm
90.
91.
92. 19) Electromagnetic waves requires a ------- for their propagation
93. A) Medium B) No medium
94. C) Sound D) None
95.
96. 20) Maxwell demonstrated that -------- and magnetic fields travel through space, in the form of waves, and at the constant speed of light
97. A) Electric B) Light
98. C) Space D) Wavelenght
99.
100. 21) The electric and magnetic fields are related as
101. A) E= cB B) E= vB
102. C) E= λB E) none
103.
104. 22) Which of the following are electromagnetic waves.
105. A) Sound wave B) Light wave
106. C) Radio waves D) Water waves
107.
108. 23) ------- full range of frequencies, from radio waves to gamma rays, that characterizes light.
109. A) Electromagnetic spectrum B) Electricity

110. C) Wave D)Radio wave

111. 24) ------ require a medium for their propagation.

112. A) Electromagnetic waves B) Microwaves

113. C) Radio waves D) Mechanical waves

114. 25) Electromagnetic waves are also called 'electromagnetic radiation' because they radiate from the ------- charged particles.'

115. A) Electrically B) Mechanically

C) Accelerated D) Electrons

116. The electromagnetic wave are __________________to each other and to the direction of the wave.

- Perpendicular
- Parallel
- 45 degree
- 180 degree
- None of above

117. Waves in the electromagnetic spectrum vary in ___________________io waves the size of buildings, to very short gamma-rays smaller than the size of the nucleus of an atom.

- Size
- Color
- Shape
- State
- None of above

118. The strength and origin of "echoes" received from objects that were hit by the_______________ is then recorded.

- Nano waves
- Sound waves
- Visible waves
- Microwaves
- None of above

119. The micro waves tower can _________information like telephone calls and computer data from one city to another.

- Block
- Transmit
- Return
- Clear
- None of above

120. The JERS satellite uses wavelengths about___cm in length (L-band).

- 10
- 30
- 20
- 40
- None of above

121. The area of brightest X-ray emission is red.

- Green
- Red
- Orange
- Blue
- None of above

122. We use satellites with X-ray_______________ on them to do X-ray astronomy.

- Like
- Unlike
- Red
- Detectors
- None of above

123. Radio waves have the ________________wavelength in the electromagnetic spectrum.

- Smallest
- Normal
- Longest
- All of above
- None of above

124. Microwaves have shorter wavelengths than radio waves,

- Normal
- Longest
- Shorter
- All of above
- None of above

125. The sun gives off waves with shorter wavelengths.

- Sound
- Light
- Infrared
- All of above
- None of above

126. Gamma Rays have the ______________wavelength and the most energy of the waves in the electromagnetic spectrum.

- Smallest
- Normal
- Longest
- All of above
- None of above

127. Cellular phones also use radio waves to transmit information.

- Block
- Transmit
- Return
- Clear
- None of above

128. X-rays were first observed and documented in 1895 by Wilhelm Conrad Roentgen.

- 1894
- 1895
- 1896
- 1897
- None of above

129. Microwaves are good for transmitting information from one place to another because microwave energy can penetrate haze, light rain and snow, clouds, and smoke.

- Good
- Bad
- Slow
- All of above
- None of above

130. Radar was developed to detect objects and determine their range (or position) by transmitting short bursts of microwaves.

- Short
- Long
- Normal
- All of above
- None of above

131. Shorter microwaves are used in remote sensing.

- Normal
- Longest
- Shorter
- All of above
- None of above

132. The ERS-1 satellite sends out wavelengths about 5.7 cm long (C-band).

- 5
- 5.7
- 6

- 6.3
- None of above

133. Radio astronomy has the advantage that sunlight, clouds, and rain do not affect observations.

- Affect
- Unaffected
- red
- All of above
- None of above

134. The ______________waves are responsible for causing our sunburns.

- Ultraviolet
- Light
- Sound
- All of above
- None of above

135. We usually talk about X-rays in terms of their energy rather than_______________.

- Wavelength
- Light
- Color
- All of above
- None of above

Topic # 10

Third law of thermodynamics

QUESTION 1:

Thermodynamics is the study of _________.

- Movement and Vectors
- Atoms and Magnetism
- **Temperature and Heat**
- Lights and waves
- None of the Above

QUESTION 2:
Liquids and gases expand as the ___________.

- Mass increases
- Volume increases
- **Temperature increases**
- Pressure increases
- All of the above

QUESTION 3:

Thermodynamic reactions play critical roles in all of the following except ______.

- Refrigerators
- Car Engines
- **Hitting Baseballs**
- Polar Ice Caps Melting
- All of the above

QUESTION 4:
Energy naturally moves from a heat source to a heat ______.

- Vacuum
- Hole

- **Sink**
- System
- None of the above

QUESTION 5:
There are ______ laws of thermodynamics.

- 1
- 2
- 3
- **4**
- 5

QUESTION 6:
______ is known as Father of Thermodynamics.

- Robert Boyle
- Robert Hooke

- **Sadi Carnot**
- Thomas Savery
- William Thomson

QUESTION 7:
Zeroth law was coined by ______.

- **Ralph H.Fowler**
- Denis Pepin
- James Joule
- William Rankin
- None of the above

QUESTION 8:
$\Delta U=\Delta Q - \Delta W$ defines ______ law of thermodynamics.

- **First**
- Second
- Third
- Zeroth
- Combined

QUESTION 9:
First law of Thermodynamics has ______ applications.

- **4**
- 2
- 6
- 5
- 1

QUESTION 10:
Third law of Thermodynamics was discovered during the years_______.

- 1912-1922
- 1895-1902
- **1906-1912**
- 1904-1908
- None of the above

QUESTION 11:
Third law of Thermodynamics was developed by ______.

- **Walther Nernst**
- Gilbert N.Lewis

- Simon Alfred
- Merle Randall
- None of the Above

QUESTION 12:
Third law of Thermodynamics was reinstated by ______.

- Walther Nernst
- Gilbert N.Lewis
- Simon Alfred
- Merle Randall
- **B & D**

QUESTION 13:
Third law of Thermodynamics states that ______.

- **”As a system approaches absolute zero, all processes cease & entropy of a system approaches a minimum value”**
- ”When heat is converted into work & others forms of energy, total

amount of energy remains constant”

- ”When system takes heat, entropy of the system has maximum value”
- ”When work is converted into heat, total enthalpy has minimum value”
- All of the Above

QUESTION 14:
Third law of Thermodynamics is also known as ______.

- **Nernst Theorem**
- Gilbert Postulates
- Law of Alfred
- Theory of Merle
- None of the Above

QUESTION 15:
Third law of Thermodynamics was reinstated in the year ______.

- **1923**
- 1912
- 1900
- 1879
- None of the Above

QUESTION 16:
The entropy of a perfect crystal lattice as defined by Nernst's theorem is ______.

- Minimum
- Maximum
- **Zero**
- Equal to r.t.p
- None of the Above.

QUESTION 17:
ΔS=Entropy=$\Delta Q \setminus \Delta T$ defines ______ law of thermodynamics.

- Zeroth
- First
- **Second**
- Third
- All of the Above

QUESTION 18:
________ remains constant in Isobaric Process.

- Energy
- Temprature

- **Pressure**
- A & B
- All of the Above.

QUESTION 19:
Applying First law of thermodynamics to isobaric process, we get ________.

- **$\Delta Q = P\Delta V + \Delta U$**
- $\Delta P = \Delta Q + \Delta W$
- $\Delta Q = \Delta W + \Delta U$
- $\Delta U = \Delta Q + \Delta V$
- None of the Above.

QUESTION 20:
Graph of Isochoric Process is _________.

- Parallel to X-axis
- **Parallel to Y-axis**
- Curve
- Perpendicular to X-axis
- Perpendicular to Y-axis

QUESTION 21:
In Isothermal Process ΔQ is equal to ________.

- **ΔW**
- ΔU
- ΔV
- ΔP
- ΔW + ΔV

QUESTION 22:
Graph of Adiabatic Process is ________.

- Straight Line
- Perpendicular to X-axis
- **Curve**
- Parallel to Y-axis
- None of the Above

QUESTION 23:
Entropy is ________.

- Measure of Molecular Disorder
- Measure of Molecules Order
- Total Internal Energy
- Total Absorbed Energy
- All of the Above

QUESTION 24:
According to Third law of Thermodynamics ________.

- **When T=0k then S=0**
- When T=Maximum then S=Minimum
- When T=Maximum then S=Maximum
- When T=Maximum then S=0
- When T=Minimum then S=0

• Third Law of Thermodynamics relates the entropy (randomness) of matter to its __________.
1. Absolute temperature
2. Volume
3. Area
• As a system approaches absolute zero, all processes cease and the ________ of the system approaches a minimum value.
1. energy
2. power
3. entropy
• The Third Law of Thermodynamics refers to a state known as "____________."
1. absolute celcius
2. absolute zero
3. absolute farhenheight

- This is the bottom point on the _________ temperature scale.
1. celcius
2. farhenheight
3. kelvin
- . The _________ scale is absolute.
1. kelvin
2. celcius
3. farhenheight
- Efficiency of a steam engine is about _____.
1. 33%
2. 17%
3. 30%
- Change in entropy does not depend on ____________________.
1. heat added to the system
2. amount of the substance
3. temperature of the substance
- If the volume of a system increase, the disorder or entropy of the system _____________.
1. increases
2. decreases
3. doubled
- _______ Kelvin is mathematically the lowest possible temperature in the universe.
1. 273.15
2. 9
3. ***0***
- The device, which converts heat energy into mechanical energy, is called _______.
1. thermostat
2. heat converter
3. heat engine
- 0° Kelvin mathematically corresponds to about ________° Celsius, or -459.7 Fahrenheit.
1. 273.15
2. -273.15
3. 273
- No object or system can have a temperature of zero ________.
1. celcius
2. kelvin

3. farhenheight

- Heat can never spontaneously move from a ______ body to a ______ body.

1. hot to cold
2. cold to cold
3. ***cold to hot***

- The ________ of a pure perfect crystal is zero (0) at zero Kelvin (0° K).

1. ***entropy***
2. energy
3. power

- If the _________ water reached absolute zero, all molecular motion would stop completely.

1. ***solid***
2. liquid
3. boiled

- Third Law of Thermodynamics occurs in ultra-_______ temperature chemistry and physics.

1. high
2. ***low***
3. 9 k

Topic # 11
Reversible& irreversible process

1. In isothermal process ______ is constant.

a. Temperature.
b. Heat.
c. Pressure.
d. Volume.
e. None of the above.

2. In adiabatic process change in_______ is constant.

a. Heat.

b. Temperature.

c. Pressure

d. Volume

e. All of the above.

3. Which of them is a reversible process

a. Isothermal process.

b. Isobaric process.

c. Isochoric process.

d. Adiabatic process.

e. Both a & d.

4. The change in entropy of an adiabatic process is always

a. Increases.

b. Decreases.

c. Both a & b.

d. **None of them**.

5. Carnot cycle is_______ process.

a. Reversible.

b. Irreversible.

c. Both a & b,

d. None of them

6. For a reversible process both the system and surrounding are to be

a. **Equilibrium**.

b. Constant.

c. None of them.

d. All of them.

7. For a reversible process,

a. **S=0** $\triangle$

b. $\triangle S<0$
c. $\triangle S>0$
d. None of them.
e. All of them.

8. Carnot cycle consist of ________ processes.

a. Isothermal process.

b. Isochoric process.

c. Isobaric process.

d. Adiabatic process.

e. **Both a & d.**

f. None of them.

g. All of them.

9. In adiabatic process _______ is constant.

a. **$\triangle$T.**

b. heat

c. Temperature.

d. Volume.

10. The single swing of friction less pendulum from its extreme to the other extreme position is_________ process.

a. Reversible
b. Irreversible

c. None of them.
d. All of them.

11. In a reversible process net work and net heat transfer must be

a. **Zero.**

b. > zero.

c. < zero.

d. None of the above.

12. Heat flow is ________ process.

a. Reversible.

b**. Irreversible.**

c. None of them.

d. All of them.

13. The single swing of real pendulum is _______.

a. Reversible.

b. **Irreversible.**

c. None of them.

d. All of them.

14. For Irreversible process entropy of the system always remains ________.

a. **Increases.**

b. Decreases.

c. Constant.

d. Equals to zero.

e. None of them.

15. The free expansion of an ideal gas is ______.

a. Reversible.

b. Irreversible.

c. None of them.

d. All of them.

16. The formula for the entropy is

a. $\triangle$Q/time

b**.** **$\triangle$Q/T avg.**

c. None of them

d. All of them.

17. The reversible process can return to their _______ condition.

a. Original

b. Initial.

18. Which of them causes a process to be irreversible?

a. Pressure.

b. Increase in entropy.

c. Loss of energy.

d. Friction.

e. None of them.

f. All of them.

19. No heat engine can have efficiency ______ a reversible heat engine.

a. **Greater than** b. Less than

c. Equal then d. Nothing

20. All Reversible Heat Engines have same efficiency when operating between the same ___temperature reservoirs

a. 02 b. 03

c.4 d. none of these

QUESTION 1*

A 1/2-liter can contains 400 g of freon gas. Treat this as an ideal gas at T = 300 K with molecular weight 187 g/mole. What is the pressure inside the can?

(a) 1.9 atm
(b) 13 atm
(c) 55 atm
(d) 105 atm
(e) 172 atm

QUESTION 2*
Compare the internal energy of the following two systems A and B:

A is a container with 2N monotomic atoms at temperature T.

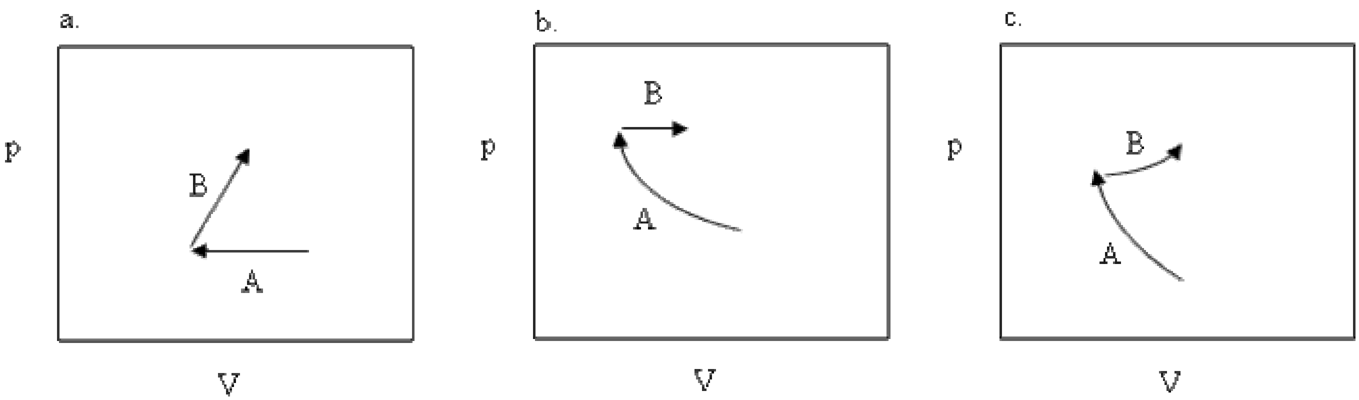
B is a container with N diatomic atoms at temperature T.

(a) $U_A = U_B$
(b) $U_A = 3U_B/5$
(c) $U_A = 5U_B/6$
(d) $U_A = 6U_B/5$
(e) $U_A = 2U_B$

QUESTION 3*
With the 3-kg mass on the plunger, the gas is heated to 310 K. What is the ratio of the new volume V_3 to the volume V_2?

(a) $V_3 / V_2 = 0.97$
(b) $V_3 / V_2 = 1$
(c) $V_3 / V_2 = 1.03$
(d) $V_3 / V_2 = 1.11$
(e) $V_3 / V_2 = 1.17$

QUESTION 4*
Which of the following could be a diagram of p vs V for the processes on the piston? ("A" represents placing the mass on the piston; "B" represents



applying heat to the cylinder.)

(a)
(b)
(c)

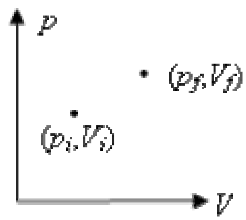
QUESTION 5*
The first law of thermodynamics is valid

(a) only during reversible processes.
(b) only during irreversible processes.
(c) always.

QUESTION 6*
A certain amount (*N* molecules) of ideal diatomic gas has initial pressure, p_i, and initial volume, V_i, as shown. It undergoes a process (not shown) and ends up with final pressure and volume, p_f and V_f, respectively. Which one of the following statements is true?

(a)
(b)
(c)

a The work done by the gas is $W_{by} = p_f V_f - p_i V_i$
b The change in the gas's internal energy is $\Delta U = \frac{5}{2}(p_f V_f - p_i V_i)$.
c. The heat flow into the gas is $Q = \frac{p_f V_f}{Nk} - \frac{p_i V_i}{Nk}$.



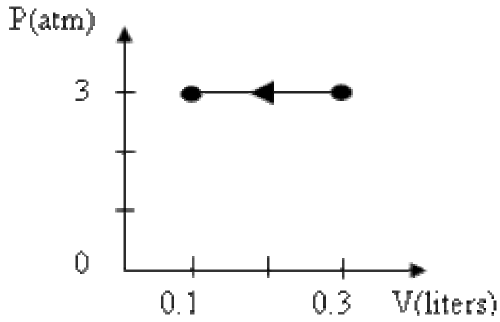
QUESTION 7*
Consider a thermodynamic cycle (on a p-V diagram) that describes a **heat pump** to heat your house in winter. In what direction should the cycle proceed?

(a) clockwise
(b) counter-clockwise
(c) It cannot be determined from the information given.

An ideal gas with an initial temperature of 900°C undergoes the isobaric process shown in the figure.

QUESTION 8*

What is the final temperature?



(a) 0°C
(b) 52°C
(c) 118°C
(d) 301°C
(e) 1040°C

QUESTION 9*
A small block of mass M moving at a velocity v collides with a big block of mass 2M at rest on a frictionless floor. The two blocks stick together after the collision. What fraction of the small block's kinetic energy before the collision is converted to internal energy after the collision?

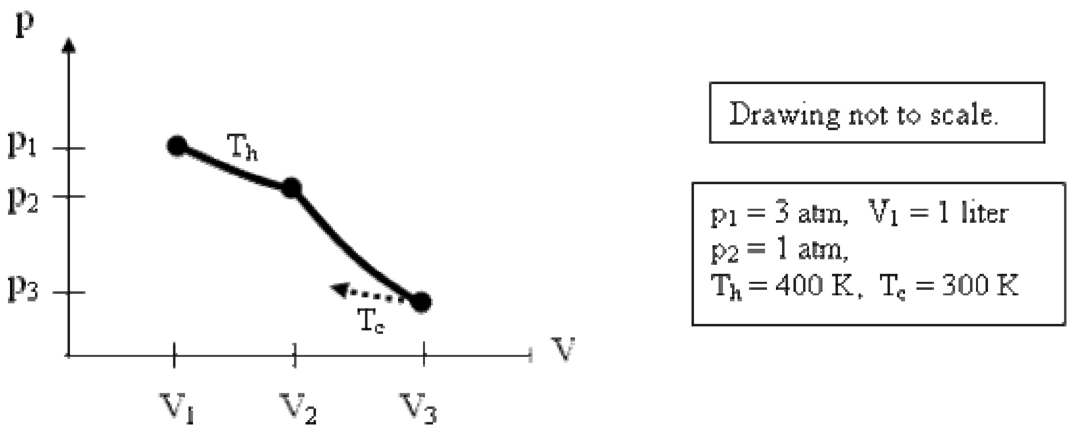
(a) 1/9
(b) 1/3
(c) $(2/3)^{1/2}$
(d) 2/3
(e) 5/6

QUESTION 10*
Jane is designing a tropical fish tank and has a 1600-W heater to warm the water and compensate for heat flow through the glass. She will use 5-cm-thick glass with a thermal conductivity of 0.8 W/m-K. Assuming a water temperature of 30°C and a room temperature 20°C, what is the maximum total area she should use for the glass?

(a) 3 m^2
(b) 10 m^2
(c) 20 m^2

QUESTION 11*
An engine is based on a Carnot cycle (partially shown above) between temperatures of T_c = 300 K and T_h = 400 K. In the cycle, a *diatomic* gas expands from p_1 = 3 atm and V_1 = 1 liter to p_2 = 1 atm along the T_h

isotherm. Then it expands along an adiabat until its temperature cools from T_h to T_c.



What is the volume V_3?

(a) 2.5 liters
(b) 4.8 liters
(c) 6.2 liters
(d) 8.9 liters
(e) 21.7 liters

QUESTION 12*
A salesman tells you that he has an alternate engine working between room temperature (20°C) and freezing (0°C) with an efficiency of 30%. What can you conclude?

(a) It could be a Stirling cycle comprising isothermal and isochoric processes.
(b) He is lying.
(c) It could be a Carnot cycle comprising isothermal and adiabatic processes.

QUESTION 13*
An ideal gas of 2 moles of oxygen is allowed to isothermally expand at a temperature of 300 K. If the pressure of the gas drops from 5 atm to 1 atm, how much heat has the gas absorbed in the process?

(a) 65 J
(b) 360 J
(c) 2510 J
(d) 8030 J
(e) 16760 J

QUESTION 14*
The temperature of an ideal gas is raised in two ways -- at constant pressure and at constant volume. If the temperature rise is the same for both cases, which requires more transfer of heat?

(a) the case of constant pressure
(b) the case of constant volume
(c) It depends on the pressures and temperatures involved.

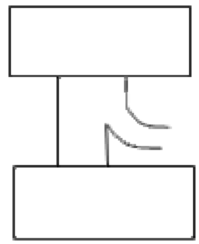
QUESTION 15*
For a given amount of heat input, which of the following processes will produce the highest work output?

(a) isochoric
(b) isobaric
(c) isothermal

QUESTION 16*
A family uses a heat pump to keep their house at 21°C (70°F) year-round. If the average outside temperature in summer is 31°C (88°F), what is the

power required to overcome a 10 kW heat leak into the house? (Assume an ideal heat pump.)

(a) 340 W
(b) 510 W
(c) 10 kW
(d) 14 kW
(e) 26 kW



QUESTION 17*
If the distance between the nerve cells were twice as far, the transit time for the molecule would increase by a factor of

(a) 1.414
(b) 2
(c) 4

QUESTION 18*
Compare the internal energy of the following two systems A and B:

A is a container with 2N monotomic atoms at temperature T.

B is a container with N diatomic atoms at temperature T.

(a) $U_A = U_B$
(b) $U_A = 3U_B/5$
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(c) It depends on the pressures and temperatures involved.

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With the 3-kg mass on the plunger, the gas is heated to 310 K. What is the ratio of the new volume V_3 to the volume V_2?

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(c) $V_3 / V_2 = 1.03$
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(e) $V_3 / V_2 = 1.17$

QUESTION 24*

A salesman tells you that he has an alternate engine working between room temperature (20°C) and freezing (0°C) with an efficiency of 30%. What can you conclude?

(a) It could be a Stirling cycle comprising isothermal and isochoric processes.
(b) He is lying.
(c) It could be a Carnot cycle comprising isothermal and adiabatic processes.

QUESTION 25*

If the distance between the nerve cells were twice as far, the transit time for the molecule would increase by a factor of

(a) 1.414
(b) 2
(c) 4

Topic # 12

THE CARNOTE CYCLE

1.The operating cycle of carnot engine consists of how much steps?

a-1 step b-2steps c-3steps d-4steps

2. First step is

a-isothermal expansion

b-isothermal compression

c-adiabatic expansion

d-adiabatic compression

3. Second step is

a-isothermal expansion

b-isothermal compression

c-adiabatic expansion

d-adiabatic compression

4. Third step is

a-isothermal expansion

b-isothermal compression

c-adiabatic expansion

d-adiabatic compression

5. Fourth step is

a-isothermsal expansion

b-isothermal compression

c-adiabatis expansion

d-adiabatic compression

6. In both the four step volume

a-change

b-ramain unchanged

c-some times change some times not

d-non of them

7.In an ideal engine all process are

a-backword

b-forward

c-reversiable

d-irreversiable

8.Who proposed the engine concepts

a-einstein

b-newton

c-N.L. sadi carnot

9.In which year engine concept was proposed

a-1820

b-1822

c-1824

d-1826

10.The efficiency of carnot engine is

a-Qout/Qin -1

b-Qin/Qout - 1

c- 1- Qout/Qin

d- 1 - Qin/Qout

11.Qout represent the temperature of

a-source

b-insulator

c-sink

d-another source

12.Qin represent the temperature of

a-source

b-insulator

c-sink

d-another insulator

13.Efficiency in percentage is

a-(1-Th/Tl)*100

b-(1-Tl/Th)*100

c-(Th/Tl-1)*100

d-(Tl/Th-1)*100

14.Efficiency of heat engine is

a-the ratio of output/input

b-the ratio of input/output

c-product of output and input

d-non of them

15.Real engine in which the processes that form the engine cycle are not reversiable have

a-medium efficiency

b-zero efficiency

c-lower efficiency

d-higher efficiency

16.Efficiency of carnot's engine is

a-100%

b-< then 100%

c-> then 100%

17.In a steam engine the working substance is

a-air

b-oil

c-water

d-soil

18.In an automobile engine the working substance is

a-air

b-water

c-gasoline(air mixture)

d-oil

19.Heat tranfered to and from carnot engine is _________ propotional

a-inversly

b-direrctly

c-non of them

20.The carnot cycle is traversed in the

a-anti-clockwise

b-clockwise

c-skip’s

d-non of them

Topic # 13

Entropy

QUESTION 1:
Consider two experiments in which 2 moles of a monatomic ideal gas are heated from temperature T to temperature T + ΔT. In the first experiment the volume V is kept constant. In the second experiment the pressure p is

kept constant. How much more heat is needed in the second experiment than in the first experiment to raise the temperature by the given amount ΔT?

- [ ] (a) 0
- [ ] (b) $R\,\Delta T$
- [x] (c) $2\,R\,\Delta T$
- [ ] (d) $3/2\,R\,\Delta T$
- [ ] (e) $5/2\,R\,\Delta T$

QUESTION 2:
A particular little isolated system in equilibrium has entropy $\sigma = 1000$ in configuration A. In configuration B it has $\sigma = 900$. What's the ratio of the probabilities of finding B and A?

- [ ] (a) $P_B / P_A = 0.9$
- [ ] (b) $P_B / P_A = e^{0.9}$
- [ ] (c) $P_B / P_A = e^{-0.9}$
- [x] (d) $P_B / P_A = e^{-100}$
- [ ] (e) Not enough information is given

QUESTION 3:
No system of any type in stable thermal equilibrium can have $C_V < 0$ because:

- ( ) (a) $U = \alpha NkT$
- ( ) (b) $C_V > C_P$
- (•) (c) Its energy would spontaneously redistribute, lumping up.

QUESTION 4:
A reversible process is one in which :

(a) the net entropy remains unchanged.

(b) the net entropy increases.

(c) the net entropy decreases.

QUESTION 5:

10^{-5} J of heat flow into a system at equilibrium at T = 300K, increasing its T very slightly. The system consists of a box with 2×10^{25} He atoms. By how much does its entropy increase?

(a) $\Delta\sigma = 1.1 \times 10^{-30}$

(b) $\Delta\sigma = 2.4 \times 10^{15}$

(c) $\Delta\sigma = 3.0 \times 10^{18}$

(d) $\Delta\sigma = 9.0 \times 10^{20}$

(e) Not enough information is given.

QUESTION 6:

This and the next four questions pertain to the following situation.

A toy balloon filled with pure nitrogen gas has an initial volume of 0.0042 m^3 at a temperature of 27°C. It is lying in the sun, heating up slowly. A few hours later, its temperature reaches a final value of 57°C. The pressure in the balloon remains at the atmospheric pressure, 1.013×10^5 Pa, throughout the heating process.

Does the heating cause the volume of the balloon to change, and, if so, by how much?

(a) The volume does not change because the pressure remains the same.

(b) The volume increases by about 5%.

(c) The volume increases by about 10%.

QUESTION 7:

Does the heating cause the root-mean-square speed of the gas molecules in the balloon to change, and, if so, by how much?

(a) The root-mean-square speed does not change because the pressure remains the same.

(b) The root-mean-square speed increases by about 5%.

(c) The root-mean-square speed increases by about 10%.

QUESTION 8:
By how many Joules ΔU does the internal energy of the gas in the balloon increase? Note that each nitrogen gas molecule is made of two nitrogen atoms.

(a) $\Delta U = 0$ J

(b) $\Delta U = 46$ J

(c) $\Delta U = 106$ J

(d) $\Delta U = 220$ J

(e) $\Delta U = 430$ J

QUESTION 9:
How much work W_{by} was done by the gas during the expansion?

(a) $W_{by} = 0$ J

(b) $W_{by} = 10$ J

(c) $W_{by} = 22$ J

(d) $W_{by} = 43$ J

(e) $W_{by} = 90$ J

QUESTION 10:
How much heat was added to the gas by the sun?

(a) 0 J

(b) $\Delta U + W_{by}$

(c) $\Delta U - W_{by}$

QUESTION 11:
This and the next three questions pertain to the following situation.

Systems A and B consist of simple harmonic oscillators (SHOs), each with the same level spacing ε. System A has 3 SHOs and a total thermal energy of 12ε; system B has 4 SHOs also with a total energy of 12ε. In this question and the following two, systems A and B are decoupled so that no energy can flow between them.

What is the average thermal energy in *one* of the SHOs of system A?

☐ (a) $U_1 = 0\varepsilon$
☐ (b) $U_1 = 1\varepsilon$
☐ (c) $U_1 = 2\varepsilon$
☐ (d) $U_1 = 3\varepsilon$
☑ (e) $U_1 = 4\varepsilon$

QUESTION 12:
What is the most likely value of the thermal energy in *one* of the SHOs of system A?

☑ (a) $U_1 = 0\varepsilon$
☐ (b) $U_1 = 1\varepsilon$
☐ (c) $U_1 = 2\varepsilon$
☐ (d) $U_1 = 3\varepsilon$
☐ (e) $U_1 = 4\varepsilon$

QUESTION 13:
What is the total entropy σ_{tot} ?

○ (a) $\sigma_{tot} = \sigma_A \sigma_B$
● (b) $\sigma_{tot} = \sigma_A + \sigma_B$
○ (c) $\sigma_{tot} = (\sigma_A^2 + \sigma_B^2)^{1/2}$

QUESTION 14:
If systems A and B are coupled so that energy can flow between them, which one of these will be true?

- [ ] (a) σ_{tot} will decrease.
- [ ] (b) σ_{tot} will be conserved.
- [x] (c) σ_{tot} will increase.

QUESTION 15:
Say that a large molecule can either be in a 'folded' macrostate with total entropy of the molecule and its environment $\sigma_{TF} = 50$ or in an 'unfolded' macrostate with total entropy $\sigma_{TU} = 60$. In equilibrium, about what is the probability P_F of finding it folded?

- [ ] (a) $P_F = 5/11$
- [ ] (b) $P_F = 5/6$
- [ ] (c) $P_F = e^{5/6}$
- [x] (d) $P_F = e^{-10}$
- [ ] (e) $P_F = e^{50}$

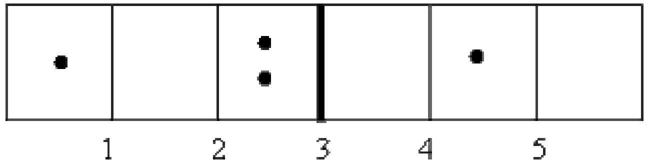
QUESTION 16:
A sealed box contains 10^{25} N_2 molecules at temperature T = 200 K. If 10^{-6} J of heat flows into the gas of molecules at equilibrium, increasing its T very slightly, by how much does its entropy increase?

- [ ] (a) $\Delta\sigma = 5.9 \times 10^{-30}$
- [ ] (b) $\Delta\sigma = 8.3 \times 10^{11}$
- [x] (c) $\Delta\sigma = 3.6 \times 10^{14}$
- [ ] (d) $\Delta\sigma = 8.7 \times 10^{17}$
- [ ] (e) Not enough information given.

QUESTION 17:
This and the next question pertain to the following situation.

A box has 6 cells and contains four 4 identical (indistinguishable) particles. A movable barrier divides the box such that 3 particles are always on the left and 1 particle is always on the right. There is no limit on the number of particles in a cell. Shown is a possible arrangement of particles when the barrier is at position 3.

What is the entropy of the system shown, with the barrier at position 3?



(a) $\sigma = 2.99$

(b) $\sigma = 3.29$

(c) $\sigma = 3.40$

(d) $\sigma = 3.99$

(e) $\sigma = 4.16$

QUESTION 18:
If the barrier is free to move, its most likely position will be

(a) left of position 3.

(b) position 3.

(c) right of position 3.

QUESTION 19:
Heat always flows spontaneously from

(a) an object with greater internal energy to an object with smaller internal energy.

(b) an object with greater entropy to an object with smaller entropy.

(c) an object with a higher temperature to an object with a lower temperature.

(d) an object with a higher heat capacity to an object with a lower heat capacity.

(e) an object with a higher specific heat to an object with a lower specific heat.

QUESTION 20:
Say you have a gas in a constant enclosed volume at T = 25°C, and some pressure P in a container with constant volume. To what temperature do you have to heat the volume of gas to double the pressure in the container?

- (a) 50°C
- (b) 323°C
- (c) 390 K

Topic # 14

Gravitation

1) There are four fundamental forces found in nature gravity is the of them.

- Strongest
- **Weakest**
- Oldest
- Most useful

2) A man jumps from flying aeroplane.he carries a bucket containing water. If the upside downs the bucket water will.

- Fall down
- Spill out every where
- **Stay in the bucket**
- None of the above

3) Tides in ocean and sea on the earth come because.

- Of increases in temperature
- The earth spins
- **The earth falls towards the of gravity**
- Earth and the moon

4) The weight of an object is equal to the force of gravity acting on it when.

- **The elevator is at rest**
- The elevator is accelerating Upward
- The elevator is accelerating Downwards
- The elevator is in middle

5) If the distance between tow masses is double and their masses are also double, the force of gravity.

- Becomes qaadmple
- Becomes twice
- Become half
- **Remains unchanged**

6) If the earth suddenly stop rotating about it axis the weight of the body on the surface of the earth will.

- Remains constant
- **Increases**
- Decreases
- Becomes infinite

7) If a plane exits whose mass and radius are twice of the earth of acceleration of gravity at its surface would be.

- 19.6 m/sec
- 9.8 m/sec
- **4.9 m/sec**
- 28.3 m/sec

8) The minimum velocity required to go out the earth's gravitational pull is called.

- Terminal velocity
- Angular velocity
- Drift velocity
- **Escape velocity**

9) The force of attraction acts along the.

- Axis of rotation
- **Line join the interacting bodies**
- Line parallel to the interacting bodies
- Line perpendicular to the interacting bodies

10) The range through which the gravitational force acts is.

- Limited to 1x10 m
- **Extremely long**
- About 1x10 m
- Limited $1x10m^{23}$

11) The force of attraction and repulsion between two bodies is.

- Inversely proportional to the distance
- Directly proportional to to the distance
- Inversely proportional to the square of the distance
- **Directly proportional to the square of the distance**

12) The weight of an object would be minimum when it is places.

- At the equator
- At the south pole
- At the north pole

- **<u>At the center of the Earth</u>**

13) The value of 'g' at the center of earth is.

- Maximum
- Minimum
- **<u>Zero</u>**
- Normal

14) The rate of decreases in value of above the surface of earth <u>is</u>
As compared to that below the surface of earth.

- Less
- **<u>More</u>**
- Same
- Not determined accurately

15) If the earth were three times farther from the sun that it is now, the gravitational force exerted on earth bt the sun will be.

- Three times
- Nine times
- **<u>One ninth time</u>**
- One third time

16) If the mass of the earth becomes four times large,the value of 'g' will.

- Remain unchanged
- **<u>Becomes four times larger</u>**

- Be doubled
- Become sixteen time larger

17) Newton's law of gravitation is often called "the law of universal gravitation" Because.

- It is valid in ever circumstances
- **It can be apply equal to terrestrial &celestial bodies**
- It is better than Einstein's theory
- It is invalid in ever circumstances

18) If the spin of the earth slows down 'g'.

- **Increase in magnitude**
- Decrease in magnitude
- Remains unchanged
- Changes in direction

19) Weight of a man falling freely is.

- **Zero**
- Equal to 'mg'
- Less than 'mg'
- Greater than 'mg'

20) At what depth below the earth's surface the value of 'g' reduces to one half of its value that it has on the surface of the earth.

- R
- 2R
- R/4
- **R/2**

Topic # 15

The unit for the spring constant is

a- Nm

b- J

c - Ns

d- N/m *

The unit for the period is

a- s *

b- /s

c- m*s

d- T

The unit for frequency is

a- S

b- s2

c- / m

d- Hz *

If the effective spring constant of a 2000 kg older car (with poor shocks) is 60000 N/m, what is the period of its vibration after hitting a bump ?

a - .15 s

b- .5 s

c- 1.15 s *

d- 2 s

What is the effective spring constant of a 10 kg, 1.5 m simple pendulum?

a- 6.5 N

b- 98 N

c- 9.8 N

d- 65 N/m

In the Simple Harmonic Equation x = 5*cos(12t+^ /6) the amplitude is

a- 5. *

b- 12.

c- ^/6.

d- 6.

In the equation in question 8 the angular frequency is

a- 5.

b- 12. *

c- ^/6.

d- 6.

To the nearest Hz, the frequency of the oscillator in question 8 is

a- 1 Hz.

b- 2 Hz. *

c- 3 Hz.

d- 4 Hz.

9- The starting position of the oscillator described by x = 5*cos(10t+^ /6) IS

a- 0 m.

b- 2.3 m.

c- 4.3 m. *

d- 5 m.

The starting velocity for the oscillator in question 9 is

a- -60 m/s

b- -30 m/s. *

c- 0 m/s.

d- 30 m/s.

What is the phase angle (in radians) for an harmonic oscillator if its initial velocity is -0.58 m/s w=10 and initial position is 0.1 m?

a- ^/9

b- ^/6 *

c- ^/3

d- ^/2

What is the phase angle (in degrees) for an harmonic oscillator if its initial velocity is -0.58 m/s w=10 and initial position is -0.1 m?

a- 30o

b- 120o *

c- 210o

d- 300o

How the period of a uniform wooden rod of length L comare to that of a simple pendulum of the same mass and length.

a- greater than

b- equal to

c- less than *

If the damping force on a harmonic oscillator is -2v and the resulting motion is described by

$$x = 5*e-2tcos(4t)$$

what is the mass of the oscillator? (All numbers are expressed in appropriate combinations of metric units.)

a- 0.5 kg *

b- 1 kg

c- 1.5 kg

d- 2 kg

What is the spring constant of the oscillator in question 16?

a- 1

b- 2

c- 5

d- 10 *

Which of the following is true for the oscillator described in questions 16 and 17?

a- It is overdamped.

b- It is critically damped.

c- It is underdamped. *

A driven oscillator has a damping force of -2v and a driving force of

50^cos(wt)

if k=50 N/m and m=0.5 kg what is its approximate resonant frequency? Note this is a case of very light damping.

a- 2^

b- 5^

c - 10^

d- 20^ *

What is the value of the vibration amplitude at resonance for the oscillator in question 19?

a- 0.75^

b- 1.00^

c- 1.25^ *

d- 1.50^

What is the Q value of the oscillator in questions 19 and 20?

a- 2^

b- 3^

c- 4^

d- 5^ *

Topic # 16

Uniform Circular Motion

1. A body is moving in a circle at a constant speed. Which of the following statements about the body is true?

A. There is no acceleration

B. There is no force acting on it

C. There is a force acting at a tangent to the circle

D. (There is a force acting towards the center of the circle.)

E. None of these

2. The rate at which the body rotates about an axis, expressed:

A Velocity

B. Angular acceleration

C. Angular momentum

D. (None of these.)

E. Speed

3. The rate of change of angular displacement is:
A. Angular momentum

B. Angular acceleration

C. (Angular velocity)

D. Velocity

E. Speed

4. If the velocity of the body revolves around the earth increases, then the centripetal acceleration is:
A. Decreases

B. (Increases)

C. Remains constant

D. None of the above

E. Zero

5. If a particle moves in circle, describing equal angles in equal intervals, then:
A. Angular velocity changes & linear velocity constant

B. Angular velocity constant & linear velocity constant

C. (Angular velocity constant & linear velocity constant)

D. None of the above

E. Angular velocity zero & linear velocity zero

6. The acceleration in uniform circular motion:

A. Varies inversely with the velocity of the particle

B. Varies inversely with the radius of the orbit

C. Varies directly with the square of the velocity

D. (Is both B and C)

E. None of these

7. A body rotates in a circle with centripetal force F, if the velocity of body is doubled, the force will be:

A. F B. F/2

C. 2F D. (4F)

E. 6F

8. If a body is rotating in a circle with variable linear speed, it must have:

A. Only centripetal acceleration

B. Only tangential acceleration

C. (Both centripetal and tangential acceleration)

D. None of these

E. Linear acceleration

9. The direction of angular velocity can be find out by ________________

A. Left hand rule

B. Angular displacement

C. Direction of moment

D. (Right hand rule)

E. None of these

10. In circular motion linear velocity (v) is always_______________ to the angular velocity (w):

A. (Perpendicular)

B. Parallel

C. At 180^o

D. At 270^o

E. None of these

11. If a particle moves in a circle, describing equal angles in equal intervals, then:

A. Angular velocity changes and linear velocity constant

B. Angular velocity constant and linear velocity constant

C. (Angular velocity constant and linear velocity changes)

D. None of the above

E. Angular velocity changes and linear constant

12. If the radius of the circular path is doubled by keeping of velocity of revolving body constant centripetal force needed will be:

A. (Half as great as before)

B. The same as before

C. Twice as great as before

D. None of these

E. Four times as great as before

13. The rate of change of angular displacement with time is called:
A. Angular acceleration

B. Linear velocity

C. (Angular velocity)

D. None of these

E. Angular speed

14. The centripetal acceleration produced in a rotating body is commonly due to the change in ________________ of the velocity:
A. Magnitude

B. (Direction)

C. Value

D. None of these

E. Variable

15. When a particle is in uniform circular motion it does not have:
A. Radical velocity and radial acceleration

B. (Radical velocity and transverse acceleration)

C. Transverse velocity and radical acceleration

D. Transverse velocity and transverse acceleration

E. None of above

16. A bell tied with a string to rotating shaft resolves at uniform speed. As the shaft is suddenly brought to rest the string start getting round with the angular velocity of ball.

A. Measuring

B. Decreasing

C. (Remain constant)

D. Becoming zero

E. None of above

17. When milk is churned, the cream separates from it dur to:

A. (Centrifugal forces)

B. Cohesive forces

C. Gravitational forces

D. frictional forces

E. None of these

18. The cyclist, cycling around a circular racing track, slides because:

A. The centripetal force upon him is less than limiting friction

B. The centripetal force upon him is greater than limiting friction

C. The centripetal force upon him is equal to the limiting friction

D. (The friction b/w the tyres of cycle and road vanished)

E. None of these

19. When an object moves along a circular path in such away that its speed is ________ then the motion is called uniform circular motion:

A. Zero

B. (Constant)

C. Increase

D. Decrease

E. None of these

20. The rate of change of angular displacement is called ________ :

A. Angular acceleration

B. Angular speed

C. (Angular velocity)

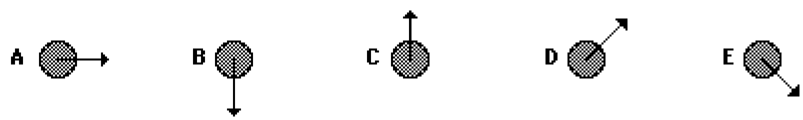
D. Angular momentum

E. None of these

<u>Topic # 17</u>

<u>Projectile Motion</u>

1. Consider these diagrams in answering the following questions.



Which diagram (if any) might represent ...

a. ... the initial horizontal velocity?

b. ... the initial vertical velocity?

c. ... the horizontal acceleration?

d. ... the vertical acceleration?

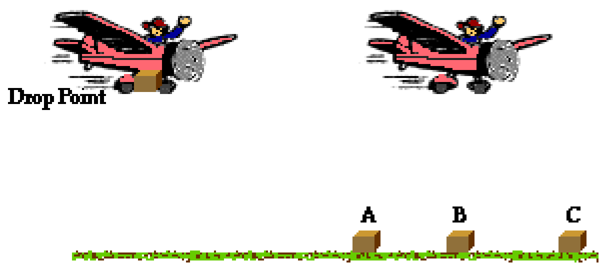
e. ... the net force?

2. Supposing a snowmobile is equipped with a flare launcher which is capable of launching a sphere vertically (relative to the snowmobile). If the snowmobile is in motion and launches the flare and maintains a constant horizontal velocity after the launch, then where will the flare land (neglect air resistance)?

a. in front of the snowmobile

b. behind the snowmobile

c. in the snowmobile



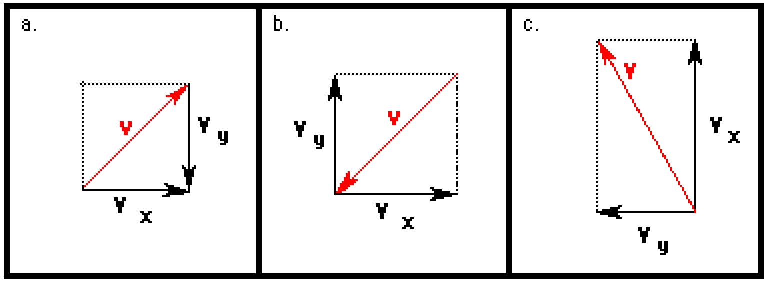
3. Suppose a rescue airplane drops a relief package while it is moving with a constant horizontal speed at an elevated height. Assuming that air resistance is negligible, where will the relief package land relative to the plane?

a. below the plane and behind it.

b. directly below the plane

c. below the plane and ahead of it

4. Aaron Agin is resolving velocity vectors into horizontal and vertical components. For each case, evaluate whether Aaron's diagrams are correct or incorrect. If incorrect, explain the problem or make the correction.

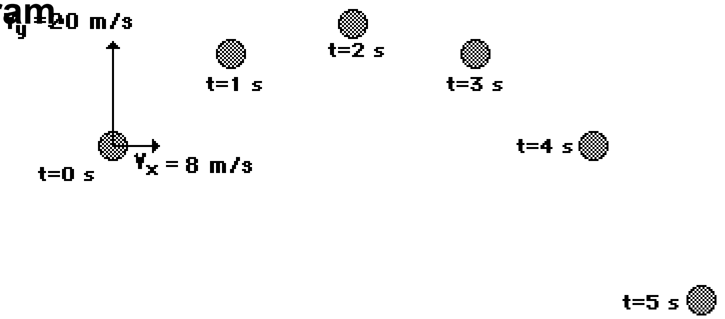


5. Anna Litical drops a ball from rest from the top of 78.4-meter high cliff. How much time will it take for the ball to reach the ground and at what height will the ball be after each second of motion?

A. 73.5 m, 58.8 m, 34.3 m, 0 m B. 91.5m, 58.8 m, 34.3 m, 0 m

C. 73.5 m, 58.8 m, 7 m, 0 m C. 73.5 m, 14.5m, 34.3 m, 0 m

7. The diagram below shows the trajectory for a projectile launched non-horizontally from an elevated position on top of a cliff. The initial horizontal and vertical components of the velocity are 8 m/s and 19.6 m/s respectively. Positions of the object at 1-second intervals are shown. Determine the horizontal and vertical velocities at 4s shown in the diagram.



A. v_y = -19.6 m/s B. v_y = 19.6 m/s

C. v_y = -10.6 m/s D. v_y = -14.6 m/s

1. A ball thrown vertically upward is an example of:
a) – uniform motion.

b) – uniformly accelerated.

c) – Projectile motion.

d) – circular motion.

e) – none of the above.

2. A pendulum is swinging. When the bob is passing through the mean position, the string breaks. The bob will

a) – move uniformly afterwards.

b) – move like a projectile.

c) – move in a straight line.

d) – fall down vertically.

e) – move uniformly backward.

3. The range of the projectile will be twice than the maximum height, if the angle of projection is

a) – $\tan^{-1}(2)$

b) – $\tan^{-1}(4)$

c) – $\tan^{-1}(1/2)$

d) – $\tan^{-1}(1/4)$

e) – none of the above.

4. The range of the projectile will be half than the maximum height, if the angle of projection is

a) – tan-1(8)

b) – tan-1(2)

c) – tan-1(4)

d) – none of the above.

5. A projectile is under the influence of gravity only (in ideal condition). The force becomes perpendicular to the velocity at
a) – the initial point
b) – the highest point
c) – at every point
d) – the final point

6. The speed of a projectile is maximum at
a) – the initial point
b) – the highest point
c) – the final point
d) – at every point
e) – depends on the angle.

7. If a shell is fired at some angle to the horizontal, its velocity will have minimum magnitude at
a) – the highest point
b) – the initial point
c) – the final point
d) – any point depending upon the angle
e) – none of the above

8. Two identical shells namely A and B are fired with equal Speeds, at angles 30 and 60 respectively then

a) – A will have greater range
b) – B will have greater range
c) – A and B will have equal ranges
d) – none of the above

9. Maximum range attend by a projectile can be found by the formula
a) – $(v_o \sin ø)/g$

b) – $(2v_o \sin ø)/g$

c) – $(v_o^2 \sin 2ø)/g$

d) – $(v_o^2 \sin 2ø)/2g$

e) – $(2v_o^2 \sin 2ø)/g$

10. The trajectory of a projectile of maximum time of flight is
a) – a parabola
b) – a straight line
c) – a hyperbola
d) – a semi-circle
e) – none of the above|

11. A shell is fired at an angle of 50˚. It falls ahead of the target. The gunman has to
a) – reduce the angle
b) – increase the angle
c) – set the angle to 45˚
d) – none of the above

12. On the surface of the moon the range of the projectile will be
a) – shorter than the earth
b) – larger than the earth
c) – equal to the earth
d) – one-half of the earth
e) – none of the above'

13. At what angle the time of projectile will be maximum
a) – 0
b) – 90
c) – 45
d) – 65
e) – 75

14. The maximum height of projectile is directly proportional to
a) – the initial velocity

b) – launch angle
c) – square of the initial velocity
d) – acceleration due to gravity
e) – none of the above

15. A hunter shoots a duck that is flying horizontally at a height H. The time interval between hitting the bird and its impact with the ground depends upon
a) – height H
b) – how fast the bird was flying
c) – the height H and the distance between the hunter and the bird when it was hit
d) – none of the above

16. A ball is thrown at an angle of 30˚ above the horizontal with the speed of 3m/sec, after 0.5sec the horizontal component of its velocity will be
a) – 4.9m/sec
b) – 7m/sec
c) – 1.2m/sec
d) – 2.6m/sec
e) none of the above

17. Motion of a paratrooper is an example of
a) – projectile
b) – accelerated motion
c) – uniform motion
d) – circular motion
e) – none of the above

18. A tennis ball and a cricket ball are projected at equal angles and with equal speeds. If air resistance were absent
a) – they both will have equal ranges
b) – tennis ball will go farther because of smaller mass
c) – cricket ball will go farther because of larger mass
d) – none of them

19. In cricket a short of high trajectory has more chances to be caught, than that of low trajectory, because
a) – of greater time of flight
b) – of greater velocity
c) – of air friction
d) – none of them

20. A rifle bullet and an artillery shell is fired with the same speed and angle of projection. The range of rifle bullet will be less than the range of artillery shell, because its_____________ than the artillery shell.
a) – mass
b) – surface
c) – density
d) – volume
e) – none of them

Topic # 18
The Role of Wave as Information Carrier

1. The wave speed is given by;
a) $V = T\lambda$
b) $V = T/\lambda$
c) $V = f/\lambda$
d) $V = f\lambda$
e) None of these
2. If 20 waves pass through the medium in 1 sec with speed of 20 m/s then wavelength is;
a) 400 m
b) 2 m
c) 20 m
d) 1 m
e) 60 m
3. The waves in which particles of the medium vibrate parallel to direction of motion is called;
a) Transverse waves
b) Directional wave
c) Stationary wave
d) Longitudinal wave
e) None of the above

4. The phenomenon of passing of waves from one medium into another medium is called;
a) Transmission
b) Diffraction
c) Reflection
d) Refraction
e) None of these
5. The distance between two adjacent nodes is ;
a) 2 λ
b) λ
c) λ / 2
d) λ / 4
e) 4 λ
6. The number of nodes between two consecutive antinodes is ;
a) 2
b) 0
c) 1
d) 3
e) 5
7. The presence of stationary waves on a string can be easily detected as the motion will be zero at ;
a) None of these
b) Nodal points
c) Between nodes and antinodes
d) Antinodal points
e) Both a and b
8. in standing waves if λ =1(length of string) then loops will be;
a) 1
b) 2
c) 3
d) 4
e) 5
9. The velocity of longitudinal waves in fluid is;
a) $V = E / \rho$
b) $V = \sqrt{\rho / E}$
c) $V = \sqrt{E / \rho}$
d) $V = \rho / E$
e) $V = E * \rho$
10. Sound waves do not travel in vacuum because;
a) They are transverse waves

b) They are stationary waves
c) They do not have enough energy
d) They require material medium for propagation
e) Both c and d

11. When sound waves enter a different medium the quantity that remains unchanged is;
a) Speed
b) Frequency
c) Intensity
d) Wave length
e) None of these

12. A bat while flying determines the location and nature of objects in his way by sending;
a) Ultra sonic waves
b) Infra sonic waves
c) Supersonic waves
d) None of the above

13. A man moves with a speed half of the speed of sound waves away from the stationary source of sound, then frequency of sound waves heard by the man will;
a) Becomes half
b) Remains same
c) Decrease four times
d) Becomes double
e) Increase four times

14. Two waves can interfere only if they have;
a) Different frequencies
b) Phase coherence
c) Propagating in opposite direction
d) Same velocity
e) Same frequencies

15. A train while whistling moves with a velocity half of the velocity of sound towards a stationary listener, then the frequency of sound waves heard by the listener will ;
a) Decrease four times
b) Become double
c) Increase four times
d) Become half
e) None of the above

16. Mechanical waves are those which;

a) Consume energy
b) Need medium
c) Do not need medium
d) Carry energy but do not need medium
e) Absorb energy

17. When the amplitude of wave become double its energy becomes;
a) Double
b) Four times
c) One half
d) One fourth
e) None of the above

18. Water waves are;
a) Stationary waves
b) Complex waves
c) Transverse waves
d) Longitudinal waves
e) Ultra sonic waves

19. When a transverse wave is incident on a denser medium from a rare one, it undergoes a phase change of ________ on reflection.
a) 270˚c
b) 180˚c
c) 90˚c
d) 60˚c
e) 360˚c

20. The wave consists of alternately placed,
a) ΔP x V/ΔV
b) Electromagnetic waves
c) Crests and troughs
d) (y1 + y2)
e) Crest

21. If two waves of displacement y1 , y2 superimpose then resultant displacement is;
a) (y1 + y2)
b) (y1 * y2)
c) (y1 /y2)
d) (y1 -y2)
e) (y1 * y2)/ (y1 + y2)

22. Two waves of slightly different frequencies and traveling in the same direction will produce;

a) Crest and troughs
b) Beats
c) Electromagnetic waves
d) Crest
e) None of the above

23. When a wave is reflected from a rare medium crest is reflected as;

a) Will produce beats
b) Crest and troughs
c) Its speed in oxygen
d) Crest
e) None of these

24. A regiment of soldiers is crossing a suspension bridge, they are ordered to?

a) March in steps
b) Break the steps
c) Lie flat and crawl
d) Twist their bodies
e) None of these

25. Waves transmit from one place to another?

a) Mass
b) Wavelength
c) Energy
d) Weight

None of the above

Topic # 19

carnot cycle

1. Nicolas Leonard Sadi Carnot inverted ______ cycle .

A. Carnot cycle
B. Otto cycle
C. Stirling cycle
D. Dual cycle

2. In an isobaric process there is no :

A. Pressure changes *B. Internal energy changes*

C. Volume changes or works done *D. Heat Exchanged*

3. A heat engine in interaction with it's surroundings always undergoes the process of :

A. Absorbing heat from a source *B. Performing mechanical work*

C. Releasing heat to its surrounding *D. All of the Above*

4. In ______ cycle working medium receives heat at higher temperature and rejects at low temperature.

A. Dual cycle
B. Otto cycle
C. Carnot cycle
D. Stirling cycle

5. In a Adiabatic process there is no :

A. Work done *B. Internal energy changes*

C. Temperature changes *D. Heat exchanged*

6. In a continuous cyclic process, the internal energy of the system:

A: Increases over the cyclic

B: Decreases over the cyclic

C: Remains the same

D: None of these

7. In _____ cycle lower temperature is sink .

A. Stirring cycle

B. Carnot cycle

C. Isothermal Process

D. Dual cycle

E. None of the above

8. Any device, which converts heat into mechanical energy, is called :

A. Thermostat
B. Heat converter
C. Heat Engine

D. Heat transmitter

9. In _______ Cycle the walls of cylinder are assumed to be perfect insulators.

A. Diesel cycle
B. Otto cycle
C. Dual cycle
D. Carnot cycle
E. None of the Above

10. In a Diesel engine ______ is used as working substance :

A: Water

B: Steam

C: Petrol

D: Crude or Heavy Oil .

11. The entropy is a measure of molecular :

A: Disorder

B: Order

C: Regularity

D: None of these.

12. _______ Cycle consist of 2 isothermal and two reversible adiabatic process .

A. Carnot Cycle
B. Otto Cycle
C. Stirring Cycle
D. Diesel Cycle

13. A cyclic heat engine is not capable of :

A. Alternately storing and releasing energy
B. Taking heats from a source and performing an equivalent amount of work.
C. Transferring heat from a high temperature reservoir (HTR) to a low temperature reservoir (LTR).
D. Transform a net amount of heat energy into mechanical work.

14. In _______ Cycle has the most efficiency .

A. None of the Above.
B. Otto Cycle
C. Dual Cycle
D. Carnot Cycle

15. The efficiency of all reversible heat engines is ______ independent of the working substance .

A. Same
B. Different
C. Details are insufficient.
D. None of these .

16. ________ Cycle is representd as Standard of perfection .

A. Diesel Cycle

B. Dual Cycle
C. Carnot Cycle
D. None of the above
E. Otto Cycle

17. The Ratio of the heat accepted to the heat rejected by a Carnot engine.

A. The efficiency of the working substance of the engine.
B. The ratio of the absolute temperatures of the two heat reservoir.
C. The thermal capacity of the working substance.
D. The ideal gas scale of temperature .

18. Using gaseous working fluid the work output from _____ cycle is quite low .

A. Carnot Cycle
B. Otto Cycle
C. Diesel Cycle
D. Joule Cycle

19. The property of a system, which remains constant during an adiabatic change, is:

A Volume

B Pressure

C Temperature

D Entropy

20. An idealized thermodynamic engine whose cycle is bounded by two isotherms and two Adiabatic on a PV diagram is called a (an):

A. Otto Cycle
B. Rankin Cycle
C. Diesel Engines
D. Carnot Cycle

21. The Carnot theorem (Carnot's principle) is in accordance with :

A. 1st Law of Thermodynamics
B. 2nd Law of Thermodynamics
C. 3rd Law of Thermodynamics
D. 4th Law of Thermodynamics

22. The difference between Rankin and Carnot cycle is that :

A. A separate boiler and condenser are used in Carnot cycle.
B. A separate boiler and condenser are in used in Rakin cycle
C. Information's are insufficient.
D. None of these.

23. A cyclic heat engine is capable of taking heat from a ______ and performing an equivalent amount of work .

A. Source
B. Sink
C. Source first and then from a sink
D. None of these

24. The alcohol, benzene and petrol engines are the examples of :

A. Carnot engine
B. Steam engine
C. Internal Combustion engine
D. None of these

25. <u>Nicolas Leonard Sadi Carnot</u> inver**ted ______ cycle .**

E. Carnot cycle
F. Otto cycle
G. Stirling cycle
H. Dual cycle

26. In an isobaric process there is no :

A. Pressure changes B. Internal energy changes

C. Volume changes or works done D. Heat Exchanged

27. A heat engine in interaction with it's surroundings always undergoes the process of :

A. Absorbing heat from a source B. Performing mechanical work

C. Releasing heat to its surrounding D. All of the Above

28. In ______ cycle working medium receives heat at higher temperature and rejects at low temperature.

E. Dual cycle
F. Otto cycle
G. Carnot cycle
H. Stirling cycle

29. In a Adiabatic process there is no :

A. Work done B. Internal energy changes

C. Temperature changes D. Heat exchanged

30. In a continuous cyclic process, the internal energy of the system:

A: Increases over the cyclic

B: Decreases over the cyclic

C: Remains the same

D: None of these

31. In _____ cycle lower temperature is sink .

A. Stirring cycle

B. Carnot cycle

C. Isothermal Process

D. Dual cycle

E. None of the above

32. Any device, which converts heat into mechanical energy, is called :

E. Thermostat
F. Heat converter
G. Heat Engine
H. Heat transmitter

33. In _______ Cycle the walls of cylinder are assumed to be perfect insulators.

F. Diesel cycle
G. Otto cycle
H. Dual cycle
I. Carnot cycle
J. None of the Above

34. In a Diesel engine ______ is used as working substance :

A: Water

B: Steam

C: Petrol

D: Crude or Heavy Oil .

35. The entropy is a measure of molecular :

A: Disorder

B: Order

C: Regularity

D: None of these.

36. _______ Cycle consist of 2 isothermal and two reversible adiabatic process .

E. Carnot Cycle
F. Otto Cycle
G. Stirring Cycle
H. Diesel Cycle

37. A cyclic heat engine is not capable of :

E. Alternately storing and releasing energy
F. Taking heats from a source and performing an equivalent amount of work.
G. Transferring heat from a high temperature reservoir (HTR) to a low temperature reservoir (LTR).

H. Transform a net amount of heat energy into mechanical work.

38. In _______ Cycle has the most efficiency .

E. None of the Above.
F. Otto Cycle
G. Dual Cycle
H. Carnot Cycle

39. The efficiency of all reversible heat engines is ______ independent of the working substance .

E. Same
F. Different
G. Details are insufficient.
H. None of these .

40. ________ Cycle is representd as Standard of perfection .

F. Diesel Cycle
G. Dual Cycle
H. Carnot Cycle
I. None of the above
J. Otto Cycle

41. The Ratio of the heat accepted to the heat rejected by a Carnot engine.

E. The efficiency of the working substance of the engine.
F. The ratio of the absolute temperatures of the two heat reservoir.
G. The thermal capacity of the working substance.
H. The ideal gas scale of temperature .

42. Using gaseous working fluid the work output from _____ cycle is quite low .

E. Carnot Cycle
F. Otto Cycle
G. Diesel Cycle
H. Joule Cycle

43. The property of a system, which remains constant during an adiabatic change, is:

A Volume

B Pressure

C Temperature

D Entropy

44. An idealized thermodynamic engine whose cycle is bounded by two isotherms and two Adiabatic on a PV diagram is called a (an):

E. Otto Cycle
F. Rankin Cycle
G. Diesel Engines
H. Carnot Cycle

45. The Carnot theorem (Carnot‘s principle) is in accordance with :

E. 1st Law of Thermodynamics
F. 2nd Law of Thermodynamics
G. 3rd Law of Thermodynamics
H. 4th Law of Thermodynamics

46. The difference between Rankin and Carnot cycle is that :

E. A separate boiler and condenser are used in Carnot cycle.
F. A separate boiler and condenser are in used in Rakin cycle
G. Information’s are insufficient.
H. None of these.

47. A cyclic heat engine is capable of taking heat from a ______ and performing an equivalent amount of work .

E. Source
F. Sink
G. Source first and then from a sink
H. None of these

48. The alcohol, benzene and petrol engines are the examples of :

E. Carnot engine

F. Steam engine
G. Internal Combustion engine
H. None of these

Topic # 20

Oscillation and concept of feedback

1. What is the name of the force that causes oscillatory motion?

(A) Damping Force

(B) Driving Force

(C) Restoring Force

(D) Oscillating Force

1	C

2. An oscillating system is one in which a particle or set of particles

(A) Move back and forth

(B) Move in a circle

(C) Move with constant velocity

(D) Move with constant acceleration

2	A

3. What is always true of an equilibrium point of an oscillating system?

(A) The velocity is always zero

(B) No net force acts on the system

(C) The velocity is always a minimum

(D) The energy is always a maximum

3	B

4. Which of the following is NOT periodic motion?

(A) A mass oscillating on a spring

(B) Projectile motion

(C) A swinging pendulum

(D) A planet orbiting the sum

6	B

5. How is frequency of oscillation related to period?

(A) $v = 2\pi T$

(B) $v = \frac{2\pi}{T}$

(C) $v = \frac{T}{2\pi}$

(D) $v = \frac{1}{T}$

9	B

6. The amplitude of oscillation is defined as

(A) The position of the equilibrium point

(B) The maximum displacement of the oscillating particle

(C) The maximum velocity of the oscillating particle

(D) The maximum acceleration of the oscillating particle

10	B

7. An oscillation is harmonic if

(A) The oscillation has a constant period

(B) The restoring force varies with sin x

(C) The restoring force varies with x

(D) The restoring force varies with x^2

11	C

8. Which of the following does not exhibit simple harmonic motion?

(A) A mass on a spring

(B) A pendulum

(C) A torsional oscillator

(D) All exhibit simple harmonic motion

13	A

9. The position of a particle in simple harmonic motion varies with

(A) t

(B) t^2

(C) kt

(D) $\cos(\omega t)$

23	B

10. The period of a torsional oscillator is given by

(A) $T = 2\pi\sqrt{\frac{I}{\kappa}}$

(B) $T = 2\pi\sqrt{\frac{m}{\kappa}}$

(C) $T = 2\pi\frac{I}{\kappa}$

(D) $T = 2\pi\sqrt{\frac{\kappa}{I}}$

24	A

11. Using a torsional oscillator we can calculate

(A) The mass of a given body

(B) The moment of inertia of a given body

(C) The gravitational acceleration

(D) The maximum tension in the wire

28	C

12. A pendulum can be used to calculate

(A) The mass of a given body

(B) The moment of inertia of a given body

(C) The gravitational acceleration

(D) The maximum tension in the wire

29	C

13. Simple harmonic motion can be described as

(A) Uniform Circular Motion

(B) The one dimensional projection of uniform circular motion

(C) The one dimensional projection of projectile motion

(D) The one dimensional projection of elliptical motion

31	B

14. A simple harmonic system and a particle moving in uniform circular motion have the same period. What can be said relating these two motions?

(A) The velocities of each system is the same

(B) Each system always experiences the same net force

(C) Each system has the same maximum displacement

(D) The angular frequency of the oscillating system is the same as the angular velocity of the rotational system

32	D

15. A force which causes an oscillating system to slow down is called a

(A) Restoring force

(B) Driving force

(C) Damping force

(D) None of the above

34	C

16. The angular frequency of a damped system must relate to the angular frequency of the corresponding simple harmonic system in what way?

(A) They must be equal

(B) The frequency of the damped system must be larger

(C) The frequency of the simple harmonic system must be larger

(D) Not enough information

36	C

17. The amplitude of a damped system

(A) Decreases exponentially

(B) Decreases linearly

(C) Increases exponentially

(D) Remains constant

37	A

18. The frequency of a damped system

(A) Decreases exponentially

(B) Decreases linearly

(C) Increases exponentially

(D) Remains constant

38	D

19. The average velocity of a damped system

(A) Decreases

(B) Increases

(C) Can either increase or decrease

(D) Remains constant

20. The motion of an oscillating system subjected to an external force is called

(A) Damped oscillation

(B) Forced oscillation

(C) Harmonic motion

(D) Periodic motion

41	B

21. Resonance occurs when

(A) The amplitude of the oscillating system increases rapidly

(B) The frequency of the driving force is the same as the natural frequency of the system

(C) The amplitude of the oscillating system decreases rapidly

(D) The amplitude of the oscillating system remains constant, even though a driving force is applied

42	A

22. What kinds of objects have natural frequencies?

(A) Only oscillating objects

(B) Only harmonically oscillating objects

(C) Only simple harmonically oscillating objects

(D) Any object

44	D

23. The rising and falling of tides are an example of

(A) Damped oscillation

(B) Forced oscillation

(C) Simple harmonic motion

(D) A massive government conspiracy to confuse sailors

45	B

24. Why is uniform circular motion not considered an oscillation?

(A) It does not move "back and forth"

(B) It does not have a restoring force

(C) It does not have an equilibrium point

(D) All of the above

49	D

25. At what point in a damped oscillation is the mechanical energy maximum

(A) After the first oscillation

(B) At the final position of the system

(C) At the initial position of the system

(D) Energy is constant in damped oscillation

In S.H.M:

A. Force/ acceleration=constant **B.** F/M = constant

C. Acceleration=constant **D.** Displacement/acceleration=constant

Motion of a simple pendulum is said to be simple harmonic because

A. it is simple in const ruction **B.** It oscillates Ina very simple way

C. It acceleration is proportion To the displacement from The mean position **D.** It depend on the mass of the body

When mercury tube is disturbed, its motion is called:

A. Simple harmonic motion **B.** Vertical motion

C. Horizontal circular motion **D.** None of these

Which of the following is necessary and sufficient condition for simple harmonic motion

A. Constant acceleration
B. Proportionally between acceleration and displacement from equilibrium
C. Constant speed
D. Proportionally between restoring force and displacement from equilibrium position

Acceleration of a body executing S.H.M is:

A. Zero at the extreme positions and maximum at the mean position
B. Zero at the mean position and max at the extreme
C. It remains constant throughout the motion
D. All are true

The total energy of a particle executing S.H.M IS:

A. Velocity in equilibrium position
B. Time period of oscillation
C. Displacement in equilibrium position
D. Square of amplitude of motion

The period of the oscillation of a simple pendulum is doubled when:

A. The mass of the bob is doubled
B. The mass of the bob and the length of the pendulum are doubled
C. The length is made four times
D. The amplitude is doubled

If a hole is drilled in the earth passing through its center and a ball is dropped in it,then

A. It will appear at the other end
B. It will stop at the centre of the earth
C. It will stop execute S.H.M about the centre of the earth
D. It depends upon the chances availed

The period of oscillation of a simple pendulum of constant length at a place inside a

Coal mine is approx

A. less than it is on the surface of the earth
B. more then it is on the surface of the earth
C. the same it is the surface of the earth
D. the same it is on the surface of the moon

Which of the following does not exhibit harmonic motion?

A. A hanging spring supporting a weight
B. The balance shell of a watch
C. The pistons of an automobile engine
D. The string of a violin

If the period of oscillation of a mass m **suspended** from a spring is one second then the period of 4m will be

A. 4sec
B. ¼ sec
C. 2 sec
D. 8 sec

A body executing S.H.M has time period T and amplitude A here

A. Tend A are in depend of each other

B. T Varies in proportional to A^2

C. **T** varies in proportion to ^{A3}

D. **T** Varies inversely to A2

Which of the following is wrongabout a S.H.M?

A. the frequency of the oscillation is always indepentof the mass of the oscillation
B. energy of the oscillation is proportional to square of amplitude of frequency
C. time period depends on the length of the pendulum
D. all are true

S.I unit of frequency is:

A. Hertz

B. Ampere

C. Coulomb

D. Watts

In a swinging pendulum, the K.E in zero at:

A. Mean position
B. Extreme position
C. Between on earn and extreme
D. None of these

The number of vibration per second is called

A. time period

B. frequency
C. amplitude
D. phase

The _______ of the body executing S.H.M remains constant at any distance, position of equilibrium and at extreme position

A. Mean position
B. P.E
C. Total energy
D. Phase

If there is no frictional effects the mechanical energy of a system executing S.H.M

A. Changes with time
B. Is variable
C. Is not conserved
D. Is constant

When a particle existing S.H.M remains constant at any distance position of equilibrium and at extreme position

A. the frequency depends upon the amplitude
B. the period depends upon the amplitude
C. the period and frequency are indepent of the amplitude
D. the period and frequency are independent of over another

The total energy of a particle existing S.H.M with amplitude a is proportional to

A. a^1
B. a^2
C. a
D. $1/a^2$

1ST LAW OF THERMODYNAMICS

Isobaric is such a thermodynamic process in which _______ remains constant during the heat supply.

- temperature
- pressure
- volume

Isochoric is such a thermodynamic process in which______ remains constant during the heat supply.

- temperature
- pressure
- volume

Isothermal is such a thermodynamic process in which ______ remains constant during the heat supply.

- temperature
- pressure
- volume

When an ideal gas, enclosed in an isolated cylinder, is expanded, then there is a/an _________ in its internal energy.

- increment
- decrement
- no change

When an ideal gas, enclosed in an isolated cylinder, is compressed, then there is a/an _________ in its temperatur

- increment
- decrement
- no change

If there is an increase in internal energy of a gas, then there will be an/a _________ in its temperatur

- increment
- decrement
- no change

Heat supplied in an _______ process is used in doing work on the piston.

- isobaric
- isochoric
- isothermal

Heat supplied in an _______ process is used in increasing the internal energy of the system and no work is performance

- isobaric
- isochoric
- isothermal

In an adiabatic process, __ =0

- ΔQ
- ΔU
- ΔV

ΔQ is considered as _______ if heat is added to the system.

- positive
- negative

ΔW is considered as positive if work is done __ the system.

- by
- on

If the internal energy of a system in a process is decreased, then the value of ΔU is _______.

- positive
- negative

Volume of a gas is ________ proportional to the pressur

- directly
- inversely

Volume of a gas is _______ proportional to the temperatur

- directly
- inversely

A/An ______ system is one in which both mass & energy transfer takes place across the boundaries.

- open
- closed
- isolated

A/An _______ system is one in which transfer of mass takes place across the boundaries of system but energy transfer is possibl

- open
- closed
- isolated

An isolated system is one in which there is no transfer of heat and energy across the boundaries of the system.

- open
- closed
- isolated

The graph of an ________ process is a straight line parallel to the V(volume) plan

- isobaric
- isochoric
- isothermal

The graph of an _______ process is a straight line parallel to the P(pressure) plan

- isobaric
- isochoric
- isothermal

The graph of an _______ process is a curve

- isobaric
- isochoric
- isothermal

Thermodynamic mostly deals with

- Measurement of quantity of heat
- Conversion of heat to other forms of energy
- Transfer of heat
- Change of state
- None of these

Thermodynamics is concerned in part with transformation between

- Different energy at various temperatures
- Internal energy at various temperatures
- One form of mechanical energy into other forms
- Heat internal energy and mechanical work
- None of these

Heat is added to a system is equal to:

- A change in its internal kinetics energy
- A change in its internal potential energy
- Work done by it
- Sum of all above
- None of these

First law of thermodynamics represents conversion of

- Heat
- Work
- Momentum
- Energy
- None of these

First law of thermodynamics of forbids flow of heat

- From low temperature to higher temperature
- From low temperature to higher pressure
- From low temperature to higher temperature
- All of above
- None of these

Thermodynamic system returns to its original state, which of the following are possible

- The work done is zero
- The work done is +ve
- The work done is -ve
- All of above
- None of these

First law of thermodynamics represents consequence of

- Law of conversation of energy
- Zeroth law of thermodynamics
- Second law of thermodynamics
- Third Law of thermodynamics
- None of above

What does thermal motion mean?

- Motion due to heat engine
- Disorderly motion of body as a whole
- Motion of a body that generates it
- Random motion of molecule
- None of these

A domestic pressure cooker is based upon

- Isothermal process
- Adiabatic process
- Isochoric process
- Isobaric process
- Isentropic process

If volume of the system remains constant during a process, it is called

- Isothermal process
- Adiabatic
- Isochoric

- Isobaric
- Isentropic

If pressure of the system remains constant during a process, it is called

- Isothermal process
- Adiabatic process
- Isochoric process
- Isobaric process
- Isentropic process

If temperature of the system remains constant during a process, it is called

- Isothermal process
- Adiabatic process
- Isochoric process
- Isobaric process
- Isentropic process

If entropy of the system remains constant during a process, it is called

- Isothermal process
- Adiabatic process
- Isochoric process
- Isobaric process
- Isentropic process

If no heat can flow into or out of the system during a process, it is called

- Isothermal process
- Adiabatic process
- Isochoric process
- Isobaric process
- Isentropic process

The internal energy in an isothermal process

- Decreases
- Increases
- Zero
- Remain the same
- Changes

The process during which no external work is performed is

- Isothermal process
- Adiabatic process
- Isochoric process
- Isobaric process
- Isentropic process

The process in which internal energy increases performed is

- Isothermal process
- Adiabatic process
- Isochoric process
- Isobaric process
- Isentropic process

The entropy of universe

- Always Decreases
- Always Increases
- Either remains constant or increases
- Always remain constant
- Zero

A system is in thermodynamic equilibrium if

- No external force act on it
- No chemical reaction takes place
- No heat exchange takes place with the surroundings
- All of above
- None of these

The volume of an ideal gas increases to twice during a adiabatic change. In the process

- Internal energy increases
- Internal energy decreases
- Both above
- Entropy remain constant
- None of above

If internal energy of a gas decreases by an amount equal to the external work, the gas is under going

- Adiabatic Expansion
- Adiabatic compression
- Isochoric Expansion
- Isothermal Expansion

- None of these

If the heat is supplied to an external gas in an isothermal process

- The internal energy of the gas will remain same
- The gas will do negative work
- The said process is not possible
- All of above
- None of these

If P is the pressure, U is the internal energy and dV the volume increases of the system, then by definition

- $dU = dQ + pdV$
- $dU = dQ - pdV$
- $dU = dQ + VdP$
- $dU= dQ - VdP$
- None of above

A given system undergoes a change in which work done by the system equals the decreases in its internal energy. The system must have undergone

- Isothermal change
- Adiabatic change
- Isochoric change
- Isobaric change
- Isentropic change

2ND LAW OF THERMODYNAMICS

A heat engine working between two isothermals and two isothermal ant two adiabatic is called:

- Diesel engine
- Clauses engine
- Rankin engine
- Carnot engine

The engine which is free from heat losses due to condition, radiation and friction is:

- Carnot engine
- Petrol engine
- Clauses Engine
- Diesel engine

Carnot cycle consists of ________ process:

- 3
- 4
- 5
- 6

"It is impossible to construct a heat engine which converts heat energy of a hot body completely into the work energy" is the statement of:

- Newton's statement
- Einstein statement
- Kelvin statement
- Clauses statement

The second law of thermodynamics is a general principle which places constraints upon the direction of:

- Sound Energy
- Heat energy
- Light energy
- None of the above

The maximum efficiency which can be achieved in ideal engine is the:

- Carnot efficiency
- Thermodynamics efficiency
- Kelvin's efficiency
- none of the above

The Carnot cycle is a particular thermodynamic cycle, modeled on the hypothetical

- Refrigerator
- Carnot heat engine
- Hypothetical engine
- Newton's engine
- None of the above

Modeled on the hypothetical Carnot heat engine was proposed by Nicolas Léonard Sadi Carnot in:

- 1824
- 1823
- 1815
- 1834

Every thermodynamic system exists in:

- Similar state
- Cubical state
- Rectangular state
- Particular state

The efficiency of the Carnot's engine is 33%. It takes heat energy from the hot reservoir which is at 500 K. The heat energy of the cold body reservoir is:

- 335 K
- 330 K
- 165 K
- 256 K

A Carnot's engine has its hot body reservoir at 1173 K and the cold body reservoir at 333 K the efficiency of Carnot's engine is:

- 89%
- 71.6%
- 69.5%
- 57%

In any cyclic process the entropy will either increase or:

- Decreases
- Remain same
- Become zero
- None of the above

A measure of the disorder of a system is:

- Resistivity
- Entropy
- Energy
- None of the above

Entropy gives information about the evolution of an isolated system with time, it is said to give us the direction of:

- Isolated time
- Entropy
- Time arrow

- None of the above

Entropy is:

- A measure of the multiplicity of a system
- A measure of the disorder of a system
- A measure of the amount of energy which is unavailable to do work
- All of the above

A ____________occurs when a system is taken through a series of different states, and finally returned to its initial state:

- Entropy
- Heat energy
- None of all
- Thermodynamic cycle

Energy systems have a tendency to increase their entropy is __________ law of thermodynamics:

- Zeroth law
- Third Law
- First Law
- Second law

The entropy change per cycle of the engine substance plus the two heat reservoirs is

- 0
- +20 J/K
- +40 J/K
- ~20 J/K.

The entropy of state B is:

- 200 J/K
- 120 J/K
- 80 J/K
- 20 J/K

A heat engine extracts 60,000 J of heat from a reservoir at temperature 600 K, does 15,000 J of work, and delivers 45,000 J of heat to a reservoir at temperature 300 K. This engine

- Is a Carnot engine
- Operates in an irreversible cycle

- Violates the First Law of Thermodynamics
- Violates the Second Law of Thermodynamics.

The maximum displacement of a particle from its rest position is called _______.

- Time period.
- Amplitude.
- Wave length.
- Wave front.
- Wave

The distance between two successive particles which are at exactly the same point in their paths and are moving in the same direction such as _________.

- Wave.
- Wave front.
- Wave length.
- Time period.
- Frequency.

The number of complete oscillations made in 1 second is called the _________.

- Time limit.
- Time period.
- Amplitude.
- Frequency.
- Wave.

The S.I unit of frequency is called the __________.

- Ampere.
- Hertz.
- Second.
- Meter per second.
- No unit.

Any line or section taken through an advancing wave in which all the particles in the same is called the ________.

- Wave length.
- Wave front.
- Wave.
- Time period.
- Frequency.

A ________ means one complete round trip of the body.

- Timeperiod.
- Wavelength.
- Wave.
- Vibration.
- Frequency.

___________ of a vibration body at any instant is its distance from the equilibrium position at that instant.

- Displacement
- Frequency
- Timeperiod
- Vibration

Wave

A waves transfers ___________.

- Molecules.
- Energy.
- Matter.
- Force.
- Atoms.

Water waves are being generated in a ripple tank at a rate of 5 Hz.this mean that in 1 second the number of waves passing through a fix point is _________.

- 0.2
- 2.5
- 5
- 7.5
- 10

Which one of the following is an example of longitudinal waves?

- Waves in a ripple tank.
- Light waves in water.
- A vibration guitar string.
- Sound waves produced by a string.
- Water waves produced by a string.

All electromagnetic waves save the same_________.

- Speed in vacuum.
- Speed in a given medium.
- Frequency in vacuum.
- Frequency in a given medium.
- Time period.

Waves that travel in a direction parallel to the direction of vibration are called_______.

- Transverse waves.
- Longitudinal waves.
- Water waves.
- Sound waves.
- General wave.

Waves that travel in a direction perpendicular to the direction of vibration are known as __________.

- Transverse waves.
- Longitudinal waves.
- Water waves.
- Sound waves.
- General waves.

The distance travelled by a wave in 1 second is called _________.

- Wave speed.
- Wave front.
- Wave limit.
- Wavelength.
- Amplitude.

have the shortest wavelength.

- Gamma rays.
- X-rays.
- Ultraviolet.
- Visible light.
- Infrared.

Visible lights is just one of the________ members of the family of electromagnetic waves.

- Five
- Six
- Seven

- Eigth
- Nine.

The_________ of a medium is the ratio of the speed of light in vacuum to the speed of light in the medium.

- Refractive index
- Diffraction
- Double slit experiment
- Young slit experiment
- Interference.

waves are classified into _______ types.

- Two
- Three
- Four
- Five
- Six

In velocity the relationship between frequency and wavelength is _________.

- Inversely proportional.
- Directly proportional.
- Curve.
- Hyperbola.
- parabola.

Rope waves,Water waves,Ligth waves and radio waves are some examples of _______________.

- Longitudinal waves.
- Transverse waves.
- Sound waves.
- Water waves.
- General waves.

Sound waves and waves produced in a vertical oscillation spring under tension are some examples of ___________.

- Longitudinal waves.
- Transverse waves.
- Sound waves.
- Water waves.

- General waves.

The frequency is given by the _________ of the period of oscillation.

- Inversly proportional
- Directly proportional
- Reciprocal
- Hyperbola
- Parabola

A relation exists between the wavelength the period and the velocity of wave is called _________.

- Velocity.
- Wave velocity.
- Time period.
- Displacement
- Frequency.

sitar string vibrates at 400 Hz.What is the timeperiod of this vibration?

- 0.0025
- 0.0005
- 0.0050
- 0.0050
- 0.0010

A sound wave of frequency 400Hz and wavelength 3m passes through a certain medium.Calculate the velocity of the wave in that medium?

- 1000
- 1200
- 200
- 500
- 1500

3RD LAW OF THERMODYNAMICS

Entropy is the measure of _________of a system.

- energy
- efficiency
- disorder

Entropy or disorder always_________or remains costant.

- decreases
- increases
- remains same

The change in entropy is .

- ▲S=▲Q/w
- ▲S=▲W/T
- S=▲Q/T

If heat is removed from the body ,the entropy is .

- positive
- negative
- neutral

Entropy can also be treated as the amount of __________ added to or removed from the system.

- heat
- temperature
- work done

The third law of thermodynamics is actually the impossibility of reaching the absolute zero of __________.

- Efficiency
- heat
- temperature

As the system approaches absolute zero,the entropy of the system reaches a ___________ valu

- maximum
- minimum
- neutral

___________ law provides an absolute reference point for the determination of entropy.

- zeroth
- first
- second
- third

Third law of thermodynamics is also referred as ________ theorem.

- newton's
- einstein's
- nernst's

The increase of entropy is the measure of unavailable ___________ of the system.

- efficiency
- temperature
- energy

When an isolated system undergoes a change,the __________ in the system increases.

- efficiency
- energy
- disorder

The concept of entropy and irreversibility are derived from the _____ law of thermodynamics.

- first
- second
- third

Total entropy change in one cycle of any carnot engine is _________.

- maximum
- minimum
- zero

A reversible process does not change the total ________ of the univers

- temperature
- workdone
- entropy

The third law states that entropy of a pure substance approaches zero when the temperature approaches _______.

- maximum
- minimum
- zero

The third law teaches us that entropy depends upon ________.

- temperature
- heat energy
- internal energy

A system at zero temperature exists in its __________ stat

- highest
- lower
- ground

At absolute zero temperature ,there is zero __________.

- internal energy
- workdone
- themal energy

when none of the atoms which make a perfectly ordered crystal move at all,there can be no ___________.

- heat
- temperature
- disorder

It is observed that in every natural process,the _________ of a system increases.

- heat
- temperature
- disorder

The third law of thermodynamics is a statistical law of nature regarding entropy and the impossibility of reaching absolute zero of temperature.

- Third law of thermodynamics
- Second law of thermodynamics
- Zeroth law of thermodynamics
- First law of thermodynamics

As a system approaches absolute zero, all processes cease and the entropy of the system approaches a minimum value

- Maximum value
- Zero value
- Minimum value
- Infinite value

The third law was developed by Walther Nernst, during the years 1906-1912, and is thus sometimes referred to as Nernst's theorem

- Einstien theorem
- Newton's theorem
- Nernst's theorem
- None of them

In simple terms, the Third Law states that the entropy of a pure substance approaches zero as the absolute temperature approaches zero

- Entropy
- Enthalpy
- Both a and b
- none

The third law of thermodynamics states that if all the thermal motion of molecules (kinetic energy) could be removed, a state called absolute zero would occur. Absolute zero results in a temperature of 0 Kelvins or -273.15° Celsius.

- Final state
- Zero state
- Absolute zero
- None of them

The Universe will attain absolute zero when all energy and matter is randomly distributed across space. The current temperature of empty space in the Universe is about 2.7 Kelvins

- 3.1
- 2.8
- 4.0
- 2.7

The entropy change accompanying a physical or chemical transformation approaches zero as the temperature approaches zero

- Properties
- Transformation
- Both of them

- None of them,

A substance in its standard state at temperature T has a standard entropy which is denoted as $S^{o}(T)$

- $S^{o}(T)$
- S (T)
- T(S)
- None

Thermodynamics laws and entropy had developed in 19^{th} century successful

- 19^{th} century
- 15^{th} century
- 18^{th} century
- 16^{th} century

The third law provides the reference state for use in calculating absolute entropies.

- Absolute zero
- Absolute entropies
- Both
- None of them

The effects of the third law are most keenly felt at very low temperatures

- High temperature
- High pressure
- Low temperature
- Low temperature

The third law of thermodynamics is a statistical law of nature regarding entropy and the impossibility of reaching absolute zero of temperature

- Physical law
- Chemical law
- Statistical law
- None of them

The third law was developed by Walther Nernst, during the years 1906-1912, and is thus sometimes referred to as Nernst's theorem or Nernst's postulate

- 1906-1912
- 1904-1912

- 1905-1912
- 1903-1912

The third law of thermodynamics states that the entropy of a system at zero is a well-defined constant

- First
- Second
- Third
- Zeroth

An alternative version of the third law of thermodynamics as stated by Gilbert N. Lewis and Merle Randall in 1923:

- 1923
- 1951
- 1943
- 1913

In simple terms, the Third Law states that the entropy of a pure substance approaches zero as the absolute temperature approaches zero

- Entropy
- Enthalpy
- Both a and b
- none of them

The third law of thermodynamics states that if all the thermal motion of molecules (kinetic energy) could be removed, a state called absolute zero would occur. Absolute zero results in a temperature of 0 Kelvins or -273.15° Celsius.

- Final state
- Zero state
- Absolute zero
- None of them

The Universe will attain absolute zero when all energy and matter is randomly distributed across space. The current temperature of empty space in the Universe is about 2.7 Kelvins

- 3.1
- 2.8
- 4.0
- 2.7

If the entropy of each element at absolute zero can be taken as zero, then all elements above absolute zero must have a finite, positive entropy

- Negative
- Positive
- Zero
- None of them

After plotting the temperatures and energy changes for several spontaneous reactions, it is possible to work backwards to find the value of absolute zero, which is -273C (about -460F).

- Temperature and pressure
- Temperature and energy
- Temperature and volume
- None of them

Carnot Cycle

Thermodynamics Deals With :

- Isolated System
- The Interaction Among Various System
- The Microscopic Behaviour Of System
- The Interection B/W System And Surrounding
- None Of Above

In An Isochoric Process There Is No:

- Internal Energy State Only
- The Final State Only
- The Initial State ,Final State And Path
- The Initial And Final States
- Energy

In General, Workdone On A Or By A Gas Depends On

- The Initial State Only
- The Final State Only
- The Initial State ,Final Satateand Path
- None Of Above

The Specific Heat Of A Gas At Constant Pressure Is Always Greater Than The Specific Heat At Constant Volumeb/C

- The Efficiency Of Aconstant Pressure Is Greater
- Only A Constant Pressure Process Is Reversible
- In Addition To Raise The Temperature ,The Heat Supplied At Constant Pressure Must Be Used Up In Doing Some External Work
- The Constant Pressure Process Is Irreversibl
- None Of Above

The Actual Path Traced Out In P-V Daigram Of A Process Must Be Known In Order To Evalute

- The Work Done
- The Work Done And The Heat Exchange
- The Heat Exchanged
- The Internalenergy Change
- All Of Above

The First Law Of Thermodynamics Is An Expression Of:

- The Theory Of Heat Exchange
- The Idea Of The Heat Death Of The Universe
- The Conservation Of Energy
- All Thermal Interaction
- None Of Above

The First Law Of Thermodynamics Can Be Expressed Mathematically By The Relation

- $W=\Delta Q+\Delta U$
- $\Delta U=\Delta Q-\Delta W$
- $\Delta Q=\Delta W-\Delta U$
- $\Delta Q=\Delta U-\Delta W$
- None Of Above

Thermodynamics Concerns Itself Primarily With

- The Measurements Of Quantity Of Heat
- The Physical Effects Temperaturechange
- The Motion Of Heated Bodies
- The Conservesion Of Heat To Other Energy Forms
- None Of Above

The First Law Of Thermodynamics States That:

- The Total Work In A Closed System Is Conserved
- The Total Energy In A Closed System Is Conserved

- The Motion Of Heated Bodies
- The Conversion Of Heat To Other Energy Form
- None Of Above

When A P-V Daigram Represents Athermodynamic Process ,The Area Underb The Curve Represents

- Work
- Presence
- Volume Change Or Work Done
- Efficeincy Of A Heat Engine
- All Of Above

In Order For A Cyclic Heat Engineoperating B/W Two Heat Reservoirs To Be As A Carnot Engine Must Be:

- A Gas Engine
- Reversible
- Referigerator
- Adiabatic

When An Open Vessel Is Used In A Steam Engine, The Steam Is Givn Off At The ______ Pressure As That Of The Atmosphere:

- Lower
- Higher
- Same
- None Of These

The Efficiency Of All Reversible Heat Engines _______ Independent Of Working Substanc

- Same
- Different
- Details Are Insufficient
- None Of These

The Ratio Of Heat Accepted To The Heat Rejected By The Carnot Engine Gives:

- The Efficiency Of Working Substance Of Engine
- The Ratio Of Asolute Temperature Of Of The Two Heat Reservoirs
- The Thermal Capacity Of Working Substance
- The Ideal Gas Scale Of Temperature

The Property Of A System Which Remains Constant During An Adiabatic Change Is :

- Volume
- Pressure
- Temperature
- Entropy

The Entopy Of A System Measuresthe Availability Of Energy:

- To Do Work
- To Increase Temperture
- All Of The Above
- None Of Above

As The Disorder Increases Increases The Entropy:

- Increases
- Decreases
- Remains
- None Of Above

The So Called “Heat Death” Of The Universe Will Occur:

- When The Thermalenergy Of The Universe Will Be Maximum
  When The Temperature Difference Among The Objects Of The Universe Will Be Minimum
- When The Temperature Difference Along The Objects Of The Universe Will Be Zero
- Never

Entropy Is Thought Of As Being Synonymous With The :

- Degree Of Order
- Degree Of Disorder
- Degree Of Regularity
- None Of Above

The Fuel Used In The Internal Combustion Engine May Be Given As:

- A Solid Or A Liquid
- A Solid Or Gas
- A Gas Or A Liquid
- None Of These

The Acohol, Benzene Engines Are Example Of :

- Carnot Engine
- Steam Engine
- Internal Combustion Engine
- None Of Thes

In A Petrol Engine , The Explosive Mixture Of Petrol Vapours With Air Contains .

- One Part Of Petrol And Vapours Eight Parts Of Air .
- Eight Parts Of Petrol Vapours And One Part Of Air .
- Four Parts Of Air And Four Parts Of Petrol Vapour .
- None Of These .

Diesel Engine Was So Named Because Of The .

- Fuel Used
- Name Of The Inventor
- Both Fuel & Name Of Inventor
- None Of These

The Graph Shown In Fig Is Plotted At Constant Temperatue .It Represents:

- An Adiabatic Process
- Isothermal Process
- Boyles Law
- Charles Law

It Is Impossible To Cause Heat To Flow From A Cold Body To Hot Body Without The

- Expenditure Of Energy
- Change Of Temperature
- Increase In K.E
- Increase In Volume

In an isobaric process there is no

- pressure changes
- internal energy changes
- volume changes
- heat exchanged
- none of above

A heat engine in interection with its surrounding `always undergoesthe process of

- absorbing heat from a source
- performing mechanical wirk
- relesing heat to its surroundings
- All of Above

In an Isothermal process there is no

- Pressure change
- Volume changes or work done
- Interal energy or temperature change
- Heat exchanged

In an Adiabatic process there is no

- Work done
- Interal energy changes
- Temperture changes
- Heat exchanged

Heat added to a gas is equal to

- The increase in internal energy of gas
- The externa work done by the gas
- The sum of the increases in internal energy
- The external work done on Gas and external work did by the gas.

In a continuous cyclic process, the internal energy of a system:

- Increase over the cycle
- decrease over the cycle
- Remains Same
- none of these

The second Law of Thermodynamics state that:

- 100% conversion of mechanical work into heat in not possible
- 100% conversion of heat into mechanical work is not possible
- The maximum efficiency of Ideal engine can never be more than 50%
- A 100% efficient engine is possible

In the Diesel Engine ___________ is used as working substance

- Water

- Steam
- Petrol
- Crude or Heavy Oil

The entropy is measure of Molecular:

- Disorder
- Order
- Regularity
- None of These

A cyclic heag engine is not Capable of :

- Alternately storing and releasing energy
- Taking heat from source and performing an equivalent amount of work
- Transfering heat rom a high performance reservoir to a low temp. reservoir
- Transform a net amount of heat energy into mechanical work

Heat transferred to or from a _______ is directly proportional to the temperature of hot or cold body.

- Carnot Engine
- Steam Engine
- Information's are insufficient
- None of these

A device that takes heat from stam boiler, performs external work and rejects a smaller amount of heat to condenser is called:

- Carnot Engine
- Steam Engine
- All f the Above
- None of these

If ΔQ is the amount of heat transferred to a system at constant Kelvin Temperature T, then the change in entropy (DS) is equal to:

- ΔQT
- $\Delta Q.\Delta U$
- $\Delta Q/T$
- $\Delta Q/\Delta U$

Any device which converts heat into mechanical energy, is called:

- Thermostat
- Heat converter
- Heat Engine
- Heat transmitter

Entropy has been called “time’s arrow” because:

- The entropy of the universe remains constant
- The entropy of the universe always increases
- The entropy of the universe always decreases
- The entropy change is sometimes negative and sometimes positive.

An idealized thermodynamic engine whose cycle is bounded by two isotherms and two adiabatic on a PV – diagram is called a (an):

- Otto cycles
- Ranking engines
- Carnot cycles
- Diesel engines

The thermodynamic process in which change in volume of the system is zero tells that

- The work done is Zero
- The work done is Maximum
- The work done on the system is maximum
- The work done by system is minimum

The Carnot’s theorem (Carnot’s principle) is in accordance with :

- 1^{st} law of thermodynamics
- 2^{nd} law of thermodynamics
- 3^{rd} law of thermodynamics
- 4^{th} law of thermodynamics

In the steam engine ,the movement of the piston is opted by the force of :

- An External source
- Expanding Steam
- First by external source & then by
- None of these
- Expanding them

The diference b/w Rakin and Carnot Cycle is that :

- A separate boiler and condenser are used in carnot cycle .
- A separate boiler and condenser are used in Rankin cycle .
- Information's are insufficient
- None of these.

The working substance in steam engine is :

- Petrol
- Steam
- Water
- None of these .

A cyclic heat engine is capable of taking heat from a _______________ and performing an equivalent amount of work .

- Source
- Sink
- Source first and then from sink.
- None of these .

The statement that " When an isolated system undergoes a change ,the entropy of the system either remains constant or it increases ", is known as the :

- 1st law of thermodynamics
- 2nd law of thermodynamics .
- Law of entropy
- None of these .

Diesel engine is also known as :

- 1st law of thermodynamics
- Internal combustion engine .
- Law of Engine
- Oil engine .

All engines in which fuel undergoes combustion inside the engine cylinder are called :

- Heat engine
- Steam Engine .
- Internal Combustion engine
- None of these.

The second law of thermodynamic helps to define

- heat
- work
- entropy
- internal energy

The Kelvin-planks law states the principle of conservation of

- work
- heat
- mass
- heat into work

It is impossible to construct a engine which while operating in a cycle produces no other effect to extract heat from a single reservoir and do equivalent amount of work this refers to :

- clauses statement.
- Carnot theorem
- Kelvin planks statement
- PMM-2

A carnot cycle comprises of:

- Two isothermal and two isentropic processes.
- Two constant volumes and two isentropic processes.
- Two constant pressures and two isentropic processes.
- One constant volume, one constant pressure and two isentropic processes.

A carnot cycle operates between temperature of 1000k to 500k its thermal efficiency is:

- 50%
- 100%
- 200%
- 150%

A carnot cycle operates between temperature of 800k to 400k its efficiency is 50% if working fluid is:

- air
- nitrogen
- carbon dioxide

any fluid

A refrigerator and heat pump operate between the same temperature limits. If COP of the refrigerator is 3 then COP of the pump is:

- 3
- 4
- 5
- 6

A heat engine is supplied with 800kj/s of heat at 600k and rejects at 300k for the process to be reversible, heat rejected is:

- 200kj/s
- 400kj/s
- 500kj/s
- 600kj/s

The more effective way to increase the thermal efficiency of a Carnot cycle is to:

- increase the source temperature
- decrease the sink temperature
- increase the sink temperature
- decrease the source temperature

Choose the correct statement

- Entropy is an intensive property of the system
- Entropy is conservative
- Entropy is a measure of the level of irreversibility associated with a process
- Entropy of the universe is always decreasing

which of the following is incorrect statement:

- heat is not completely reversible in to work
- Energy can be transfer from one form to another automatically
- Heat cannot flow automatically from cold body to hot body
- Gas cannot expand automatically from low to high pressure

The statement that" heat energy cannot be completely transformed into work" is a statement of

-

  first thermodynamic law
  second thermodynamic law
  third thermodynamic law
  zero thermodynamic law

A reservoir delivers 1000 J of heat to another reservoir at 133 ^oC. What is the increase in entropy of the second reservoir?

- 7.5j/k
- 2.5j/k
- 1000j/k
- 133000j/k

A reservoir delivers 1000 J of heat to another reservoir at 133 ^oC. What can be said about the change in entropy of the first reservoir during the process?

- positive and < 2.5
- positive and > 2.5
- negative and < -2.5
- negative and > -2.5

The carnot efficiency for heat engine operating between the temperatures of227 deg C and 27 deg C is:

- 20%
- 30%
- 50%
- 90%

An engine on each cycle takes in 40 Joules does 10 Joules of work and expels 30 Joules of heat.Its efficiency is:

- 20%
- 50%
- 65%
- 75%

If the thermal efficiency of a Carnot Engine is to be 100%, the heat sink must be at a temperature of:

- 100K
- 300K
- 500K
- 800K

A Carnot cycle requires an ideal gas for its working substance

- ideal gas
- constant volume
- constant pressure
- none of the above

The most efficient engine possible is the:

- carnot engine
- heat engine
- refrigerator
- none of the above.

The process in which the heat neither enters nor flows out of the system is ____

- isothermal
- isochoric
- isobaric
- adiabatic

Isobaric process is one in which _______ remain constant.

- Volume
- Pressure
- Temperature
- energy

For all adiabatic processes:

- The entropy does not change
- The entropy increases
- The entropy decreses
- The entropy does not increase

A friction less heat engine can be 100% efficient if the temperature of sink is:

- Equal to that of source
- Less than that of source
- Zero celcius
- Zero kelvi

If the temperature of the sink is decreased ,efficiency of carnot engine:

- Decreases
- Increase
- Remain constant
- First increases, then decreases

Under Isochoric process:

- The volume of the system remain constant
- The temperature the system remain constant

- The pressure of the system remain constant
- The energy of the system remain constant

PV=constant this equation represents which process?

- Isothermal
- Isochoric
- Isobaric
- Adiabatic

Which of the following system of particles has constant pressure on it:

- Adiabatic
- Isothermal
- Isochoric
- Isobaric

The temperature of the system remains constant in:

- Isothermal
- Isochoric
- Isobaric
- Adiabatic

Some amount of heat given to a gas under iso thermal conition will result in

- Doing external work
- Rise in temperature
- Doing external work and change in temperature
- An increase in the enternal energy of the gas.

The enternal energy of a gas does not change during the process

- Adiabatic
- Isothermal
- Isochoric
- Isobaric

The device, which convert heat energy to mechanical energy , is called

- thermostat
- Heat converter
- Heat transmitter
- Heat engine

when an isolated system under goes a change, the _____ of the system either increses OR remain constant.

- Energy
- Entropy
- Heat
- Mass

The carnot engine can be described as:

- One that has input=output efficiency 100% and is imaginary
- One that has input=output, efficiency 100% and real
- None of these
- Alll of these

Nicolas Leonard Sadi Carnot inverted ______ cycle .

- Carnot cycle
- Otto cycle
- Stirling cycle
- Dual cycle

A heat engine in interaction with it's surroundings always undergoes the process of :

- Absorbing heat from a source
- Performing mechanical work
- Releasing heat to its surrounding
- All of the Above

In a continuous cyclic process, the internal energy of the system:

- Increases over the cyclic
- Decreases over the cyclic
- Remains the same
- None of these

In a Diesel engine ______ is used as working substance :

- Water
- Steam
- Petrol
- Crude or Heavy Oil .

_______ Cycle consist of 2 isothermal and two reversible adiabatic process .

- Water
- Steam
- Petrol
- Crude or Heavy Oil

In _______ Cycle has the most efficiency .

- Otto Cycle
- Dual Cycle
- Carnot Cycle
- None of the Above.

The Ratio of the heat accepted to the heat rejected by a Carnot engine.

- The efficiency of the working substance of the engine.
- The ratio of the absolute temperatures of the two heat reservoir.
- The thermal capacity of the working substance.
- The ideal gas scale of temperature .

The Carnot theorem (Carnot‘s principle) is in accordance with :

- 1st Law of Thermodynamics
- 2^{d} Law of Thermodynamics
- 3rd Law of Thermodynamics
- 4th Law of Thermodynamics

The alcohol, benzene and petrol engines are the examples of :

- Carnot engine
- Steam engine
- Internal Combustion engine
- None of these

The difference between Rankin and Carnot cycle is that :

- A separate boiler and condenser are used in Carnot cycle.
- A separate boiler and condenser are in used in Rakin cycle
- Information’s are insufficient.
- None of these.

Using gaseous working fluid the work output from _____ cycle is quite low .

- Carnot Cycle
- Otto Cycle
- Diesel Cycle

- Joule Cycle

ELECTROMAGNETIC WAVES

Electromagnetic waves are by nature:

- transverse waves
- traveling waves
- standing waves
- longitudinal waves

Which of the following is not an electromagnetic wave:

- X-ray
- microwaves
- light waves
- sound waves

If a pebble is dropped into a quiet pond, a circular pattern spreads out from the point of impact. it is an example of:

- circular waves
- longitudinal waves
- transverse waves
- electromagnetic waves

Electromagnetic waves can propagate:

- both in a gas and a metal
- in a gas but not in a metal
- not in a gas but in a metal
- neither in any of these

Electromagnetic waves, travel at:

- varies with respect to medium
- depend on the nature of the medium
- constant as speed of light (3×10^8m/s)
- none of them

The particles of the medium move perpendicular to the direction of the propagation of the waves:

- transverse waves

- traveling waves
- standing waves
- sound waves

Scientist who studied about the electromagnetic waves, first:

- James Clerk Mawell
- Heinrich Heartz
- both of them
- none of them

Electromagnetic radiation are emitted by the matters:

- having temperature below absolute zero
- having temperature above absolute zero
- having temperature absolute zero
- none of these

In an electromagnetic waves electric field and magnetic fields both are:

- parallel to each other
- perpendicular to each other
- opposite to the direction of the each other
- in the same direction

Brightness or the intensity of the electromagnetic waves depend on its:

- wavelength
- amplitude
- frequency
- velocity

Velocity of the electromagnetic waves in vacuum is:

- 300,000 km/s
- 18000 km/s
- 90 miles/h
- 200,00 miles/h

The unit of frequency is:

- cycle per second
- hertz
- oscillation per second
- all of them

When electrons move back and forth or oscillate, their electric and magnetic fields change together, forming:

- sound waves
- light waves
- radiations
- electromagnetic waves

Visible light is emitted from matter hotter than about 700 degrees Celsius, matter is said to be:

- visible matter
- visual matter
- incandescent
- none

Gamma rays are emitted from nuclear reactions, atomic bombs, and explosions on:

- the sun
- the stars
- planets
- none

Special film can detect shorter wavelengths such as:

- X-rays
- gamma rays
- infrared rays
- visible waves

The light seen by the human eye is an example of:

- electromagnetic spectrum
- short wavelength
- visible range
- none

James Clark Maxwell was a:

- German physicist
- Scottish physicist
- English chemist
- none

Electromagnetic waves transports:

- matter
- wavelength
- energy
- charge

Characteristics of the electromagnetic waves are:

- amplitude
- frequency
- velocity
- all of them

Electromagnetic waves are moving electric and

- magnetic fields
- gamma fields
- propagating fields
- light fields

Electromagnetic waves are proposed by

- Newton
- Einstein
- Jabir-ibn-Hayyan
- James Clerk Maxwell

Electromagnetic radiation is also known as

- waves
- light
- field
- rays

Electromagnetic radiation carries energy and

- force
- momentum
- matter
- light

A wave consists of successive crests and

- troughs
- craters
- depths
- studs

The distance between two adjacent crests or troughs is known as

- wave
- energy
- electromagnetic wave
- wavelength

The wavelength of electromagnetic waves vary from size of football field to

- size of needle head
- size of a hair
- size of a nuclei
- size of a human

Electromagnetic waves cannot travel through

- vacuum
- air
- semi conductor
- super conductor

Electromagnetic waves travel on speed slower than the speed of light in medium other than

- vacuum
- air
- semi conductor
- water

If we consider any electromagnetic wave then if the electric field is zero, then the magnetic field will be

- higher
- lower
- zero
- none of the above

In refraction, a wave entered from one medium to another medium of different densities it alters it's

- speed
- direction
- speed and direction both
- none of the above

he physics of electromagnetic waves is

- electrodynamics
- thermodynamics
- electric dynamics
- none of the above

The energy in electromagnetic waves is sometimes called

- electric energy
- magnetic energy
- radiant energy
- nuclear energy

Microwaves have wavelengths that can be measured in

- millimeters
- nano meters
- centimeters
- kilometers

Microwaves are used in the radars for getting the weather forecasts known as

- Doppler radars
- electro radars
- weather radars
- eccentric radars

RADAR is an acronym for

- Random Access Detection Array Random
- Radio Detection And Ranging
- Random Detection And Ranging
- Radio Detection And Random

Ultra violet waves can be seen by

- humans
- cows

- bumblebees
- dolphins

It is ultraviolet waves that are responsible for causing our

- cancer
- tumor
- sunburns
- chicken poxs

ENTROPY

A hot object and a cold object are placed in thermal contact and the combination is isolate They transfer energy until they reach a common temperatur The change ΔSh in entropy of the hot object, the change ΔSc in the entropy of the cold object, and the change ΔStotal in the entropy of the combination are:

- ΔSh > 0, ΔSc > 0, ΔStotal > 0
- ΔSh < 0, ΔSc > 0, ΔStotal > 0
- ΔSh < 0, ΔSc > 0, ΔStotal < 0
- ΔSh > 0, ΔSc < 0, ΔStotal > 0
- ΔSh > 0, ΔSc < 0, ΔStotal < 0

At a given temperature, which of the following molecules will ahve the greatest entropy?

- CH4(g)
- C2H2(g)
- C2H4(g)
- C2H6(g)
- H2(g)

Which of the following has the least entropy?

- H20(s)
- H20(l)
- H20(g)
- Answers a and b have the same entropy
- Answers a, b, and c have the same entropy

What is the total entropy σ_{tot} ?

- $\sigma_{tot} = \sigma_A \sigma_B$
- $\sigma_{tot} = \sigma_A + \sigma_B$
- $\sigma_{tot} = (\sigma_A^2 + \sigma_B^2)^{1/2}$

Say that a large molecule can either be in a 'folded' macrostate with total entropy of the molecule and its environment $\sigma_{TF} = 50$ or in an 'unfolded' macrostate with total entropy $\sigma_{TU} = 60$. In equilibrium, about what is the probability P_F of finding it folded?

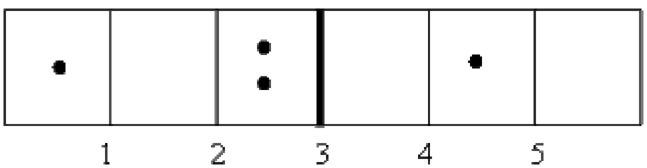
- $P_F = 5/11$
- $P_F = 5/6$
- $P_F = e^{5/6}$
- $P_F = {}^{10}$
- $P_F = e^{50}$

A sealed box contains 10^{25} N_2 molecules at temperature T = 200 K. If 10^{-6} J of heat flows into the gas of molecules at equilibrium, increasing its T very slightly, by how much does its entropy increase?

- $\Delta\sigma = 5.9 \times 10^{-30}$
- $\Delta\sigma = 8.3 \times 10^{11}$
- $\Delta\sigma = 3.6 \times 10^{14}$
- $\Delta\sigma = 8.7 \times 10^{17}$
- Not enough information given.

What is the entropy of the system shown, with the barrier at position 3?

- $\sigma = 2.99$
- $\sigma = 3.29$
- $\sigma = 3.40$
- $\sigma = 3.99$
- $\sigma = 4.16$



Entropy can be demonstrated by which of the following examples:

- adding a drop of food coloring to warm water and watching it disperse
- allowing chairs in a classroom to become more disorganized over time
- gasoline burning cars using 20-40 % of the efficiency of the fuel
- collecting and putting in order all your CDs
- trash dumps being filled up and buried

What would be the entropy of mixing, expressed in terms of □Sm/R (i. a molar basis)?

- -0.693
- + 0.693
- 1733

- + 1733
- + 0.347

The entropy change per cycle of the engine substance plus the two heat reservoirs is

- 0,
- +20 J/K
- +40 J/K
- 20 J/K

In 1880 ludwig Boltzmann proposed that entropy is the logarithm of total no. of states.

- Source
- Drain
- Gate
- Metalisation.

Which of the following will tend to decrease the entropy?:

- removing a constraint internal to a system;
- straightening a folded protein;
- molecular dissociation;
- a reversible compression of an ideal gas;
- only two of the above (state which two).

A chemical reaction is most likely to be spontaneous if it is accompanied by:

- increasing energy and increasing entropy
- lowering energy and increasing entropy
- increasing energy and decreasing entropy
- lowering energy and decreasing entropy

The second law of thermodynamics states that:

- the entropy of a perfect crystal is zero at 0 K.
- the entropy of the universe is constant.
- The energy of the universe is increasing.
- The entropy of the universe is increasing.
- The energy of the universe is constant.

If the change in entropy of the surroundings for a process at 451 K and constant pressure is -326 J/K, what is the heat flow for the system?

- 326 kJ

- 24.2 kJ
- -147 kJ
- 12.1 kJ
- 147 kJ

The third law of thermodynamics states:

- The entropy of the universe is increasing.
- The entropy of the universe is constant.
- The entropy is zero at zero K for a perfect crystal.
- The absolute entropy of a substance decreases with increasing temperatur
- The entropy of the universe equals the sum of the entropy of system and surroundings.

Calculate the entropy change when 5.00 mol of an monatomic ideal gas is cooled from 135°C to 85°C at 1 atm pressur

- -250 J/K
- -9.62 J/K
- -48.9 J/K
- -13.6 J/K
- -27.4 J/K

ΔS:

- 824 J/K
- -824 J/K
- 38.3. J/K
- -38.3 J/K
- none of these

A particular little isolated system in equilibrium has entropy $\sigma = 1000$ in configuration In configuration B it has $\sigma = 900$. What's the ratio of the probabilities of finding B and A?

- $P_B / P_A = 0.9$
- $P_B / P_A = e^{0.9}$
- $P_B / P_A = {}^{0.9}$
- $P_B / P_A = {}^{100}$
- Not enough information is given

In a Carnot cycle

•

Qh > Ql * Th/Tl
Qh = Ql * Th/Tl
Qh < Ql * Tl/Th

For an ideal gas:

- Cp = Cv
Cp > Cv
Cp < Cv
Cv = Cp + R
- None of above

For the unfolding reaction of protein G, ΔH=50.4 Kcal/mol.; this means that

- Unfolding is favored enthalpically
- Folding is favored enthalpically
- The entropy is close to zero
- The entropy is negative at all temperatures
- None of above

The S.I. unit of Entropy is

- $J.K^{-1}$
- J/K^{-1}
- C J^{-1}.K
- J^{-1}/K
- None of above

Entropy is a

- Availability of energy
- Unavailability of energy
- Presence of energy
- Absence of energy
- None of above

In any process the entropy

- Increases
- Decreases
- Increases or remains constant
- Decreases or remains constant
- None of above

Consider two experiments in which 2 moles of a monatomic ideal gas are heated from temperature T to temperature T + ΔT. In the first experiment the volume V is kept constant. In the second experiment the pressure p is kept constant. How much more heat is needed in the second experiment than in the first experiment to raise the temperature by the given amount ΔT?

- 0
- R ΔT
- 2 R ΔT
- 3/2 R ΔT
- 5/2 R ΔT

.

Change in entropy is =_______ .

- Q
- ▲T/▲Q
- Q/▲T
- ▲Q/T

Consider impurity atoms diffusing from the surface of a metal into the interior (bulk). Assume each impurity makes a random step of size $l = 10^{-10}$ m about once every 10 seconds.

Estimate the diffusion constant D of the impurities in the metal.

- D = 0
- D = 7 m^2 /s
- D = 0.0004 m^2/s
- D = 3 × 10^{-22} m^2/s
- D = 6 × 10^{-27} m^2/s

If D is the diffusion constant of the process, about how far, on average, will most impurity atoms have diffused into the metal after a time t?

- 2 D t
- t / D
- $(2 D t)^{1/2}$

- $D t^2 /2$

System A has 12 accessible states and system B has 5 possible states. How many states are available to the combined system?

- 17 = 5 + 12
- $13 = \mathrm{sqrt}(5^2+12^2)$
- $55 = e^{\ln(12)\ln(5)}$
- 60 = 12 × 5

Boltzmann's entropy equation is _________ .

- S = ln W
- S = k W
- S = k ln W
- S = k log W

Thermodynamics is concerned in part with transformations between _________ .

- Different forms of heat energy.
- Internal energy at various temperature
- One forms of mechanical energy into other forms.
- Heat internal energy and mechanical work.

By how many Joules ΔU does the internal energy of the gas in the balloon increase? Note that each nitrogen gas molecule is made of two nitrogen atoms.

- $\Delta U = 0$ J
- $\Delta U = 46$ J
- $\Delta U = 106$ J
- $\Delta U = 220$ J
- $\Delta U = 430$ J

Heat is energy that is transferred from one body to another body due to difference in the __________ of the bodies.

- Length
- Temperature
- Volume
- None of the above

A system is in the thermodynamic equilibrium if.

- No external force acts on it
- No chemical reaction takes place
- No heat exchange takes place
- All of these

Entropy is a measure of the ________________ of a system.

- Disorder
- Work done
- internal energy
- change in temperature

When ice melts then entropy of the system:

- Does not change
- Is zero
- Increase
- Decrease

In an irreversible process, the entropy S of the system always _________ .

- decreases
- remains same
- increases
- none of the above

In a reversible process, the entropy of the system always _________ .

- decreases
- remains same
- increases
- none of the above

If heat is removed from a body the change in entropy is _________.

- positive
- negative
- neutral
- none of the above

If heat is entered in the system , the change in entropy is ________ .

- positive
- negative
- neutral
- none of the above

Entropy is measure of disorder of ________ .

- temperature
- length
- system
- none of the above

The entropy never ________ .

- Increases
- decreases
- remains same
- none of the above

Thermodynamics mostly deals with ___________ .

- measurement of quantity of heat
- change of state
- transfer of heat
- conversion of heat to other forms of energy

The second law of thermodynamics implies _________ .

- A refrigerator can reduce the temperature to absolute zero
- Every heat engine has an efficiency of 100%.
- No heat engine can be 100%.
- Whole of the heat can be converted into mechanical energy.

Change in entropy is ▲S = ________ .

- T/Q

- ▲T/▲Q
- Q/▲T
- ▲Q/T

A system is in the thermodynamic equilibrium if.

- No external force acts on it
- No chemical reaction takes place
- No heat exchange takes place
- All of these

In a/an ______ engine ,all processes are reversible and no wasteful energy transfer occur due to friction and turbulence.

- ideal
- carnot
- normal
- car

Heat is energy that is transferred from one body to another body due to difference in the __________ of the bodies.

- Length
- Temperature
- Volume
- None of the above

Boltzmann's entropy equation is _________ .

- S = ln W
- S = k W
- S = k ln W
- S = k log W

Thermodynamics is concerned in part with transformations between _________ .

- Different forms of heat energy.
- Internal energy at various temperature
- One forms of mechanical energy into other forms.
- Heat internal energy and mechanical work.

Which of the following device is used for measuring very high temperature.

- Mercury thermometer
- Gas thermometer

- Platinum resistance thermometer
- Pyrometer.

In recent years, entropy has been interpreted in terms of the _______ of energy.

- Dispersal
- Kinetic
- Mechanical
- Potential

The S.I unit of entropy is ________ .

- JK
- J/K
- J
- K/J

GRAVITATION

THE ORBITAL MOTION OF THE PLANET S AROUND THE SUN IS DUE TO

- CENTRIPETAL FORCE
- GRAVITATIONAL FORCE
- CENTRIFUGAL FORCE
- COMPRISING FORCE
- NONE OF THE ABOVE

IF THE DISTANCE BETWEEN TWO MASSES IS HALVED , THEN THE FORCE OF ATTRACTION BETWEEN THEM IS ;

- FOUR TIMES THE ORIGINAL
- DOUBLE
- IS REDUCED TO $1/4^{th}$
- IS REDUCED TO HALF
- REMAIN SAME

THE FORCE ,WHICH ALWAYS ACTS TOWARDS THE CENTER OF A CIRCLE IS CALLED :

- CENTRIPETAL FORCE
- PULSING
- CENTRIFUGAL FORCE
- GRAVITATION FORCE

THE ACCELARATION DUE TO GRAVITY ABOVE THE SURFACE WOULD BE HALF OF ITS VALUE ON THE SURFACE OF EARTH AT AN ALTITUDE OF (R=4000MILES)

- 1600MILES
- 200MILES
- 1000MILES
- 400 MILES
- 540 MILES

THE GRAVITIONAL FORCE OF ATTRACTION B/W THE EARTH AND A BODY OF MASS 1 KG ON THE SURFACE:

- 9.8 N
- 9.8DYNE
- 980N
- 98
- 9800N

THE KNOWLEDGE OF NEWTON'S LAW OF GRAVITATION ENABLES US TO:

- CALCULATE THE MASS OF EARTH
- DETERMINING THE WEIGHT OF A PERSON
- NONE OF ABOVE
- BOTH ARE TRUE
- STATE THAT THE ACCECLERATION DUE TO GRAVITY AT THE SURFACE OF PLANETS OF EQUAL DENSITY IS PROPORTION

G IS CALLED UNIVERSAL GRAVITATIONAL CONSTANT , BECAUSE

- IT IS FOUND IN NATURE
- ITS VALUE IS CONSTANT
- IT IS CONNECTED WITH UNIVRSE
- IT EXPLAINS THE UNIVERSE

THE GRAVITIONAL FORCE WITH WHICH EARTH ATTRACTS THE MOON :

- IS GREATER THAN THE FORCE WITH WHICH MOON ATTRACTS THE EARTH
- IS SMALLER THAN THE FORCE WITH WHICH MOON
- IS EQUAL TO THE FORCE WITH WHICH MOON ATTRACTS EARTH
- THE FACT IS YET TO BE ESTABLISHED
- NONE OF ABOVE

ACCORDING TO THE LAW OF GRAVITATIONAL THE ATTRACTION B/W THE BODIES INCREASE WHEN DISTANCE B/W THEM IS

- INCREASED
- DECREASED
- KEPT THE SAME
- NOTHING CAN BE SAID
- ALL ARE TRUE

G, WHICH IS USED IN UNIVERSAL LAW OF GRAVITATION , IS ACTUAALY ;

- FORCE OF GRAVITATION
- CONSTANT OF GRAVITATION
- GRAVITATION ACCELERATION
- GRAVITATIONAL ATTRACTION

AS WE GO FROM THE EQUATOR TO THE POLES THE VALUE OF G:

- FIRST INCREASE AND THEN DECREASE
- DECREASES
- INCREASES
- DECRESE UPTO ALLTITUDE OF 30^0
- NO CHANGE

THE VALUE OF ACCELERATION DUE TO GRAVITY IS MAXIMUM :

- AT AHEIGHT H
- AT THE CENTRE OF EARTH
- AT A DEPTH H/2
- AT THE SURFACE OF THE EARTH
- REMAIN SAME

IF APLANET EXSISTS WHOSE MASS AND RADIUS BOTH HALF THAT OF THE EARTH THEN THE ACCELERATION DUE TO GRAVITY AT ITS SURFACE WOULD BE:

- $5M/S^2$
- $30\ m/s^2$
- $10m/s^2$
- $20\ m/s^2$
- $0m/s^2$

WHICH IS GREATER ATTRACTION OF EARTH FOR 1 KG OF LEAD OF ATTRACTION OF 1 KG LEAD FOR EARTH;

- BOTH ARE EQUAL
- ATTRACTION OF EARTH
- ATTRACTION OF LEAD
- DEPENDE OF ATMOSPDERIC CONDITION

CONSIDER THE EARTH TO BE A HOMOGENOUS SPHERE ‘A’GOES UP DEEP DOWNIN A MINE AND ‘B’ GOES HIGH UP IN THE BALLON , THE GRAVITATIONAL FIELD MEASURED BY:

- B GOES ON DECREASING AND ‘A’ GOES INCREASING
- ‘A’ GOES ON DECREASING AND THAT ‘B’ GOES ON INCREASING
- BOTH DECREASES
- BOTH INCREASES
- NONE OF ABOVE

IF THE EARTH WERE TIMES FURTHER FROM THE SUM THEN IT IS NOW ,THE ATTRACTION B/W THE TWO WOULD HAVE BEEN:

- SIX TIMES THE PRESENT FORCE
- THREE TIMES THE PRESENT FORCE
- NINE TIMES THE PRESENT FORCE
- ONE NINTH TIMES YHE PRESENT FORCE
- NONE OF ABOVE

THE ORBIT OF SETTITIES ARE:

- OVALS
- CIRCLES
- HYPERBOLIC
- TRIANGULAR
- SQUARE

GRAVITATIONAL FORCE B/W TWO BODIES DEPENDS ON;

- SUM OF THEIR MASSES
- THEIR SHAPE
- DISTANCES B/W THEM
- PRODUCT OF THEIR MASSES
- ALL OF ABOVE

IF WE GO AWAY FROM THE SURFACE OF THE EARTH A DISTANCE EQUAL TO THE RADIUS OF THE ,THE VALUE OF G WILL:

- BECOMES ONE THIRD
- BECOME TWO THIRD

- BECOME ONE SIXTH
- BECOME FOUR TIMES
- NO CHANGE

IF THE MASS OF THE EARTH BECOMES FOUR TIMES THE VALUE OF g WILL

- BECOME HALF
- BECOME DOUBLE
- BECOME TRIPLE
- BECOME FOUR TIMES
- REMAIN SAME

IF THE MASS OF THE EARTH BECOMES FOUR TIMES THE VALUE OF g WILL BE:

- BECOME DOUBLE
- REMAIN SAME
- BECOME HALF
- BECOME ONE FOURTH
- NONE OF ABOVE

IF WE TAKE AWAY ABODY FROM THE CENTER OF THE EARTH ,THE VALUE OF g VARIES:

- DIRECTLY WITH THE DISTANCE
- INVERESLY OTHER THE DISTA
- DIRECTLY WITH SQUARE
- DISTANCE REMAIN SAME
- NONE OF ABOVE

THE SOUTHERN HEMISPHERE OF EARTH IS “UP SIDE DOWN”BUT THE PEOPLE LIVING THERE DO NOT FALL OF THE EARTH :

- EARTH ATTRACTS EVERY BODY NEARLY TOWARDS ITS CENTER
- THEIR WEIGHT IS ZERO
- THERE IS INFINITE
- THE VALUE OF g IS ZERO IN THE SOUTHERN HEMISPHERE
- NONE OF ABOVE

KEPLERS SECOND LAW IS A CONSEQUENCESOF

- KINETIC ENERGY
- POTENTIAL ENERGY
- LINEAR MOMENTUM

- ANGULAR MOMENTUM

FOR THE MOTION OF A ROCKET ,THE ATMOSPHERE IS:

- ESSENTIAL
- EQUAL
- VERY RISKY
- NONE OF THE ABOVE

The unit of G, the gravitational constant is

- Nm_2
- m_3kg/s_2
- N_2/kg_2
- Nm_2/kg_2
- None of above

The value of g at mean earth surface is

- 8.70
- 4.55
- 9.08
- 9.83
- 0.225

3. Force of gravitation between two bodies is directly proportional to the

- Square of the distance between them
- Sum of their masses
- Product of their mass
- Twice of the distance between them
- Square of the product of their masses

This minimum initial speed to escape from earths orbit is called

- Zero velocity
- Escape velocity
- Earth velocity
- Centripetal velocity
- None of them

The radius of earth is

- $6.4 \times 10_6$ m
- $1.66 \times 10_{23}$ m

- 5.98×10^{24} m
- 6.67×10^{-11} m
- 1.74×10^{6} m

According to Kepler's law of periods

- $F= (Gm_1m_2)/r^2$
- F= ma
- $T^2 = (4\pi^2/GM)r^3$
- T= 2GM/r
- U=-GMm/R

The unit of weight is

- N
- Nm^2/kg^2
- kg
- $m^2/kg.s$
- kg/m

The gravitational force of attraction between the earth and a 70-kg student if the distance of between them is 6.38×10^6

- 778 N
- 686 N
- 980 N
- 589 N
- None of above

The weight of a particle differs from the magnitude of the gravitational force, because

- Earth's mass is distributed uniformly
- Earth rotates
- Earth is a perfect sphere
- Earth does not rotate
- None of above

According to Kepler's law of orbits "All planets move in ellipticalorbits, with the _________ at one focus."

- Moon
- Stars
- Sun
- Earth
- Mars

The fundamental postulate of Einstein's theory of relativity about gravitation is called

- Theory of relative gravitation
- Gravitational theory
- Principle of superposition
- Principle of gravitation
- Principle of equivalence

Mass of earth is

- 5.98×10^{24} kg
- b) 1.66×10^{23} kg
- c) 6.4×10^{6} kg
- d) 6.67×10^{-11} kg
- e) 1.74×10^{6} kg
-

"A net effect is the sum of the individual effects." This principle is known as

- Principle of relativity
- Principle of equivalence
- Principle of addition
- Principle of superposition
- None of above

The value of g at a distance of about 5.64×10^{7} m from the centre of earth is

- 1.3 m/s^2
- 9.86 m/s^2
- 0.31 m/s^2
- 0.98 m/s^2
- 0.13 m/s^2

If the radius of Mars is 3.38×10^{6}. The gravity at its surface will be

- 8.83 m/s^2
- b) 26.0 m/s^2
- c) 3.75 m/s^2
- d) 8.96 m/s^2
- e) None of above

According to Kepler's law of periods "The Square of the period of any planet is proportional to the _________________________."

- Square of the mass of attracting body

- Cube of semi major axis of its orbit
- Mass of the attracting body
- Gravity
- Force of gravitation

The escape speed of the earth's moon is

- 2.38 km/s
- 0.98 km/s
- 11.2 km/s
- 112 km/s
- None of above

According to principle of superposition. The net effect

- is less than the the sum of all effects
- b) is equals to the half of the product of all effects
- c) is greater than the the product of all effects
- d) is equals to the product of all effects
- e) is equals to the sum of all effects

The force of gravitational attraction between the earth and a 70-kg man, if the student is in an airplane at 40000 feet above earth's surface. This would place the student a distance of $6.39 \times 10_6$ m from earth's center.

- 778 N
- 686 N
- 980 N
- 864 N
- 684 N

If a body is at rest on a height of 12m, then its kinetic energy will be

- Maximum
- b) Zero
- c) Greater than potential energy
- d) Equals to the potential energy
- e) None of above

The escape speed of the earth is
- 2.38 km/s
- b) 0.98 km/s
- c) 11.2 km/s
- d) 112 km/s
- e) None of above

If an apple attracts you with a force of magnitude of about 0.1 N. Then the force with which you attract the apple is

- 1 N
- 6.67×10^{-11} N
- 9.8 N
- 0.1 N
- None of above

Kepler's laws are direct consequences of

- Einstein's theory of relativity
- b) Newton's law of motion
- c) Newton's law of gravitation
- d) Newton's law of conservation of energy
- e) None of above

Escape velocity is inversely proportional to

- Mass
- Radius
- Gravity
- Time period
- Force of gravitation

If the mass of Mars is 6.42×10^{23} kg and its radius is 3.38×10^{6} m. Then its escape velocity is

- 5033 km/s
- 3.56 km/s
- 5.03 km/s
- 8.70 km/s
- None of above

___________ is the force of attraction that acts between all objects because of their mass.

- Gravitation
- Mass
- Velocity

An object's __________is the rate of change of its velocity

- Acceleraton
- Velocity

- Momentum

________said that all objects fall with the same acceleration unless air resistance or some other force acts on them.

- Galileo
- Newton
- Eienstein

Thus, a heavy object and a light object that are dropped from the same height will reach the ground at the ________.

- same time
- different time
- not reach

_________described a connection between the movements of the celestial bodies and the gravitation that attracts objects to Earth.

- Isaac Newton
- Einstein
- Shahrukh

_______showed how the sun's force of gravity must decrease with the distance from the sun.

- Newton
- Hrithik
- Einstein

Newton's law of gravitation says that the gravitational force between two objects is directly proportional to their ________.

- Masses
- Velocities
- distance b/w them

The distance between the two objects doubles, the force between them becomes _________of its original strength

- one-fourth
- doubles
- fourths)

In ______, the German-born physicist Albert Einstein announced his theory of space, time, and gravitation, the general theory of relativity.

- 1915
- 1905
- 1989

Einstein's theory completely changed scientists' way of thinking about ________

- Gravitation
- sun
- earth

Einstein's theory predicts that gravity will bend the path of a light ray as the ray passes near a _________body

- Massive
- Small
- very tiny

General relativity also indicates that massive bodies in orbit around each other will emit waves of ______known as gravitational waves.

- Energy
- Waves
- Raffy

Einstein's theory predicts the existence of objects called ________

- black holes
- white holes
- brown holes

A black hole is a region of space whose gravitational force is so ___________that not even light can escape from it.

- Strong
- Weak
- very weak

The theory showed that the __________must either expand or contract.

- universe
- Earth
- Moon

Einstein's Special Theory of Relativity is valid for systems that are not accelerating. Since from ______________.

- Newton second law
- 1st law
- 3rd law

Albert Einstein introduced his Special Theory of Relativity in _______

- 1905
- 1915
- 1989

Albert Einstein proposed his General Theory of Relativity in ________

- 1905
- 1915
- 1989

OSCILLATION

The to and fro motion about a mean position is called.

- linear motion
- vibratory motion
- rotational motion
- none of these.

When amass attached to one end of spring is displaced through distance x, the force exerted on spring is

- F=kx
- F=kx^2
- F=1/2kx^2
- F=k^2x

the opposing force exerted by the spring on the mass is called

- frictional force
- dragging force
- restoring force
- none of these

the restoring force which opposes the applied force is given by

- F=kx
- F= -kx
- F= kx^2
- F= -x

the ratio of applied force to the displacement gives

- acceleration
- spring constant
- decay constant
- planck constant

the unit of spring constant k are

- joule-second
- meter second^-2
- meters
- Newton meter^-1

the oscillation of physical system results from two basic properties of the system, namely

- densty and inertia
- elasticity and inertia
- moment of inertia and viscosity
- resistivity and entropy

choose the wrong statement. In simple harmonic motion

- the restoring force is proportional to displacement
- the acceleration acts in a direction opposite to that of the displacement
- the acceleration does not change with time
- the oscillatioc are necessarily periodic

a uniform sping of force constant k is cut in to two pieces whose lengths are the ratio 1:2 . what is the force constant of the longer piece of sring?

- k/2
- k
- 3k/2
- 2k

if a given spring constant K is cut into three identical segments the spring constant of each segment is

- k/2
- k/3
- 3k
- 4k

when a mass attached to one spring is pulled to one side and released t perform

- rotational motion
- circular motion
- simple harmonic motion
- none of these

for a body executing simple harmonic acceleration a is

- $a \propto x$
- $a \propto -x$
- a∝ -x^2
- a∝√

hertz is a unit of

- frequency
- time period
- displacement
- none of these

frequency f is related to time period as

- F=T
- F=1/T
- F=2π/T
- F=T^2

at extreme position of mass its potential energy is

- mnimum
- maximum
- zero
- depends upon the body

ONE IMPORTANT PROPERTY OF OSCILLATION MOTION IS IT'S

- VELOCITY
- ACCELARATION
- FREQUENCY
- TIME PERIOD
- MOTION

1 HERTZ IS EQUAL TO

- 2 OSCILLATIONS
- TIME PERIOD
- 1 OSCILLATION PER SEC
- 1 OSCILLATION
- 2 OSCILLATION PER SEC

TIME PERIOD IS

- DIRECTLY PROPORTIONAL TO FREQUENCY
- INVERSELY PROPORTIONAL TO FREQUENCY
- BOTH A & B
- EQUAL TO FREQUENCY
- LESS THAN FREQUENCY

ANY MOTION THAT REPEATS ITSELF AFTER CERTAIN INTERVAL OF TIME IS CALLED

- SIMPLE HARMONIC MOTION
- OSCILLATORY MOTION
- FREQUENCY
- ANGULAR SIMPLE HARMONIC OSCILLATOR
- WAVES

THE SI UNIT OF ANGULAR FREQUENCY IS

- RADIAN PER SEC
- VELOCITY SEC
- VELOCITY PER SEC^2
- RADIAN PER SEC^2
- HERTZ

EVERY OSCILLATING SYSTEM, BE IT A DIVING BOARD OR A VIOLIN STRING, HAS SOME ELEMENT OF "SPRINGINESS" ANDE SOME ELEMENT

- INERTIA
- MOTION
- VELOCITY

- ACCELARATION
- TIME

THE ENERGY OF A LINEAR OSCILLATOR TRANSFERS BACK AND FORTH

- KINETIC ENERGY & POTENTIAL ENERGY
- ONLY KINETIC ENERGY
- ONLY POTENTIAL ENERGY
- FORCE
- ENERGY

THE MECHANICAL ENERGY OF A LINEARE OSCILLATOR IS INDEED CONSTANT & INDEPENDENT OF

- VELOCITY
- MASS
- ACCELARATION
- TIME
- FORCE

WHEN THE MOTION OF AN OSCILLATOR IS REDUCED BY AN EXTERNAL FORCE, THE OSCILLATOR & IT'S MOTION ARE SAID TO BE

- DAMPED
- DAMPING FORCE
- HARMONIC MOTION
- OSCILLATORY MOTION
- GRAVITATIONAL FORCE

A CIRCULAR PROCESS OF INFLUENCE WHERE ACTION HAS EFFECT ON THE ACTOR IS CALLED,

- POSITIVE FEEDBACK
- NEGATIVE FEEDBACK
- FEEDBACK
- AMPLIFIER
- OP-AMP

THE LIMITING VALUE WILL BE INDEPENDENT OF INPUT IN,

- POSITIVE FEEDBACK
- FEEDBACK
- NEGATIVE FEEDEBACK

- OP-AMP
- OHM'S LAW

THE USE OF NEGATIVE FEEDBACK REDUCES THE,

- GAIN
- LOSS
- AMPLITUDE
- FREQUENCY
- DAMPING FORCE

IN NEGATIVE FEEDBACK CIRCUIT PROPERTIES ARE DEPENDENT UPON THE EXTERNAL,

- POSITIVE FEEDBACK NETWORK
- NEGATIVE FEEDBACK NETWORK
- FEEDBACK NETWORK
- TRANSISTORS
- SEMICONDUCTORS

AN OSCILLATOR IN WHICH CAPACITOR IS CHARGED GRADUALLY AND THEN DISCHARGED RAPIDLY.

- RELAXATION OSCILLATOR
- LINEAR OSCILLATOR
- OSCILLATORY MOTION
- OP-AMP
- FEEDBACK

HYSTERETIC OSCILLATOR IS AN EXAMPLE OF

- LINEAR OSCILLATOR
- RELAXATION OSCILLATOR
- FEEDBACK NETWORK
- OSCILLATORY MOTION
- SEMICONDUCTORS

THE SYSTEM IS IN UNSTABLE EQUILIBRIUM IF BOTH THE INPUTS AND OUTPUTS OF THE OP-AMP ARE AT,

- 5 VOLTS
- 50 VOLTS
- 75 VOLTS
- 10 VOLTS
- ZERO VOLTS

AT THE POINT WHERE VOLTAGE AT THE INVERTING INPUT IS GREATER THAN THE NON-INVERTING INPUT, THE OUTPUT OF THE OP AMP FALLS QUICKLY DUE TO,

- NEGATIVE FEEDBACK
- AMPLITUDE
- DAMPING FORCE
- POSITIVE FEEDBACK
- FREQUENCY

IF THE THRESHOLD ELEMENT IS A NEON LAMP, THE CIRCUIT ALSO PROVIDES A FLASH OF LIGHT WITH EACH DISCHARGE OF THE,

- TRANSISTOR
- CAPACITOR
- RESISTOR
- VOLTAGE
- SEMICONDUCTOR

THE ELECTRICAL OUTPUT OF A RELAXATION OSCILLATOR IS USUALLY A

- LONGITUDINAL WAVE
- TRANSVERSE WAVE
- SAWTOOTH WAVE
- STANDING WAVE
- OSCILLATORY MOTION

<u>FREQUENCY OF OSCILLATION IS,</u>

- 1/2ln(2)RC
- 1/T
- 1/2ln(10)RC
- 1/2ln(3)
- 1/5ln(5)

Oscillation and concept of feedback

Which of the following is not an example of free oscillations:

- swinging pendulum
- Ice cube bobbling up and down in water.
- Vibrations on a drum skin after it has been hit.

- Light rays in space travelling from sun to earth. Tidal variations in sea level.

A particle executes S.H.M. with a time period of 16 s. At time t = 2 s, the particle crosses the mean position while at t = 4 s, its velocity is 4 ms^{-1}. The amplitude of motion in meter is:

- $\sqrt{2}\ \pi$
- $16\sqrt{2}\ \pi$
- $24\sqrt{2}\ \pi$
- $4/\pi$
- $(32\sqrt{2})/\pi$

In damped oscillations, the amplitude of oscillations is reduced to one-third of its initial value a_0 at the end of 100 oscillations. When the oscillator completes 200 oscillations, its amplitude must be:

- a_0 /2
- a_0 / 6
- a_0 /12
- a_0 /4
- a_0 /9

For a simple pendulum, the graph between T^2 and L is:

- a straight line passing through the origin
- parabola
- circle
- ellipse
- hyperbola

The oscillatory motion in which the instantaneous acceleration is proportional to the displacement of the oscillating bodies is called:

- Elastic motion
- Transiating motion
- Transverse motion
- Harmonic motion

Total energy of a particle performing S.H.M is directly proportional to:

- The amplitude

- The square root of amplitude
- Square of amplitude
- The reciprocal of amplitude

If the feedback opposes the original signal, it is :

- negative feedback
- Positive feedback
- Zero feedback
- None of the above

Which one of the following is not undergoing a simple harmonic motion:

- Motion of a pendulum
- Vibration of a violin string
- Motion of body in a rectilinear path
- Oscillations of mass on a string

The vertical oscillations of a body on a spring are started by holding the body at a point where the spring is at its natural length and then releasing it. If the mass of the body increase the time period of the oscillation will be:

- Increased
- Decreased
- Remains uncharged
- First increase than decreased

A second pendulum has time period:

- 1 sec
- 2sec
- 4sec
- 8sec

If a simple pendulum is kept in an elevator which is allying downward under the action of gravity, then the time period of the pendulum:

- Increases
- Decreases
- Become infinite
- Zero

The work done by a compound pendulum in one complete oscillation is:

- Equal to potential energy of the pendulum
- Equal to kinetic energy of the pendulum
- Equal to total energy of the pendulum
- Zero

To double the period of a pendulum, the length:

- Must be increased by a factor 2
- Must be decreased by a factor 2
- Must be increased by a actor of 21/2
- Must be increased by a factor 4

The period of oscillation of a simple pendulum of constant length at a place inside a coal mine is approximately:

- Less than it`s on the surface of the earth
- More than it is on the surface of the earth
- The same as it is on the moon`s surface
- The same as it`s on the surface of the earth

The term which tells us the stage of vibration of the particles of the medium is called:

- Time period
- Phase
- Wavelength
- Amplitude

The period of a spring mass system undergoing simple harmonic motion is T . if the amplitude of the spring mass system`s motion is doubled, the period will be:

- (¼)T
- (½)T
- T
- 2T
- 4T

The motion of a vibrating body from one extreme point to the other extreme point and back to the first extreme point is called :

- Oscillation
- Vibration
- Rotational
- None of the above

In S.H.M negative sign indicates that acceleration and displacement are :

- Same in direction
- Opposite in direction
- None of the above

During the oscillatory motion, the K.E is maximum at:

- Mean position
- Extreme position
- Rest position
- None of the above

__________ is not an example of free oscillations?

- tidal variations in sea level.
  vibrations on a drum skin after it has been hit
  light rays in space travelling from sun to earth.
- Ice cube bobbling up and down in water
  Swinging pendulum

A particle executes S.H.M. with a time period of 16 s. At time t = 2 s, the particle crosses the mean position while at t = 4 s, its velocity is 4 ms^{-1}. The amplitude of motion in meter is _____

- $\sqrt{2}\ \pi$
- $16\sqrt{2}\ \pi$
- $24\sqrt{2}\ \pi$
- $4/\pi$
- $(32\sqrt{2})/\pi$

The graph between T^2 and L for a simple pendulum is ______

- a straight line
- ellipse

- circle
- hyperbola
- parabola

A second pendulum has time period _____

- 1 sec
- 2sec
- 4sec
- 8sec

The length ____________ to double the period of a pendulum,

- Must be increased by a factor 2
- Must be decreased by a factor 2
- Must be increased by a actor of 21/2
- Must be increased by a factor 4

A mass on a spring transforms energy back and forth b/w _________

- kinetic and potential energy
- kinetic and mechanical energy
- potential and mechanical energy

The oscillatory motion in which the instantaneous acceleration is proportional to the displacement of the oscillating bodies is called __________

- Elastic motion
- Transition motion
- Transverse motion
- Harmonic motion

When a stone is thrown in water, any circle drawn with its centre as the stone is a __________

- Longitudinal wave
- Stationary wave
- Circular wave
- Wave front

The vertical oscillations of a body on a spring are started by holding the body at a point where the spring is at its natural length and then releasing it. If the mass of the body increase the time period of the oscillation will be _________

- Increased
- Decreased
- Remains uncharged
- First increase than decreased

The term which tells us the stage of vibration of the particles of the medium is called_________

- Time period
- Phase
- Wavelength
- Amplitude

When a mass is acted upon by an elastic force which tends to bring it back to its equilibrium configuration, and when that force is _______ to the distance from equilibrium then the object will undergo simple harmonic motion when released.

- Directly proportional
- Inversely proportional

The work done by a compound pendulum in one complete oscillation is _________

- Equal to potential energy of the pendulum
- Equal to kinetic energy of the pendulum
- Equal to total energy of the pendulum
- Zero

The maximum displacement from the equilibrium on either of the sides is _______

- Period
- Frequency
- Amplitude

A simple harmonic motion is not being undergone in ________.

- Motion of a pendulum
- Vibration of a violin string
- Motion of body in a rectangular path
- Oscillations of mass on a string

Time period of a pendulum is calculated by ________

- $T = 2\pi\sqrt{\frac{L}{g}}$

- $T = 2\pi\sqrt{\frac{g}{L}}$

Period is measured in ______

- seconds / cycle
- cycles/second

Total energy of a particle performing S.H.M is directly proportional to __________

- The amplitude
- The square root of amplitude
- Square of amplitude
- The reciprocal of amplitude

The period of oscillation of a simple pendulum of constant length at a place inside a coal mine is approximately ____________

- Less than it`s on the surface of the earth
- More than it is on the surface of the earth
- The same as it is on the moon`s surface
- The same as it`s on the surface of the earth

The number of vibrations per second is called________

- Period
- Frequency
- Amplitude

If a simple pendulum is kept in an elevator which is alling down ward under the action of gravity, then the time oeriod of the pendulum __________

- Increases
- Decreases
- Become infinite
- Zero

PROJECTILE MOTION

A boy, standing on the top of a building, throws a stone up with a velocity of 16 ms^{-1} in a direction making an angle of 30º with the horizontal. If the height of the building is 9.8 m, the velocity with which the stone will strike the ground will be approximately

- 17 ms^{-1} at angle $\tan^{-1}(2/\sqrt{3})$ with the horizontal

- 21 ms^{-1} at angle $\tan^{-1}(-2/\sqrt{3})$ with the horizontal
- 25 ms^{-1} at angle $\tan^{-1}(-\sqrt{3}/2)$ with the horizontal
- 27 ms^{-1} at angle $\tan^{-1}(-\sqrt{3}/2)$ with the horizontal
- 29 ms^{-1} at angle $\tan^{-1}(-2/\sqrt{3})$ with the horizontal

A steel sphere A projected up with a velocity of 10 ms^{-1} at an angle of 60º with the horizontal, collides elastically with an identical steel sphere B located at the highest point of the trajectory of A. The sphere B is the bob of a simple pendulum. After the collision, if the sphere B just moves along a vertical circle, what is the length of the pendulum? (Take g = 10 ms^{-2})

- 50 cm
- 55 cm
- 60 cm
- 65
- 70 cm

The velocity of a projectile equals its initial velocity added to:

- a constant horizontal velocity
- a constant vertical velocity
- a constantly increasing horizontal velocity
- a constantly increasing downward velocity
- a constant velocity directed at the target

A stone thrown from the top of a tall building follows a path that is:

- circular
- made of two straight line segments
- hyperbolic
- parabolic
- a straight line

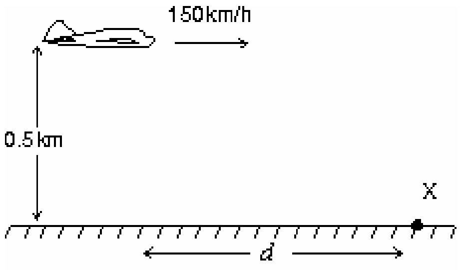
A bullet shot horizontally from a gun:

- strikes the ground much later than one dropped vertically from the same point at the same instant
- never strikes the ground
- strikes the ground at approximately the same time as one dropped vertically from the same point at the same instant
- travels in a straight line
- strikes the ground much sooner than one dropped from the same point at the same instant

A bomber flying in level flight must release its bomb before it is over the target. Neglecting air resistance, which one of the following is NOT true?

- The bomber will be over the target when the bomb strikes
- The acceleration of the bomb is constant
- The horizontal velocity of the plane equals the vertical velocity of the bomb when it hits the target
- The bomb travels in a curved path
- The time of flight of the bomb is independent of the horizontal speed of the plane

The airplane shown is in level flight at an altitude of 0.50 km and a speed of 150 km/h. At what distance d should it release a heavy bomb to hit the target X? Take g = 10 m/s^2.

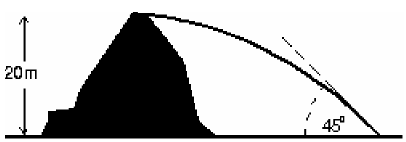


- 150 m
- 295 m
- 417 m
- 2550 m
- 15,000 m

An object is shot from the back of a truck moving at 30 mph on a straight horizontal road. The launcher is aimed upward, perpendicular to the bed of the truck. The object falls:

- in front of the truck
- behind the truck
- on the truck
- depends on the initial speed of the object
- depends on the value of g

A stone is thrown horizontally from the top of a 20-m high hill. It strikes the ground at an angle of 45. With what speed was it thrown?



- 14 m/s

- 20 m/s
- 28 m/s
- 32 m/s
- 40 m/s

A stone is thrown outward from the top of a 59.4-m high cliff with an upward velocity component of 19.5 m/s. How many seconds will the stone be in the air?

- 4
- 5
- 6
- 7
- 8

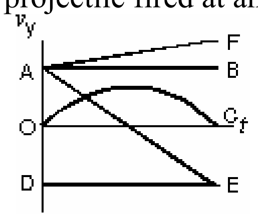
A large cannon is fired over level ground at an angle of 30□ above the horizontal. The muzzle velocity is 980 m/s. Neglecting air resistance, the projectile will travel what horizontal distance before striking the ground?

- 4300 m
- 8500 m
- 43,000 m
- 85,000 m
- 170,000 m

A boy on the edge of a vertical cliff 20 m high throws a stone horizontally outwards with a speed of 20 m/s. It strikes the ground at what horizontal distance from the foot of the cliff? Use g = 10 m/s^2

- 10 m
- 40 m
- 50 m
- $50\sqrt{5}$ m
- none of these

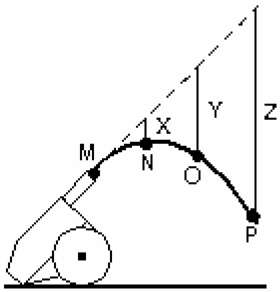
Which of the curves on the graph below best represents the vertical component v_y versus t for a projectile fired at an angle of 45 above the horizontal?



- OC
- DE

- AB
- AE
- AF

A cannon fires a projectile as shown. The dashed line shows the trajectory in the absence of gravity; points MNOP correspond to one second intervals. Using g = 10 m/s^2, the lengths X,Y,Z are:



- 5 m, 10 m, 15 m
- 5 m, 20 m, 45 m
- 10 m, 40 m, 90 m
- 10 m, 20 m, 30 m
- 0.2 m, 0.8 m, 1.8 m

A projectile is fired over level ground with an initial velocity that has a verticaTl component of 20 m/s and a horizontal component of 30 m/s. Using g = 10 m/s^2, the distance from launching to landing points is:

- 40 m
- 60 m
- 80 m
- 120 m
- 180 m

An object is projected at an angle to the horizontal in a gravitational field and it follows a parabolic path, PQRST. These points are the position of the object after successive equal time intervals, T being the highest point reached.

- Are equal.
- Decrease at a constant rate.
- Have equal horizontal components.
- Increase at a constant rate.
- Have equal vertical components.

A ball is projected horizontally from the top of a cliff on the surface of the Earth with a speed of 40 m/s. Assuming that there is no air resistance, what will its speed be 3 s later?

- 30 m/s.
- 40 m/s.
- 50 m/s.
- 60 m/s.
- 7

REVERSIBLE AND IRREVERSIBLE PROCESS

In an irreversible process

- THERE IS NO LOSS OF ENTROPY
- THERE IS ALWAYS A NET GAIN IN ENTROPY
- THERE IS NO CHANGE OF ENTROPY
- THERE IS NO GAIN IN ENTROPY

One of the following is an example for irreversible process

- ISOTHERMAL PROCESS
- MELTING OF ICE
- WORK DONE AGAINST FRICTION
- PETTIER EFFECT

One of the following is an example for reversible process

- WORK DONE AGAINST FRICTION
- MELTING OF ICE
- SEEBECK EFFECT
- HEAT PRODUCED BY CURRENT

A heat engine working in between two isothermals and two adiabatic is called

- DIESEL ENGINE
- CLAUSIUS ENGINE
- RANKINE ENGINE
- CARNOT ENGINE

A device based upon the thermodynamics property of matter is called

- CALORIMETER

- HEAT ENGINE
- THERMOMETER
- VOLTMETER

Efficiency of an ideal engine can be 100%if and only it

- T1=0
- T2=0K
- T1=T2
- T1=T2=0

Area inside the efficiency of a heat engine ranges between

- 5-25%
- 25-35%
- T1-T2
- 40-50%

Mathematically entropy can be defined as

- Q=S/T
- Q=T/S
- Q=T*S
- S=T*Q

Entropy

- IS THE SPECIFIC HEAT OF THE BODY
- IS THAT THERMAL PROPERTY OF THE BODYTHAT VARIES
- IS THAT THERMAL PROPERTY OF THE BODY WHICH REMAINS CONSTANT DURING ADIABATIC PROCESSWHEN NO HEAT ENERGY IS GIVEN
- OR REMOVED FROM
- NONE OF THESE

No entropy change in associated with

- ISOTHERMAL PROCESS
- ISOCHORIC PROCESS
- ADIABATIC PROCESS
- ISOBARIC PROCESS

When the temperature of source and sink of a heat engine become equal the entropy change will be

- ZERO
- MAXIMUM
- MINIMUM
- NEGATIVE

Entropy of universe during any neutral process

- INCREASE
- INCREASE OR CONSTANT
- DECREASE
- DECREASE OR CONSTANT

For operation of carnot cycle,if temperature of source and sink of t1 k and t2 k respectively then

- T1 MAY BE GREATHER
- T1<T2
- T1=T2
- T1>T2

The efficiency of carnot engine can be made 100% if

- LOW TEMPERATURE RESERVOIR IS AT 0 C
- LOW TEMPERATURE IS AT 0 K
- WHENBOTH THE RESERVOIR ARE AT SAME TEMPERATURE
- LOW TEMPERATURE IS AT 0 F

The efficiency of carnot engine depends upon

- THE TEMPERATURE OF THE SINK ONLY
- THE TEMPERATURE OF THE SOURCE ONLY
- THE TEMPERATURE OF THE SOURCE AND SINK
- THE WORKING SUBSTANCE

Area inside the carnot cycle represents

- HEAT REJECTED BY THE SYSTEM
- HEAT LOSS DUE TO LEAKAGE HEAT TAKEN TO INCREASE THE TEMPERATURE OF THE BODY
- ENERGY DUE TO LEAKAGE
- USEFUL WORKDONE IN 0NE CYCLE

The efficiency of a carnot cycle is given by

- T1-T2/2

- T1T2/T1+T2
- T1-T2/T1
- T1+T2/2

If the temperature of the source increases,the efficiency of a carnot engine

- INCREASES
- DECREASES
- CONSTANT
- FIRST INCREASE AND THEN DECREAS

The efficiency of carnot engine in terms of temperatureof source(t1) and that of sink(t2) is given as

- T1-T2/2
- T2-T1/2
- T1-T2/T1
- T1+T1/T2

The efficiency of carnot engine using an ideal gas is

- n=T1-T2/T1
- n=T2-T1
- n=T1-T2/T2
- n=T1/T1-T2

A reversible process change the state of a system in such a way that the net change in the combined entropy and its surroundings --------------

- zero
- 1
- greater than zero
- none

In a reversible cycle,the -----------will be exactly the the same after each cycle

- system
- surroundings
- both
- none

All spontaneous process are.

- Irreversible

- Reversible
- Adiabatic
- none

Maximum work can be obtained in the process called------

- reversible
- isothermal
- isochoric
- none

A process is one where no heat is lost from the system as “waste”.

- Reversible
- Isothermal
- Adiabatic
- None

A carnot cycle consist of -------process.

- isothermal process
- adiabatic process
- isochoric process
- none

The efficiency is defined to be ---------

- η =W/QH
- η=WxQH
- η=QH/W
- none

A reversible process -------- the total entropy of the ‘universe’.

- increase
- decrease
- does not change
- none

Any irreversible process ---------the total entropy of the universe.

- increase
- derease
- does not change

- none

All naturally occurring process proceed in -------

- one direction
- one direction and known as reversible process
- two direction
- none

When we place a hot block of metal and a cool block of metal into contact, heat is transferred from the hotter block to the cooler one . That is an --------

- Irreversible process
- Reversible process
- Both
- None

Change in entropy is ---------

- S= Q/T
- S =Q.T
- S = T/Q
- None

Theoritically, the efficiency of carnot engine is 100% when temp. of low temp. reservoir is ---

- 0K
- 0°C
- 273K
- None

Which one of the following is the example of irreversible process.

- Peltier effect
- Work done against friction
- Melting of ice
- Isothermal process

Entropy is called as "Time Arrow" because the entropy of the universe -----

- always increase
- always decrease
- remains constant
- some times increase and some times decrease

No entropy change is associated with -------

- Isobaric process
- Isothermal process
- Isochoric process
- Adiabatic process

Entropy is the measure of -------

- Order of the system
- Disorder of the system
- Internal energy of the system
- Kinetic energy of the system

ROLE OF WAVE AS INFORMATION CAREER

The maximum displacement of a particle from its rest position is called _______.

- Time period.
- Amplitude.
- Wave length.
- Wave front.
- Wave

The distance between two successive particles which are at exactly the same point in their paths and are moving in the same direction such as _________.

- Wave.
- Wave front.
- Wave length.
- Time period.
- Frequency.

The number of complete oscillations made in 1 second is called the _________.

- Time limit.
- Time period.
- Amplitude.
- Frequency.
- Wave.

The S.I unit of frequency is called the __________.

- Ampere.
- Hertz.
- Second.
- Meter per second.
- No unit.

Any line or section taken through an advancing wave in which all the particles in the same is called the ________.

- Wave length.
- Wave front.
- Wave.
- Time period.
- Frequency.

A ________ means one complete round trip of the body.

- Timeperiod.
- Wavelength.
- Wave.
- Vibration.
- Frequency.

___________ of a vibration body at any instant is its distance from the equilibrium position at that instant.

- Displacement
- Frequency
- Timeperiod
- Vibration

Wave

A waves transfers ___________.

- Molecules.
- Energy.
- Matter.
- Force.
- Atoms.

Water waves are being generated in a ripple tank at a rate of 5 Hz.this mean that in 1 second the number of waves passing through a fix point is _________.

- 0.2
- 2.5
- 5
- 7.5
- 10

Which one of the following is an example of longitudinal waves?

- Waves in a ripple tank.
- Light waves in water.
- A vibration guitar string.
- Sound waves produced by a string.
- Water waves produced by a string.

All electromagnetic waves save the same_________.

- Speed in vacuum.
- Speed in a given medium.
- Frequency in vacuum.
- Frequency in a given medium.
- Time period.

Waves that travel in a direction parallel to the direction of vibration are called_______.

- Transverse waves.
- Longitudinal waves.
- Water waves.
- Sound waves.
- General wave.

Waves that travel in a direction perpendicular to the direction of vibration are known as __________.

- Transverse waves.
- Longitudinal waves.
- Water waves.
- Sound waves.
- General waves.

The distance travelled by a wave in 1 second is called _________.

- Wave speed.
- Wave front.
- Wave limit.

- Wavelength.
- Amplitude.

have the shortest wavelength.

- Gamma rays.
- X-rays.
- Ultraviolet.
- Visible light.
- Infrared.

Visible lights is just one of the________ members of the family of electromagnetic waves.

- Five
- Six
- Seven
- Eigth
- Nine.

The_________ of a medium is the ratio of the speed of light in vacuum to the speed of light in the medium.

- Refractive index
- Diffraction
- Double slit experiment
- Young slit experiment
- Interference.

waves are classified into _______ types.

- Two
- Three
- Four
- Five
- Six

In velocity the relationship between frequency and wavelength is _________.

- Inversely proportional.
- Directly proportional.
- Curve.
- Hyperbola.
- parabola.

Rope waves,Water waves,Ligth waves and radio waves are some examples of _______________.

- Longitudinal waves.
- Transverse waves.
- Sound waves.
- Water waves.
- General waves.

Sound waves and waves produced in a vertical oscillation spring under tension are some examples of ___________.

- Longitudinal waves.
- Transverse waves.
- Sound waves.
- Water waves.
- General waves.

The frequency is given by the _________ of the period of oscillation.

- Inversly proportional
- Directly proportional
- Reciprocal
- Hyperbola
- Parabola

A relation exists between the wavelength the period and the velocity of wave is called _________.

- Velocity.
- Wave velocity.
- Time period.
- Displacement
- Frequency.

sitar string vibrates at 400 Hz.What is the timeperiod of this vibration?

- 0.0025
- 0.0005
- 0.0050
- 0.0050
- 0.0010

A sound wave of frequency 400Hz and wavelength 3m passes through a certain medium. Calculate the velocity of the wave in that medium?

- 1000
- 1200
- 200
- 500
- 1500

Those waves which exist only within material medium are called ___________.

- Mechanical Wave.
- Matter Wave.
- Electromagnetic wave.
- All of them.
- None of above.

There are _________ types of mechanical waves.

- two
- three
- four
- five
- six

Such wave in which the particles of the medium vibrate in the direction of motion of waves is called _______________.

- Longitudinal Wave.
- Transverse Wave.
- Both a and b.
- Matter Wave.
- None of above

Such waves in which the particles of the medium vibrate in the direction perpendicular to the direction of wave are known as _________.

- Longitudinal Wave.
- Transverse Wave.
- Both a and b.
- Matter Wave.
- None of above

___________ Waves are associated with electrons, protons, and other fundamental particles.

- Mechanical Wave.
- Matter Wave.
- Electromagnetic wave.
- All of them.
- None of above.

Those waves which don't require any material medium to exist are called ________________

- Mechanical Wave.
- Matter Wave.
- Electromagnetic wave.
- All of them.
- None of above

All electromagnetic waves travel through a vacuum at the same speed of _____________ m/s.

- 299745928
- 299792458
- 297995248
- 297245858
- 299792439

Television Wave is an example of ________wave.

- Mechanical Wave.
- Matter Wave.
- Electromagnetic wave.
- All of them.
- None of above

The __________ of a wave is the distance between repetitions of the shape of the wave.

- Wavelength
- Frequency
- Amplitude
- None

All of above

The number of waves generate by a source in unit times is called_______.

- Wavelength
- Frequency
- Amplitude
- Time period
- None

Frequency is the reciprocal of ___________.

- Wavelength
- Wave Speed
- Amplitude
- Time period
- None

The distance between the crest highest point on the graph and the normal position is called________.

- Wavelength
- Frequency
- Amplitude
- Time period
- None

______ is the distance traveled by it in a unit time in the direction of the wave.

- Wavelength
- Wave Speed
- Amplitude
- Time period
- None

The periodic variation in intensity of two waves having slightly different frequencies is called_________

- Beats
- Resonance
- Frequency
- Both a and b.
- None.

HFSWR stands for:

- High Frequency Source Wave Radar
- High Frequency Surface Wave Radio

- High Frequency Surface Wave Radar
- Heavy Frequency Surface Wave Radar
- High Frequency Super Wave Radar

The term 'wireless' is the basis for the term ___________.

- Radio wave
- Radar wave
- Tv wave
- Light wave
- None

Electromagnetic radiation with a frequency lying within a radio frequency band is called _____________.

- Radio wave
- Radar wave
- Tv wave
- Light wave
- None

____________ scatter in a variety of ways depending on the size.

- Radio wave
- Radar wave
- Tv wave
- Light wave
- None

Sound is a __________ Wave.

- Mechanical Wave.
- Matter Wave.
- Electromagnetic wave.
- All of them.
- None of above.

The interference of two identical waves moving in opposite direction produces_________

- Mechanical Wave.
- Matter Wave.
- Electromagnetic wave.
- Standing wave.
- All of them.

ROLE OF WAVE AS INFORMATION CAREER

The maximum displacement of a particle from its rest position is called _______.

- Time period.
- Amplitude.
- Wave length.
- Wave front.
- Wave

The distance between two successive particles which are at exactly the same point in their paths and are moving in the same direction such as _________.

- Wave.
- Wave front.
- Wave length.
- Time period.
- Frequency.

The number of complete oscillations made in 1 second is called the _________.

- Time limit.
- Time period.
- Amplitude.
- Frequency.
- Wave.

The S.I unit of frequency is called the __________.

- Ampere.
- Hertz.
- Second.
- Meter per second.
- No unit.

Any line or section taken through an advancing wave in which all the particles in the same is called the ________.

- Wave length.
- Wave front.
- Wave.

- Time period.
- Frequency.

A ________ means one complete round trip of the body.

- Timeperiod.
- Wavelength.
- Wave.
- Vibration.
- Frequency.

___________ of a vibration body at any instant is its distance from the equilibrium position at that instant.

- Displacement
- Frequency
- Timeperiod
- Vibration

Wave

A waves transfers ___________.

- Molecules.
- Energy.
- Matter.
- Force.
- Atoms.

Water waves are being generated in a ripple tank at a rate of 5 Hz.this mean that in 1 second the number of waves passing through a fix point is _________.

- 0.2
- 2.5
- 5
- 7.5
- 10

Which one of the following is an example of longitudinal waves?

- Waves in a ripple tank.
- Light waves in water.
- A vibration guitar string.
- Sound waves produced by a string.
- Water waves produced by a string.

All electromagnetic waves save the same_________.

- Speed in vacuum.
- Speed in a given medium.
- Frequency in vacuum.
- Frequency in a given medium.
- Time period.

Waves that travel in a direction parallel to the direction of vibration are called_______.

- Transverse waves.
- Longitudinal waves.
- Water waves.
- Sound waves.
- General wave.

Waves that travel in a direction perpendicular to the direction of vibration are known as __________.

- Transverse waves.
- Longitudinal waves.
- Water waves.
- Sound waves.
- General waves.

The distance travelled by a wave in 1 second is called _________.

- Wave speed.
- Wave front.
- Wave limit.
- Wavelength.
- Amplitude.

have the shortest wavelength.

- Gamma rays.
- X-rays.
- Ultraviolet.
- Visible light.
- Infrared.

Visible lights is just one of the________ members of the family of electromagnetic waves.

- Five
- Six
- Seven
- Eigth
- Nine.

The_________ of a medium is the ratio of the speed of light in vacuum to the speed of light in the medium.

- Refractive index
- Diffraction
- Double slit experiment
- Young slit experiment
- Interference.

waves are classified into _______ types.

- Two
- Three
- Four
- Five
- Six

In velocity the relationship between frequency and wavelength is _________.

- Inversely proportional.
- Directly proportional.
- Curve.
- Hyperbola.
- parabola.

Rope waves,Water waves,Ligth waves and radio waves are some examples of _______________.

- Longitudinal waves.
- Transverse waves.
- Sound waves.
- Water waves.
- General waves.

Sound waves and waves produced in a vertical oscillation spring under tension are some examples of ___________.

- Longitudinal waves.

- Transverse waves.
- Sound waves.
- Water waves.
- General waves.

The frequency is given by the _________ of the period of oscillation.

- Inversly proportional
- Directly proportional
- Reciprocal
- Hyperbola
- Parabola

A relation exists between the wavelength the period and the velocity of wave is called _________.

- Velocity.
- Wave velocity.
- Time period.
- Displacement
- Frequency.

sitar string vibrates at 400 Hz.What is the timeperiod of this vibration?

- 0.0025
- 0.0005
- 0.0050
- 0.0050
- 0.0010

A sound wave of frequency 400Hz and wavelength 3m passes through a certain medium. Calculate the velocity of the wave in that medium?

- 1000
- 1200
- 200
- 500
- 1500

Those waves which exist only within material medium are called ___________.

- Mechanical Wave.
- Matter Wave.
- Electromagnetic wave.
- All of them.

- None of above.

There are _________ types of mechanical waves.

- two
- three
- four
- five
- six

Such wave in which the particles of the medium vibrate in the direction of motion of waves is called _______________.

- Longitudinal Wave.
- Transverse Wave.
- Both a and b.
- Matter Wave.
- None of above

Such waves in which the particles of the medium vibrate in the direction perpendicular to the direction of wave are known as _________.

- Longitudinal Wave.
- Transverse Wave.
- Both a and b.
- Matter Wave.
- None of above

___________ Waves are associated with electrons, protons, and other fundamental particles.

- Mechanical Wave.
- Matter Wave.
- Electromagnetic wave.
- All of them.
- None of above.

Those waves which don't require any material medium to exist are called ________________

- Mechanical Wave.
- Matter Wave.
- Electromagnetic wave.
- All of them.

- None of above

All electromagnetic waves travel through a vacuum at the same speed of _____________ m/s.

- 299745928
- 299792458
- 297995248
- 297245858
- 299792439

Television Wave is an example of ________wave.

- Mechanical Wave.
- Matter Wave.
- Electromagnetic wave.
- All of them.
- None of above

The __________ of a wave is the distance between repetitions of the shape of the wave.

- Wavelength
- Frequency
- Amplitude
- None

All of above

The number of waves generate by a source in unit times is called_______.

- Wavelength
- Frequency
- Amplitude
- Time period
- None

Frequency is the reciprocal of ___________.

- Wavelength
- Wave Speed
- Amplitude
- Time period
- None

The distance between the crest highest point on the graph and the normal position is called________.

- Wavelength
- Frequency
- Amplitude
- Time period
- None

______ is the distance traveled by it in a unit time in the direction of the wave.

- Wavelength
- Wave Speed
- Amplitude
- Time period
- None

The periodic variation in intensity of two waves having slightly different frequencies is called_________

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- Resonance
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- Electromagnetic wave.
- Standing wave.
- All of them.

SIMPLE HARMONIC MOTION

The snake like motion of the rope is the example of

- Vibratory motion
- Circulatory motion
- Translatory motion
- Wave motion

If we dip a pencil into a tub of water and take it out what will it happen on the surface of water

- Water starts flowing
- Color of water is changed

- Circular ripples are formed
- It will remain calm and still

Waves can transfer one of the following from one place to another

- Energy
- Atoms
- Molecules
- Medium in which waves are produced

Time period is inverse of

- Velocity
- Frequency
- Wavelength
- Time

The wavelength of the stationary wave is _____the distance between two successive nodes or antinodes

- Half
- One fourth
- Twice
- Four times

If the mass of bob of a simple pendulum is doubled, its time period

- Is doubled
- Becomes four times
- Remains the same
- Becomes half

Bouncing back of a wave from the surface is called

- Reflection
- Interference
- Refraction
- Diffraction

When a object repeats a set pattern of motion in equal interval of time is known as

- Linear motion
- Vibratory motion
- Translational motion
- Wave motion

When an external force is applied on spring and then released, spring goes back to its equilibrium position due to

- Gravitational force
- Restoring force
- Electrostatic force
- Electromagnetic force

In simple harmonic motion velocity of the object is maximum at

- Both extreme position
- Only one extreme position
- The mean position
- All of the above

How many types of Mechanical waves are?

- Two
- Three
- Four
- Five

Invisible waves can be detected with

- Transistor
- Transmitter
- Ammeter
- Sensitive equipments

The energy of the bob of pendulum at its extreme position is

- Potential energy
- energy
- Kinetic
- Wave energy
- Mechanical energy

Waves produced by a vibrating body in air are

- Transverse waves
- Magnetic waves
- Electromagnetic waves
- Longitudinal waves

The number of waves passing through a point in one second is called its

- Frequency
- Time period
- Velocity
- amplitude

in S.H.M:

- Force/ acceleration=constant
- F/M = constant
- Acceleration=constant
- Displacement/acceleration=constant

Motion of a simple pendulum is said to be simple harmonic because

- it is simple in const ruction
- It oscillates Ina very simple way
- It acceleration is proportion
- It depend on the mass of the body

When mercury tube is disturbed, its motion is called:

- Simple harmonic motion
- Vertical motion
- Horizontal circular motion
- None of these

Which of the following is necessary and sufficient condition for simple harmonic motion?

- Constant acceleration
- Proportionally between acceleration and displacement from equilibrium
- Constant speed
- Proportionally between restoring force and displacement from equilibrium position

Acceleration of a body executing S.H.M is:

- Zero at the extreme positions and maximum at the mean position
- Zero at the mean position and max at the extreme
- It remains constant throughout the motion
- All are true

The total energy of a particle executing S.H.M IS:

- Velocity in equilibrium position
- Time period of oscillation
- Displacement in equilibrium position
- Square of amplitude of motion

The period of the oscillation of a simple pendulum is doubled when:

- The mass of the bob is doubled
- The mass of the bob and the length of the pendulum are doubled
- The length is made four times
- The amplitude is doubled

If a hole is drilled in the earth passing through its center and a ball is dropped in it,

- It will appear at the other end
- It will stop at the centre of the earth
- It will stop execute S.H.M about the centre of the earth
- It depends upon the chances availed

The period of oscillation of a simple pendulum of constant length at a place inside a Coal mine is approx

- less than it is on the surface of the earth
- more then it is on the surface of the earth
- the same it is the surface of the earth
- the same it is on the surface of the moon

Which of the following does not exhibit harmonic motion?

- A hanging spring supporting a weight
- The balance shell of a watch
- The pistons of an automobile engine
- The string of a violin

When a object repeats a set pattern of motion in equal interval of time is known as,

  - Linear motion
  - Vibratory motion
  - Translational motion
  - Wave motion
  - None of the above

Total energy of a particle performing S.H.M is directly proportional to:

- The amplitude
- The square root of amplitude
- Square of amplitude
- The reciprocal of amplitude
- The reciprocal square of amplitude

When a particle is executing S.H.M. It is found that:

- The frequency depends upon the amplitude
- The periods depends on the amplitude
- The period and frequency depend upon the amplitude
- The period and frequency are independent of the amplitude
- None of the above

In simple harmonic motion velocity of the object is maximum at,

- Both extreme positions
- The mean position
- Only one extreme position
- None of the above
- All of the above

The energy of the bob of pendulum at its extreme position is

- Potential energy
- Kinetic energy
- Wave energy
- Mechanical energy
- Both a and b

Which one of the following is not undergoing a simple harmonic motion?

- Motion of a pendulum
- Vibration of a violen string
- Motion of body in a rectilinear path
- Oscillations of mass on a string
- The back and forth motion of electrons

The oscillatory motion in which the instantaneous acceleration is proportional to the displacement of the oscillating bodies is called,

- Elastic motion

- Translating motion
- Transverse motion
- Circular motion
- Harmonic motion

Which of the following phenomenon will demonstrate that energy is being transmitted in the form of waves?

- Reflection
- Refraction
- Absorption
- Interference
- None of the above

It is a common characteristic of all types of wave motion that,

- Particles move up and down
- Particles move back and forth
- Energy is transferred without the transport of particles
- A material medium transmits the disturbance
- Both a and b

If a simple pendulum is kept in an elevator which is falling dawn ward under the action of gravity, then the time period of the pendulum:

- Increases
- Decreases
- Become infinite
- Become double
- Zero

An ordinary clock loses time in summer. This is because:

- The length of the pendulum increases
- The length of the pendulum decreases

a) The length of the pendulum decreases and time period increases
b) The length of the pendulum increases and time period decreases
c) The length of the pendulum neither increases nor decreases

If the second pendulum is taken up on the moon, in order to have its time period same:

- The length of the pendulum must be increased
- The length of the pendulum must be decreased
- The length of the pendulum must be kept the same
- The length of the pendulum become double
- None of the above

The work done by a compound pendulum in one complete oscillation is:

- Equal to potential energy of the pendulum
- Equal to kinetic energy of the pendulum
- Equal to total energy of the pendulum
- Zero
- None of the above

A pendulum clock is running slow, it can be corrected by making this pendulum:

- Longer
- Shorter
- Heavier
- Lighter
- All the above

A seconds pendulum has time period of:

- 1 second
- 2 seconds
- 4 seconds
- 8 seconds
- 6 seconds

The frequency of a simple pendulum of length "ℓ" for small angular oscillations by:

- $V = \frac{1}{2\pi}\sqrt{g/\lambda}$
- $V = 2\pi\sqrt{g/\lambda}$

- $V = \frac{1}{2\pi}\sqrt{\lambda / g}$
- $V = 2\pi\sqrt{\lambda / g}$
- None of the above

To double the period of a pendulum, the length:

- Must be increased by a factor 2
- Must be decreased by a factor 2
- Must be increased by a factor of 2 ½
- Must be increased by a factor 4
- Must be decreased by a factor of 4

The period of oscillation of a simple pendulum of constant length at a place inside a coal mine is approximately:

- Less than its on the surface of the earth
- More than its is on the surface of the earth
- The same as it is on the moon's
- The same as it's on the surface of the earth
- All the above

When an external force is applied on spring and then released, spring goes back to its equilibrium position due to

- Gravitational force
- Electrostatic force
- Electromagnetic force
- Centripetal force
- Restoring force

The velocity of a particle moving a frequency "f" and wave length "λ" is,

- $f\lambda$
- f / λ
- λ / f
- $\lambda^2 f$

- $f\lambda^2$

The term which tells us the stage of vibration of the particles of the medium is called,

- Time period
- Phase
- Wavelength
- Amplitude
- Frequency

The one which has the longest wave length in the following is?

- Red light
- X-rays
- Infra-red
- Radio waves
- None of the above

Which of the following has the shortest wavelength:

- Gamma rays
- Ultraviolet light
- Microwaves
- Radio waves
- Electromagnetic waves

The total energy of a particle executing simple harmonic motion is proportional to,

- Displacement from equilibrium position
- Frequency of oscillation
- Velocity in equilibrium position
- Time period of oscillation
- All of these

UNIFORM CIRCULAR MOTION

A motion in which an object moves with constant speed along a circular path is called-----------------

- Uniform circular motion
- Simple Harmonic motion

- Non-uniform circular motion
- None of the above

The object in uniform circular motion constantly changing ----------------------

- its speed
- direction
- both
- none

In uniform circular motion velocity is ---------------------- to the circular path.

- tanget
- perpendicular
- making of an angle of 60°
- none

The acceleration in uniform circular motion is known as---------------------

- instantaneous acceleration
- centripetal acceleration
- gravitational acceleration
- none

The magnitude of centripetal acceleration is given by ---------------------

- $a=v^2/r$
- $a=v^2 \times r$
- $a=r/v^2$
- none

The accelerltion is usually considered to an inward acting force, which is known as--------
----

- centrifugal force
- magnetic force
- gravitational force
- centripetal force

centripetal force =--------------------

- mv^2/r
- mv^2r
- mvr^2

- none

While the car moves in a cercular arc it is in ----------------------

- simple harmonic motion
- uniform circular motion
- non-uniform cercular motion
- none

A centripetal force accelerates a body by changing the direction of the body's velocity -----------------

- without changing its speed
- with increasing its speed
- with decreasing its speed
- none

The acceleration of a body undergoing uniform cercular motion is constant only in ------------------

- Direction only
- magnitude only
- both magnitude and direction only
- neither magnitude & direction

The force needed to maintain the cercular motion of a body called-------------------

- Gravitational force
- coulomb force
- centrifugla force
- centripetal force

The direction of linear velocity of a body at a point moving along a circular path is ------------

- along the tangent
- along the axis of rotation
- directed towards the ceter
- directed away from the center

A satellite remainsin an orbit around the earth due to the centripetal force provide by -----------

- Gravitational pull of the sun on the satellite
- Gratvitational force pull of the earth on the satellite

- The rocket engine attched to the satellite
- None of the above

A car moves with a uniform speed of 2m/s in a circle of radius 0.4m. Its angular speed in rad/s is ---------

- 0.8
- 1.6
- 4
- 5

The time rate of change of angular displacement is called----------------

- Angular velocity
- angular speed
- angular acceleration
- angular displacement

When a body moves in a circle the angle between its linear vilocity v and angular velocity ω is ----------

- 0°
- 45°
- 90°
- 180°

In the case of planets , the acceleration which makes them to moves in circular orbit is provided by ---------

- frictional force
- gravitational force
- coulomb force
- centrifugal force

Which statement is most correct ?

- UCM causes a force towards the center
- UCM is caused by aconstant force towards the center
- UCM is caused by a constant magnitude net force towards the center
- UCM is caused by constant magnitude net force away form the center

The SI unit of angular displacement is ------------

- meter
- centi meter

- radian
- none

The centripetal force is given by-------------------

- $F_c = mv^2/r$
- $F_c = mv/r^2$
- $F_c = m^2v/r$
- none

WAVE AND PARTICLE PROPERTIES OF DIFFRACTION

To determine the pattern produced by diffraction we must determine the phase and _______________ of each of the waves.

- Amplitude
- Frequency
- Velocity
- Nature

Diffraction can occur in _____________ types of waves.

- Micro
- Light
- Any
- Electromagnetic

Diffraction is the _____________ of waves when they interact with obstacles in their path.

- Property
- Transfer
- Combination
- Bending

The angular spacing of the features in the diffraction pattern is ____________ to the dimensions of the object causing the diffraction.

- Inversely Proportional
- Directly Proportional
- Equal

The smaller the diffracting objects the ____________ the resulting diffraction pattern.

- Smaller
- Shorter
- Wider

Monochromatic light is an example of _______________

- Electromagnetic wave
- transversal wave
- Diffraction

Diffraction angles depend only on the ratio of the to the size of the ________________diffracting object.

- Velocity
- Frequency
- light
- Wavelength

_________ are the bundles of light particles.

- wavelets
- spectrum
- Photon

_________are used in spectroscopy to determine the properties of atoms and molecules.

- Diffraction gratings
- Slits
- monochromatic light source

Infrared waves are an example of _____________ waves.

- Sound
- Light
- Electromagnetic

WAVE AND PARTICLE PROPERTIES OF POLARIZATION

A luminous object is an object that

- gives off a dim blue-green light in the dark.
- produces light of its own by any method.

- shines by reflected light only, such as the moon.
- an object that glows only in the absence of light.

According to the electromagnetic wave model, visible light is produced when

- an electric charge is accelerated with a magnitude within a given range.
- an electric charge is moved at a constant velocity.
- a blackbody is heated to any temperature above absolute zero.
- an object absorbs electromagnetic radiation.

An object is hot enough to emit a dull red glow. When this object is heated even more, it will

- emit shorter-wavelength, higher-frequency radiation.
- emit longer-wavelength, lower-frequency radiation.
- emit the same wavelengths as before, but with more energy.
- emit more of the same wavelengths with more energy.

The difference in the light emitted from a candle, an incandescent lightbulb, and the sun is basically from differences in

- energy sources.
- materials.
- temperatures
- phases of matter.

Before it travels through the earth's atmosphere, sunlight is mostly

- infrared radiation.
- visible light
- ultraviolet radiation.
- blue light.

You are able to see in shaded areas, such as under a tree, because light has undergone

- refraction.
- incident bending.
- a change in speed.

An image that is not produced by light rays coming from the image, but is the result of your brain's interpretations of light rays is called a(n)

- real image.
- imagined image.
- virtual image.

- phony image.

Light traveling at some angle as it moves from water into the air is refracted away from the normal as it enters the air, so the fish you see under water is actually

- above the refracted image.
- below the refracted image.
- beside the refracted image.
- in the same place as the refracted image.

When viewed straight down (90° to the surface), a fish under water is

- above the image (away from you).
- below the image (closer to you).
- beside the image.
- in the same place as the image.

The ratio of the speed of light in a vacuum to the speed of light in some transparent materials is called

- the critical angle.
- total internal reflection.
- the law of reflection.
- the index of refraction.

Any part of the electromagnetic spectrum, including the colors of visible light, can be measured in units of

- wavelength.
- frequency.
- energy.
- any of the above.

A prism separates the colors of sunlight into a spectrum because

- each wavelength of light has its own index of refraction.
- longer wavelengths are refracted more than shorter wavelengths.
- red light is refracted the most, violet the least.
- all of the above.

Light moving through a small pinhole does not make a shadow with a distinct, sharp edge because of

- refraction

- diffraction
- polarization
- interference

Which of the following can only be explained by a wave model of light?

- reflection
- refraction
- interference
- photoelectric effect

WAVE PARTICLE AND NATURE OF LIGHT

A phenomenon in which two waves support each other at same point and cancel each other at some other point is known as:

- Interference
- diffraction
- Polarization
- dispersion

To obtain interference of light waves

- The source should be coherent
- The source should be monochromatic
- The principle of superposition should be applicable
- all of the above

In 1921 who confirmed the photon nature of light

- Albert Einstein
- Isaac Newton
- Compton
- Maxwell

Which of the following phenomenon cannot explain wave nature of light

- Photoelectric effect
- Interference
- Compton effect
- Pair

The energy of a photon is directly proportional to

- Wavelength
- intensity
- Frequency
- none of these

When viewed in white light, soap bubbles shows colors because of

- Interference
- Scattering
- Diffraction
- dispersion

Young's double slit experiment explains

- Diffraction of light
- interference of light
- Polarization of light
- none of these

The distance between two consecutive bright or dark fringes is called

- Wave length
- fringe spacing
- Half wavelength
- width of slit

Young's experiment establishes that

- Light consist of waves
- light consist of particles
- Neither particle nor wave
- both particle and waves

The fringe width in Young's experiment can be increased

- by decreasing
- Separation of the slits
- Frequency of the source of light
- Distance between slit and screen

For which of the following colors will the fringe widthbe minimum in the Young's experiment

- Violet
- red
- Green
- yellow

The fringe pattern observed in Young's experiment is a

- Diffraction pattern
- Interference pattern
- Both
- Neither

Which of the following has the longest wavelength?

- Blue light
- gamma rays
- X-rays
- red light

Which one of the following has greater frequency?

- Ultra violet rays
- visible light
- Infra red radiation
- gamma rays

Minimum frequency required to initiate photoelectric
Effect is called

- Minimum freq.
- Maximum freq.
- Quantum freq.
- Threshold freq.

In photoelectric effect light exhibits

- Wave nature
- particle nature
- both a and b
- Light is not present in photoelectric effect

Working of a photocell is based on

- Photoelectric effect
- Compton effect
- Pair production
- uncertainty principle

Plank’s works was connected with

- Wave nature of material
- photoelectric effect
- Structure of atom
- Quantum nature radiations

The photoelectric effect is the rejection of electrons from the surface of a metal when

- It is heated
- Electrons of suitable velocity strike it
- Radiation of suitable wavelength falls on it
- It is placed in a strong electric field

The value of work function is depends upon

- Frequency of incident light
- Wavelength of incident light
- Nature of surface material
- Time of which metal is exposed

The interference of light is the result of super-position of two coherent light waves.

- Intermixing
- Super-position
- Destruction
- None of them

For interference of light, the two sources of light should have phase coherence.

- same wavelength
- same time-period
- phase coherence
- none of the above

In constructive interference the trough of one wave lie on the trough of the other wave.

- crest
- trough

THOMAS YOUNG demonstrated the phenomenon of optical interference for the first time.

- Thomas Edison
- Thomas Young
- Clark Maxwell

The phenomenon of the interference of light support the wave theory of light.

- Wave
- Particle
- Dual

The bending and spreading of light waves around sharp edges or corner is called

- Diffraction of Light.
- Path deflection
- Refraction of light
- Reflection of light
- Diffraction of light

Light waves are very small in wavelength, i.e. from 4×10^{-7} m to 7×10^{-7} m.

- 4m to 7m
- 4×10^{-3} m to 7×10^{-4} m
- 4×10^{-4} m to 7×10^{-4} m
- 4×10^{-7} m to 7×10^{-7} m

In Franhoufer diffraction the source and the screen are far away from eachother.

- Fresnel diffraction
- Franhoufer diffraction
- None of them

Distance between two consecutive slits(lines) of a grating is called grating element.

- diffraction lining
- grating element
- consecutive linings)

Grating Equation is used to determine the wavelength of light.

- frequency
- time-period
- amplitude

- wavelength

Newton's rings are formed due to interference between the light waves reflected from the top and bottom surfaces of the air film.

- Reflected
- refracted
- diffracted

Soap bubbles and thin layers of oil floating on water surface are common examples of

- thin films.
- thin films
- diffraction grating
- refracting films

A diffraction grating is an optical device containing thousands of fine equidistant lines ruled over it.

- equidistant lines
- zigzag lines
- none of them

X-rays have very short wavelength of the order of 10×10^{-10} m.

- 10×10^{-10} nm
- 10×10^{-10} km
- 10×10^{-10} m
- 10×10^{10} m

Coherent sources emit light of same all of them

- amplitude
- wave-length
- frequency
- time-period
- all of them

A phenomenon on which two waves support each other at some points and cancel each other at some other points is known as

- Interference
- Diffraction
- Polarization
- Dispersion

Which of the following phenomenon is the result of super position of two waves

- Interference
- Diffraction
- Polarization
- Dispersion

To obtain interference of light waves

- The sources should be phase coherent
- The sources should be monochromatic
- The principle of superposition should be applicable
- All of the above

To obtain a sustained interference pattern, we require two sources which emit radiation of

- The same frequency
- Nearly the same frequency
- The same frequency and have a definite phase relationship
- Different wavelengths

When viewed in white light, soap bubbles show colors because of

- Interference
- Diffraction
- Scattering
- Dispersion

The phenomenon of interference is shown by

- Longitudinal mechanical waves only
- Transverse mechanical waves only
- Non-mechanical transverse waves only
- All the above types of waves

Two sources of waves are called coherent if

- Both have the same amplitude of vibrations
- Both produce waves of the same wavelength
- Both produce waves of the same wavelength having a constant phase difference
- Both produce waves having the same velocity

Wave nature of light follows because

- Light rays travel in a straight line
- Light exhibits the phenomena of reflection and refraction
- Light exhibits the phenomena of interference
- Light causes the phenomena of photoelectric effect

Two identical light sources emit light of the same wavelength. They will exhibit interference if their

- Phase difference remains constant
- Phases are distributed randomly
- Intensities remains constant
- Intensities change randomly

Oil floating on water appears colored due to interference of light. The approximate thickness of oil for such effect to be visible is

- 1.cm
- 1mm
- 10,000 Å
- 100 Å

Young's Double slit experiment explains

- Interference of light
- Diffraction of light
- Polarization of light
- None of these

In Young's double slit experiment, the condition for constructive interference is

- $2d \, Sin\theta = m\lambda$
- $d \, Sin\theta = m\lambda$
- $d \, Sin\theta = (m + \lambda/2)$
- $d \, Sin\theta = (m + 1/2)\lambda$

For destructive interference the path difference between two light rays is equal to

- Zero
- $m \lambda$
- $(m+1/2)\lambda$
- none of these

In young's double slit experiment the fringe width(or fringe spacing) is equal to

- $\lambda d/L$

- $d/\lambda L$
- $2\lambda d/L$
- $\lambda L/d$

The position of bright fringes in young’s double slit experiment are given by

- $Y_d = \lambda L/d(m)$
- $Y_d = \lambda d/Lm$
- $Y_d = mLd/\lambda$
- $Y_d = mLd\lambda$

The position of dark fringes in young’s s double slit experiment are given by

- $Y_b = \lambda L/d(m+1)$
- $Y_b = \lambda L/d(m)$
- $Y_b = \lambda d/L(m+1/2)$
- $Y_b = \lambda L/d(m+1/2)$

The distance between two consecutive bright fringes(or dark fringes) in young’s double slit experiment is called

- Wavelength
- Fringe spacing
- Half-wavelength
- Width of slit

In an interference pattern

- Bright fringes are wider than dark fringes
- Dark fringes are wider than bright fringes
- Both dark and bright fringes are of equal width
- None of these

In Young’s experiment for interference of light with two slits, maxima occurs at angles for which $\sin\theta = m\lambda/d$. Here ‘d’ is

- Distance of slits from the screens
- Distance between dark and bright fringes
- Both dark and bright fringes are of equal width
- None of these

Young’s experiment establishes that

- Light consists of waves
- Light consists of particles

- Light is neither particle nor wave
- Light is both particle and wave

ZEROTH LAW OF THERMODYNAMICS

If object A is in thermal equilibrium with object B, and object B is in thermal equilibrium with object C, then object C is also in thermal equilibrium with object A this law is called

- 1st law of thermodynamics
- 2nd law of thermodynamics
- zeroth law of thermodynamics
- none of these

Heat is a form of

- momentem
- work
- energy
- none of these

When gas is in equilibrium its molecules

- all have the same energy
- have a certain constant average energy
- have different energies which remain constant
- do not collide with one another

The gas exerts pressure on the walls of the container because the gas molecules

- have momentum
- collide with one another
- obey Boyle's law
- have finite size

Pressure of a gas depends upon

- only on the moleculer speed
- only on the speed of molecules in a unit volume
- only on the mass of molecules
- no. of molecules in a unit volume mass and speed of the molecules

One pascal is the unit of

- pressure

- volume
- force
- weight

Absolute thermodynamics temperature

- is independent of any particular substance
- is define by dividing the expansion of mercury into even degrees
- is define by dividing the expansion of water into even degrees
- none of these

The value of universal gas constant R in J/K mole K is

- 8.314
- 8380
- 8314
- 336000

The molecules of an ideal gas have zero

- K.E
- P.E
- both K.E and P.E
- total energy

Which of the following is correct?

- air is an ideal gas
- hydrogen is an ideal gas
- oxygen is an ideal gas
- neither air nor hydrogen nor oxygen is an ideal gas

The force between two molecules of an ideal gas is

- strong
- weak
- zero
- none of these

Real gases obey gas laws only

- at low pressure and high temperature
- at high pressure and low temperature
- at high pressure and high temperature
- at low pressure and low temperature

SI unit of energy is

- BTU
- calorie
- pressure
- joule

Heat is another form of

- temperature
- caloric fluid
- power
- energy

One calorie is equivalent to

- 540 cal/gm
- 4.185 J
- 418.5 erg
- 4185 K.cal

1st law is a restatement of the

- law of conservation of mass
- law of conservation of energy
- law of conservation of momentum
- Boyle's law

No. of kilomoles of 0.2 kg hydrogen are

- 0.01
- 0.1
- 1
- 10

Which one of the following possesses max specific heat?

- milk
- turpentine oil
- cedar oil
- water

Hotness or coldness of an object is expressed in terms of

- chemical energy
- temperature
- thermal energy
- heat

According to KMT of gases the absolute zero is the temperature at which

- water disappears
- water freezes
- the kinetic energy of molecules is minimum
- all gases changes to liquid

Pressure of a gas is defined as

- only on the molecular speed
- absolute temperature
- only on the mass of molecules

In field of physics that describes and correlates the physical properties of macroscopic systems of matter and energy is called:

- physics
- Kinematics
- Motion
- Thermodynamics
- projectile motion.

collection of matter that has distinct and well-defined boundary is called:

- Temperature
- system
- Motion
- gas
- none of above.

Which one(s) of these are examples of a system:

- balloon
- gas cylinder
- glass of water
- all of above
- none.

The study of heat energy, mechanical energy and the transformation of heat energy into mechanical energy (work) is known as:

- projection
- Mathematics
- Motion
- Thermodynamics
- physics

Room temperature is about:

- 98 C
- 212 F
- 290 K
- 209 K
- none.

When the universe began its temperature was about:

- 1000 C
- 10^{23}k
- 10^{20} K
- 10^{0} K
- 10^{39}K

The temperature of the sun is:

- 10^{4}C
- 10^{23}k
- 10^{38} K
- 10^{4} K

10^{-4}K

Which one of these can be called microscopic components:

- gas
- solid
- liquid
- a, b
- all.

Select the true formulae of temperature conversion:

- F=(9/5)*(C+32)
- C=(5/9)*(F+32)
- C=(5/9)*(F-32)
- K=C+273
- F=(9/5)*(C-32)

When two systems are in equilibrium then the temperature of both systems is:

- un-equal
- both zero
- 1st system zero
- equal
- none of above.

Zeroth Law was introduced in:

- 1910
- 1920
- 1940
- 1895
- 1930

1st Law of thermodynamics is defined as:

- ΔQ=ΔW+ΔU
- ΔQ=ΔW*ΔU
- ΔU=ΔQ+ΔW
- None of above
- all

Which one these can be use to measure the Temperature:

- Thermostat
- thermometer
- reservoir
- ammeter
- galvanometer.

How many of these are related with thermodynamics:

- Gas
- Temperature
- Pressure
- none
- All of above.

1st Law of thermodynamics is related to:

- solid
- metal
- internal energy
- none
- All.

An isolated system is, which:

- doesn’t take or give and form of energy
- take energy
- give energy
- b ,c
- none.

How many laws of thermodynamics are ther:

- 2
- 3
- 4
- 10
- none.

The zeroth law of thermodynamics

- Is the restatement of Law of conser
- Is the basic for definition of conservation of energy temperature
- Is the basic for definition of Internal
- None of the above
- all

The second law is associated with:

- Temperature
- Entropy
- Internal Energy
- Heat
- none.