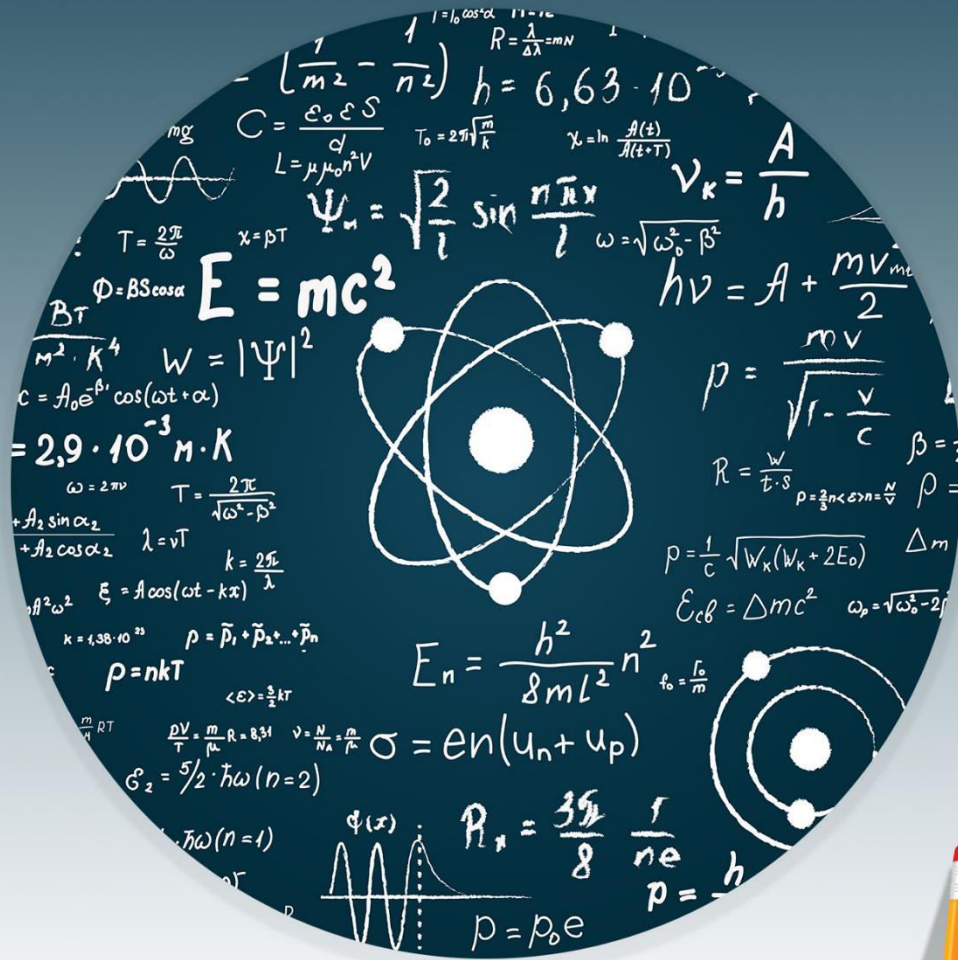


# PHYSICS



## WORKSHEET-11



**STP**

A PROJECT BY PUNJAB GROUP

## Worksheet-11

Topics:- Physical Quantities, Units, Errors, Uncertainties & Prefixes

**Q.1 Supplementary units are:**

- A) Two  
B) Three  
C) Four  
D) Five

**Q.2 A set of supplementary units are:**

- A) radian, kilogram  
B) radian, mole  
C) radian, steradian  
D) second and meter

**Q.3 Example of Base quantity is:**

- A) Area  
B) Light year  
C) Velocity  
D) Volume

**Q.4 S.I unit of plane angle is:**

- A) steradian  
B) radian  
C) candela  
D) unitless

**Q.5 Which one is not the principal characteristic of an ideal standard?**

- A) Accessible  
B) Invariable  
C) Both A and B  
D) Variable

**Q.6 How many kinds of units are there in SI-Unit system?**

- A) Seven  
B) Three  
C) Five  
D) Two

**Q.7 S.I unit of amount of substance is:**

- A) ampere  
B) candela  
C) mole  
D) joule

**Q.8 The units of pressure in base units are:**

- A)  $\text{kg m}^{-1} \text{s}^{-2}$   
B)  $\text{kg m s}^{-2}$   
C)  $\text{kg m}^{-2} \text{s}^{-2}$   
D)  $\text{kg}^2 \text{m s}^{-2}$

**Q.9 Which of the following is the least sub-multiple?**

- A) pico  
B) femto  
C) atto  
D) nano

**Q.10 The units of  $\frac{X}{Y}$ , where  $X = \frac{1}{\sqrt{\mu_0 \epsilon_0}}$  and  $Y = \frac{E}{B}$ , where**

**E=electric intensity and B=magnetic intensity is:**

- A)  $\text{kg}^0 \text{m s}^{-1}$   
B)  $\text{kg}^0 \text{m}^0 \text{s}^{-1}$   
C)  $\text{kg}^0 \text{m}^0 \text{s}^0$   
D)  $\text{kg m s}$

**Q.11 Which one is the biggest unit of plane angle?**

**USE THIS SPACE FOR  
SCRATCH WORK**

**USE THIS SPACE FOR**

SCRATCH WORK

- A) radian  
B) revolution
- C) steradian  
D) degree
- Q.12 The units of force are:**  
A)  $\text{kg m}^2 \text{s}^{-2}$   
B)  $\text{kg}^2 \text{m}^2 \text{s}^{-2}$
- C)  $\text{kg m s}^{-2}$   
D)  $\text{kg m}^2 \text{s}^{-1}$
- Q.13 The angle subtended at the centre of football by an area of its surface equal to one half of total area will be:**  
A)  $\pi \text{ sr}$   
B)  $3\pi \text{ sr}$
- C)  $2\pi \text{ sr}$   
D)  $4\pi \text{ sr}$
- Q.14 The units of power are:**  
A)  $\text{kg m}^2 \text{s}^{-2}$   
B)  $\text{kg m}^{-1} \text{s}^{-1}$
- C)  $\text{kg m}^2 \text{s}^{-3}$   
D)  $\text{kg m}^{-2} \text{s}^{-2}$
- Q.15 The base units of torque are:**  
A)  $\text{kg m}^{-1} \text{s}$   
B)  $\text{kg m}^2 \text{s}^{-1}$
- C)  $\text{kg m}^2 \text{s}^{-2}$   
D) None of these
- Q.16 The units of viscosity are:**  
A)  $\text{kg m}^{-1} \text{s}$   
B)  $\text{kg m}^2 \text{s}^{-1}$
- C)  $\text{kg m}^{-1} \text{s}^{-1}$   
D)  $\text{kg m}^{-1} \text{s}^{-2}$
- Q.17 Units of impulse are same as of:**  
A) Momentum  
B) Force
- C) Power  
D) Torque
- Q.18 The base units of gravitational constant G are:**  
A)  $\text{kg m}^2 \text{s}^{-2}$   
B)  $\text{kg}^{-1} \text{m}^3 \text{s}^{-2}$
- C)  $\text{kg}^2 \text{m}^{-1} \text{s}^{-2}$   
D)  $\text{kg m}^{-2} \text{s}^{-1}$
- Q.19 One dyne is equal to:**  
A)  $10^{-5} \text{ N}$   
B)  $10^{+5} \text{ N}$
- C)  $10^{-4} \text{ N}$   
D)  $10^{+4} \text{ N}$
- Q.20 In the relation of Bernoulli's equation**  
 $P + \frac{1}{2}\rho v^2 + \rho gh = \text{constant}$  **which term has same units as that of stress?**  
A) P  
B)  $\frac{1}{2}\rho v^2$
- C)  $\rho gh$   
D) All of these
- Q.21 Which of the following have same units as that of the**

USE THIS SPACE FOR

energy density (energy per unit volume)?

- A) Pressure  
B) Young's modulus  
C) P.E per unit volume  
D) All of these

**Q.22** In the relation  $E = \sigma T^4$ , the units of E are same as that of:

- A) Solar constant  
B) Energy intensity  
C) Energy  
D) Both "A" & "B"

**Q.23** Three different readings are taken by three instruments Vernier caliper, meter rod and screw gauge. Which reading will be more precise?

- A) Vernier caliper's reading  
B) Screw gauge's reading  
C) Meter rod reading  
D) All have same precision

**Q.24** Two measurements have fractional uncertainties 0.04 and 0.02, which measurement will be more accurate?

- A) Measurement with 0.04 uncertainty  
B) Measurement with 0.02 uncertainty  
C) Both are equally accurate  
D) Can't be predicted

**Q.25** Diameter of a wire is measured by screw gauge. Which of following can be the possible value?

- A) 8.1 mm  
B) 8.12 mm  
C) 8.125 mm  
D) 8.1250 mm

**Q.26** Two measurements  $x_1 = 10.5 \pm 0.1$  cm &  $x_2 = 26.8 \pm 0.2$  cm are being subtracted. The uncertainty in final answer will be:

- A) Zero  
B) 0.1 cm  
C) 0.2 cm  
D) 0.3 cm

**Q.27** In a square plate on increasing temperature, error in the length is 1%. The percentage error in area will be:

- A) 1%  
B) 2%  
C) 3%  
D) 4%

**Q.28** If % age errors in moment of inertia and angular velocity are 2% and 4% respectively then % age error in rotational K.E is:

- A) 2%  
B) 10%  
C) 4%  
D) 8%

**Q.29** The time for 20 vibrations of simple pendulum is recorded by a stop watch of least count 0.1 s is 54.6 s. The uncertainty in time period will be:

SCRATCH WORK

USE THIS SPACE FOR  
SCRATCH WORK

- A) 0.1 s  
B) 0.001 s
- C) 0.005 s  
D) 0.003 s
- Q.30** For power factor formulae like  $V = \frac{4\pi r^3}{3}$ , %age uncertainty in V = \_\_\_\_.
- A) (% uncertainty in r)<sup>3</sup>  
B) 3 × % uncertainty in r
- C)  $\frac{\% \text{ uncertainty in } r}{3}$   
D) % uncertainty in r<sup>3</sup>
- Q.31** 1 femto = \_\_\_\_\_ giga?
- A) 10<sup>-18</sup>  
B) 10<sup>-15</sup>
- C) 10<sup>-12</sup>  
D) 10<sup>-24</sup>
- Q.32** A student measures the length & diameter of cylinder by screw gauge both readings have an error of “0.05 mm”, which type of error is in these readings:
- A) Random error  
B) Personal error
- C) Systematic error  
D) All of these
- Q.33** Out of following which have same power in base units of viscosity and spring constant?
- A) metre  
B) second
- C) Both A & B  
D) kilogram
- Q.34** The ratio of units of surface tension & spring constant produces the units same as that of:
- A) Refractive index  
B) Magnification
- C) Both A & B  
D) Plank’s constant
- Q.35** Which of following pair have same base units?
- A) Strain, relative permittivity  
B) Surface tension, spring constant
- C) Stress, energy density  
D) All of these

## ANSWER KEY (Worksheet-11)

1	A	11	B	21	D	31	D
2	C	12	C	22	D	32	C
3	B	13	C	23	B	33	D
4	B	14	C	24	B	34	C
5	D	15	C	25	B	35	D
6	B	16	C	26	D		
7	C	17	A	27	B		
8	A	18	B	28	B		
9	C	19	A	29	C		
10	C	20	D	30	B		

## SOLUTIONS

## Unit – 1 (WS-11)

Q.1 Answer is “A”

**Solution:-** There are two supplementary units named “Radian” and “Steradian”.

Q.2 Answer is “C”

**Solution:-** There are two supplementary units named “Radian” and “Steradian”.

Q.3 Answer is “B”

**Solution:-** Light year is the distance covered by light in one year. As light year is distance, so it is measured in metres which is a base unit.

Q.4 Answer is “B”

**Solution:-**

- SI-unit of plane angle is radian.
- SI-unit of solid angle is steradian.

Q.5 Answer is “D”

**Solution:-** An ideal standard has two characteristics:

- Accessible
- Invariable

Q.6 Answer is “B”

**Solution:-** The kinds of units in system International are three i-e base units, derived units and supplementary units.

Q.7 Answer is “C”

**Solution:-** The amount of substance is measured in mole.

Q.8 Answer is “A”

**Solution:-**

$$P = \frac{F}{A} = \frac{N}{m^2} = \frac{kg \ m \ s^{-2}}{m^2} = kg \ m^{-1} \ s^{-2}$$

Q.9 Answer is “C”

**Solution:-**

- 1 atto =  $10^{-18}$
- 1 femto =  $10^{-15}$
- 1 pico =  $10^{-12}$
- 1 nano =  $10^{-9}$

Q.10 Answer is “C”

**Solution:-** Both relations  $Y = \frac{E}{B}$  and

$$X = \frac{1}{\sqrt{\mu_0 \epsilon_0}}$$

represent speed, X represents speed of light while Y represents speed of a charge particle in velocity selector. So, the ratio X/Y will surely be unit-less.

Q.11 Answer is “B”

**Solution:-** Plane angle (2D-angle) is measured in radian (SI-unit), degree and revolution. These units can be arranged in descending order as:

revolution > radian > degree

Q.12 Answer is “C”

**Solution:-**  $F = ma = kg \ m \ s^{-2}$

Q.13 Answer is “C”

**Solution:-** The general formula for solid (3D-angle) angle is:

$$\theta = \frac{\text{Area of Patch}}{\text{Square of radius}} = \frac{A}{r^2} \text{ (sr)}$$

For half football

$$A = 2\pi r^2 \quad (\text{for full sphere; } A = 4\pi r^2)$$

So,

$$\theta = \frac{2\pi r^2}{r^2} = 2\pi \text{ sr}$$

**Q.14** Answer is “C”

**Solution:-**  $P = \frac{W}{t} = \frac{J}{\text{sec}} = \frac{N \cdot m}{s}$

$$P = \frac{\left(kg \frac{m}{s^2}\right)m}{s} = kg \cdot m^2 \cdot s^{-3}$$

**Q.15** Answer is “C”

**Solution:-**

$$\tau = N \cdot m = \left(kg \frac{m}{s^2}\right)m$$

$$\tau = kg \cdot m^2 \cdot s^{-2}$$

**Q.16** Answer is “C”

**Solution:-**  $\eta = \frac{N \cdot s}{m^2} = \frac{\left(kg \frac{m}{s^2}\right)s}{m^2}$

$$\eta = kg \cdot m^{-1} \cdot s^{-1}$$

**Q.17** Answer is “A”

**Solution:-** As impulse is equal to change in momentum, so its units are same as that of momentum. i.e

$$\text{Impulse} = F \cdot t = mv_f - mv_i$$

$$\text{Impulse} = kg \cdot m \cdot s^{-1}$$

**Q.18** Answer is “B”

**Solution:-**

$$F = G \frac{Mm}{r^2}$$

$$G = \frac{Fr^2}{Mm}$$

$$G = \frac{Nm^2}{kg^2} = \frac{(kg \cdot m \cdot s^{-2})m^2}{kg^2}$$

$$G = kg^{-1} \cdot m^3 \cdot s^{-2}$$

**Q.19** Answer is “A”

**Solution:-** Dyne is the C.G.S unit of force and it is related with SI unit of force as;

$$1 \text{ dyne} = 1 \text{ gm cm s}^{-2}$$

$$1 \text{ dyne} = (10^{-3} \text{ kg})(10^{-2} \text{ m})(s^{-2})$$

$$1 \text{ dyne} = 10^{-5} \text{ N}$$

**Q.20** Answer is “D”

**Solution:-** In the Bernoulli’s equation, all the terms are pressures i.e

P=static pressure

$$\frac{1}{2} \rho v^2 = \text{dynamic Pressure}$$

$$\rho gh = \text{Pressure in depth}$$

So, all terms have units of pressure which are same as that of stress.

**Q.21** Answer is “D”

**Solution:-** All these quantities pressure, stress, energy density, P.E per unit volume, K.E per unit volume and elastic modulus have same units which are  $N \cdot m^{-2}$  or pascal.

**Q.22** Answer is “D”

**Solution:-** In the given relation ‘E’ is not energy rather it is energy intensity(energy per second per unit area). Also the solar constant is measured in the same units as that of energy intensity.

**Q.23** Answer is “B”

**Solution:-** A precise measurement is the one which has least absolute uncertainty i.e least count.

**Q.24 Answer is “B”**

**Solution:-** An accurate measurement is the one which has least fractional or percentage uncertainty.

**Q.25 Answer is “B”**

**Solution:-** A screw gauge measures up to second decimal value in (mm) unit. So, the reading which contains two digits after decimal fraction is correct.

**Q.26 Answer is “D”**

**Solution:-** U.C of final result in addition & subtraction = sum of absolute U.Cs of individual measurements.

**Q.27 Answer is “B”**

**Solution:-** Use relation,  $A = \ell^2$ , Also in power factor we simply multiply percentage error with power.

**Q.28 Answer is “B”**

**Solution:-** Use relation;

$$K.E_{\text{rot}} = 1/2 I\omega^2$$

% U.C in  $K.E_{\text{rot}} = (\% \text{ U.C in moment of inertia}) + 2(\% \text{ U.C in angular velocity})$

**Q.29 Answer is “C”**

**Solution:-**

$$\text{U.C in time period} = \frac{\text{L.C}}{\text{no.of vibrations}}$$

**Q.30 Answer is “B”**

**Solution:-** Simple power factor rule i.e

$$\% \text{ U.C in } V = 3(\% \text{ U.C in radius})$$

**Q.31 Answer is “D”**

$$\text{Solution:- } \frac{1 \text{ femto}}{1 \text{ giga}} = \frac{10^{-15}}{10^{+9}} = 10^{-24}$$

**Q.32 Answer is “C”**

**Solution:-** Both readings have equal error when measured by same instrument, this is the definition of systematic error i.e

“System error refers to an effect that influences all measurements of a particular quantity equally.”

**Q.33 Answer is “D”**

**Solution:-**

$$\begin{aligned} \text{Viscosity} &= \text{N s m}^{-2} = (\text{kg m s}^{-2}) \text{ s m}^{-2} \\ &= \text{kg m}^{-1} \text{ s}^{-1} \end{aligned}$$

$$\text{Spring constant} = \text{N m}^{-1} = (\text{kg m s}^{-2}) \text{ m}^{-1} = \text{kg s}^{-2}$$

So, kg has same power in base units of viscosity and spring constant.

**Q.34 Answer is “C”**

**Solution:-** Both Spring constant and surface tension have same units i.e  $\text{N m}^{-1}$ , so their ratio is unit less just like refractive index and magnification.

**Q.35 Answer is “D”**

**Solution:-**

A) Both are unit less

B) Both have units  $\text{N m}^{-1}$

C) Both have units  $\text{N m}^{-2}$



# STOP

A PROGRAM BY PUNJAB GROUP

