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Motto :
“We are saviour of nation.”



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Roll No. of Candidate

Name of Candidate

STARS ENTRY TEST SYSTEM-2020 ONLINE SESSION - MDCAT

Test Code: P13 Nuclear physics

Time Allowed: 40 mins

1. Complete the following nuclear reaction:



A) ${}_{92}\text{Ra}^{234}$

C) ${}_{90}\text{U}^{234}$

B) ${}_{90}\text{Pu}^{234}$

D) ${}_{90}\text{Th}^{234}$

2. After 2 hours (1/16)th of the initial amount of a certain radioactive isotope remains undecayed. The half – life of the isotope is:

A) 60 minute

C) 45 minute

B) 30 minute

D) 15 minute

3. The half – life period of a radioactive element is 10 days. Then, how long does it take for 90% of a given mass of this element to disintegrate?

A) 19 days

C) 27 days

B) 33 days

D) 37 days

4. The mother and daughter elements, with the emission of β -rays, are called:

A) isotopes

C) isobars

B) isomers

D) isodiaphers

5. 1 am u is equal to

A) 1.66×10^{-27} kg

C) 931.5 MeV

B) $\frac{1}{12}$ th of the mass of ${}^{12}_6\text{C}$

D) All of these

6. The amount of energy that must be supplied to a nucleus if the nucleus is to be broken into protons and neutrons is called

A) Nuclear energy

C) Fusion energy

B) Fission energy

D) Binding energy

7. The activity of a radioactive element decreased to one – third of the original activity I_0 in a period of nine years. After a further lapse of nine years its activity will be:

A) I_0

C) $(2/3)I_0$

B) $I_0/9$

D) $I_0/6$

8. A nucleus with an excess of neutrons may decay radioactively with the emission of:

A) a neutron

C) a proton

B) an electron

D) a positron

9. The penetrating power decreases in the order:

A) $\alpha > \gamma > \beta$

C) $\beta > \gamma > \alpha$

B) $\gamma < \beta < \alpha$

D) $\gamma > \beta > \alpha$

10. A freshly prepared radioactive source of half life 2 hours emits radiation of intensity which is 64 times the permissible safe level. The minimum time after which it would be possible to work safely with the source is:

A) 6 hour

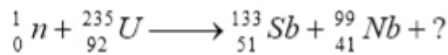
C) 12 hour

B) 24 hour

D) 128 hour

11. Product of decay constant and half life is equal to
 A) 1 C) 0.963
 B) 2 D) 0.693
12. If N_0 radioactive atoms are present in a sample initially. After five half-lives radioactive atoms left to decay are
 A) $\frac{N_0}{5}$ C) $\frac{N_0}{64}$
 B) $\frac{N_0}{16}$ D) $\frac{N_0}{32}$
13. Mark the correct statement.
 A) Every element has only two stable isotopes.
 B) All isotopes of every element are radioactive.
 C) Only one isotope of each element is stable.
 D) Nuclei of different elements can have the same number of neutrons.
14. An element A decays into element C by a two step process.
 $A \rightarrow B + {}_2\text{He}^4$
 $B \rightarrow C + 2e^-$,
 A) A and B are isotopes C) A and B are isobars
 B) A and C are isotopes D) A and C are isobars
15. The activity of a radioactive sample is 1.6 curie and its half – life is 2.5 days. Its activity after 10 days will be:
 A) 0.8 curie C) 0.1 curie
 B) 0.4 curie D) 0.16 curie
16. An artificial radioactive decay series begins with unstable ${}_{94}\text{Pu}^{241}$. The stable nuclide obtained after eight α - decays and five β – decays is:
 A) ${}_{83}\text{Bi}^{209}$ C) ${}_{82}\text{Pb}^{209}$
 B) ${}_{82}\text{Tl}^{205}$ D) ${}_{82}\text{Hg}^{201}$
17. A nucleus ${}_n\text{X}^m$ emits one α and one β – particle. The resulting nucleus is:
 A) ${}_n\text{X}^{m-4}$ C) ${}_{n-2}\text{Y}^{m-4}$
 B) ${}_{n-4}\text{Z}^{m-4}$ D) ${}_{n-1}\text{Z}^{m-4}$
18. The half – life of a radioactive substance is 40 days. The substance will disintegrate completely in:
 A) 40 days C) 400 days
 B) 4000 days D) infinite time
19. The half – life of I^{131} is 8 days. Given a sample of I^{131} at time $t = 0$, we can assert that:
 A) no nucleus will decay before $t = 4$ days C) all nuclei will decay before $t = 16$ days
 B) no nucleus will decay before $t = 8$ days D) a given nucleus may decay at any time after $t = 0$
20. A radioactive substance has a half – life of 60 min. During 3 hrs the fraction of atom that has decayed would be:
 A) 12.5% C) 87.5%
 B) 8.5% D) 25.1%
21. Two radioactive substances X and Y initially contain equal number of nuclei. X has a half – life of 1 hour and Y has a half – life of 2 hours. After two hours, the ratio of the activity of X to the activity of Y is:
 A) 1 : 4 C) 1 : 2
 B) 1 : 1 D) 2 : 1
22. Decay constant of radium is λ . By a suitable process its compound radium bromide is obtained. The decay constant of radium bromide will be:
 A) λ C) $> \lambda$
 B) $< \lambda$ D) zero

23. How many neutrons are released during following nuclear reaction



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

24. In proton – proton cycle no. of protons consumed are

- A) 2
B) 3
C) 4
D) 6

25. A radioactive element A decays into B with a half life of 2 days. A fresh prepared sample of A has a mass of 12 gm. What mass of A and B are there in the sample after 4 days?

- A) $A = 3 \text{ gm}, B = 9 \text{ gm}$
B) $A = 12 \text{ gm}, B = 0 \text{ gm}$
C) $A = 6 \text{ gm}, B = 6 \text{ gm}$
D) $A = 9 \text{ gm}, B = 3 \text{ gm}$

26. If 75% of the radioactive reaction is completed in 2 hrs, what would be the half – life period?

- A) 1 hr
B) 2 hrs
C) 1.5 hrs
D) 3.0 hrs

27. Ionization power and penetration range of radioactive radiation increases in the order:

- A) γ, β, α and γ, β, α , respectively
B) γ, β, α and α, β, γ , respectively
C) α, β, γ and α, β, γ , respectively
D) α, β, γ and γ, β, α , respectively

28. A radioactive element forms its own isotope after 3 consecutive disintegrations. The particles emitted are:

- A) 3 β – particles
B) 2 β – particles and 1 α – particle
C) 2 β – particles and 1 γ – particle
D) 2 α – particles and 1 β – particle

29. If λ is decay constant and N the number of radioactive nuclei of element, the decay rate (R) of that element is:

- A) λN^2
B) λ / N
C) λN
D) $\lambda^2 N$

30. In gamma ray emission from a nucleus:

- A) both the neutron number and the proton number change
B) there is no change in the proton number and the neutron number
C) only the neutron number changes
D) only the proton number changes

31. When ${}_4\text{Be}^9$ atom is bombarded with alpha particles, one of the products of nuclear transmutation is ${}_6\text{C}^{12}$. The other is:

- A) ${}_{-1}\text{e}^0$
B) ${}_1\text{D}^2$
C) ${}_1\text{H}^1$
D) ${}_0\text{n}^1$

32. A pair of quark and anti quark produces

- A) Photon
B) Meson
C) Electron
D) Neutron

33. A quark cannot have charge

- A) $\frac{1}{3}e$
B) $\frac{2}{3}e$
C) $\frac{1}{4}e$
D) $-\frac{1}{3}e$

34. In nuclear fusion, two nuclei come together to form a large nucleus. Which of the following is a correct equation for such a reaction?

- A) ${}_{98}\text{Cf}^{253} \rightarrow {}_{99}\text{Th}^{253} + {}_{-1}\text{e}^0$
B) ${}_4\text{Be}^9 \rightarrow {}_2\text{He}^4 + {}_2\text{He}^4 + {}_0\text{n}^1$
C) ${}_1\text{H}^2 + {}_1\text{H}^3 \rightarrow {}_2\text{He}^4 + {}_0\text{n}^1 + {}_{-1}\text{e}^0$
D) ${}_{92}\text{U}^{238} + {}_0\text{n}^1 \rightarrow {}_{92}\text{U}^{239}$

35. Of the following atoms:

${}_6\text{C}^{14}$, ${}_7\text{N}^{13}$, ${}_{88}\text{Ra}^{236}$, ${}_7\text{N}^{14}$, ${}_8\text{O}^{16}$ and ${}_{86}\text{Rn}^{232}$

A pair of isobars is:

A) ${}_6\text{C}^{11}$, ${}_7\text{N}^{13}$

C) ${}_7\text{N}^{13}$, ${}_7\text{N}^{14}$

B) ${}_6\text{C}^{14}$, ${}_7\text{N}^{14}$

D) ${}_6\text{C}^{14}$, ${}_8\text{O}^{16}$

36. The binding energy per nucleon is maximum in case of

A) ${}_2\text{He}^4$

C) ${}_{56}\text{Ba}^{141}$

B) ${}_{26}\text{Fe}^{56}$

D) ${}_{92}\text{U}^{235}$

37. When a radioactive nuclide decays consecutively by emitting an α -particle, a β -particle and γ -rays the change in nucleon number and atomic number are:

	A	B	C	D
Change in mass number	-2	-3	-3	-4
Change in atomic number	-3	-2	-3	-1

38. The mass of α -particle is

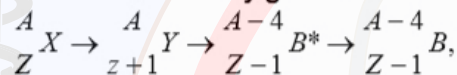
A) $4 m_p$

C) $2 m_p + 2 m_n$

B) $4 m_n$

D) $2 m_p + 2 m_p$

39. In the nuclear decay given below:



The particles emitted in the sequence are:

A) γ, β, α

C) β, γ, α

B) α, β, γ

D) β, α, γ

40. The mass of an α -particle is:

A) less than the sum of masses of two protons and two neutrons

B) equal to mass of four protons

C) equal to mass of four neutrons

D) equal to sum of masses of two protons and two neutrons

41. Thermal neutrons are those which:

A) are at very high temperature

B) move with high velocities

C) have kinetic energies similar to those of surrounding molecules

D) are at rest

42. The amount of energy released in the fission of ${}_{92}\text{U}^{235}$ is approximately:

A) 200 MeV

C) 3.2×10^{-11} joule

B) 3.2×10^{-11} watt – sec

D) all of these

43. In hydrogen bomb, we use the process called:

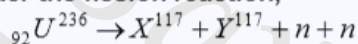
A) fission

C) fusion

B) electrolysis

D) ionization

44. Consider the fission reaction,



i.e., two nuclei of same mass number 117 are found plus two neutrons. The binding energy per nucleon of X and Y is 8.5 MeV whereas of ${}_{92}\text{U}^{236}$ is 7.6 MeV. The total energy liberated will be about:

A) 2 MeV

C) 20 MeV

B) 200 MeV

D) 2000 MeV

45. In each fission of ${}_{92}\text{U}^{235}$, 200 MeV energy is released. How many fissions must occur per second to produce a power of 1 kW?

A) 3.125×10^{13}

C) 1.25×10^{18}

B) 0.125×10^{13}

D) 3.2×10^{-8}

46. Minimum mass of uranium to start chain nuclear fission is called

A) Fermi mass

C) Critical mass

B) Curie mass

D) Threshold mass

47. Which of given radiation travel with speed of light
 A) α C) γ
 B) β D) All
48. Which of given is not correct
 A) Half-life of elements ranged from very small to very high
 B) All sample of radioactive element may decay in 10 half lives
 C) Half-life of radium is 1600 years
 D) Graph of No. of radioactive atoms and time is exponential
49. In atomic reactors cadmium rods are used to control the chain reaction. This is because cadmium:
 A) speeds up neutrons C) slows down neutrons
 B) emits neutrons D) absorbs some neutrons
50. Heavy water is used as a moderator in a nuclear reactor. The function of the moderator is:
 A) to absorb neutrons and stop the chain reaction
 B) to cool the reactor
 C) to slow down the neutrons to thermal energies
 D) to control the energy released in the reactor
51. M_n and M_p represent the mass of neutron and proton respectively. An element having mass M has N neutrons and Z protons, then the correct relation will be:
 A) $M < (NM_n + ZM_p)$ C) $M > (NM_n + ZM_p)$
 B) $M = (NM_n + ZM_p)$ D) $M = N(M_n + M_p)$
52. Binding energy of the nucleus decides:
 A) charge C) momentum
 B) mass D) stability
53. Complete the reaction:
 $n + {}_{92}^{235}\text{U} \rightarrow {}_{56}^{144}\text{Ba} + \dots + 3n$
 A) ${}_{36}^{89}\text{Kr}$ C) ${}_{36}^{90}\text{Kr}$
 B) ${}_{36}^{91}\text{Kr}$ D) ${}_{36}^{92}\text{Kr}$
54. An electron is:
 A) hadron C) baryon
 B) a nucleon D) a lepton
55. The binding energies for nuclei ${}_1^1\text{H}$, ${}_2^4\text{He}$, ${}_{26}^{56}\text{Fe}$ and ${}_{92}^{235}\text{U}$ are 2.22, 28.3, 492 and 1786 MeV respectively. The most stable nuclei is:
 A) ${}_1^1\text{H}$ C) ${}_2^4\text{He}$
 B) ${}_{26}^{56}\text{Fe}$ D) ${}_{92}^{235}\text{U}$
56. Radioactivity is a _____:
 a) Spontaneous activity
 b) Chemical property
 c) Self disintegration property
 A) a & b C) c & a
 B) b & c D) a, b & c
57. In radioactivity, the rate of decay:
 A) Can be increased by magnetic field
 B) Can be kept constant by the electric field
 C) Can be decreased by the magnetic fields
 D) Is not effected by electric and magnetic field
58. The decay constant λ of a radioactive sample:
 A) Decreases as the age of atoms Increase
 B) Increases as the age of atoms increase
 C) Is independent of the age
 D) Depends on the nature of activity
59. Half life of a radioactive substance depends upon:
 A) Temperature C) Pressure
 B) Nature of substance D) Electric and magnetic field
60. In the nuclear reaction ${}_{92}^{235}\text{U}$ decay to ${}_{91}^{231}\text{Pa}$, what are the particles emitted?
 A) One α - particle and one proton C) One deuteron and one positron
 B) One α - particle and one electron D) One electron and one proton

Medicos Hub Phy Test #18 Key

Key

1.	D	17.	D	33.	C	49.	D	65.		81.		97.	
2.	B	18.	D	34.	C	50.	C	66.		82.		98.	
3.	B	19.	D	35.	B	51.	A	67.		83.		99.	
4.	C	20.	D	36.	B	52.	D	68.		84.		100.	
5.	D	21.	C	37.	D	53.	A	69.		85.		101.	
6.	D	22.	A	38.	C	54.	D	70.		86.		102.	
7.	B	23.	D	39.	D	55.	B	71.		87.		103.	
8.	B	24.	C	40.	A	56.	C	72.		88.		104.	
9.	D	25.	A	41.	C	57.	D	73.		89.		105.	
10.	C	26.	A	42.	D	58.	C	74.		90.		106.	
11.	D	27.	B	43.	C	59.	B	75.		91.		107.	
12.	D	28.	B	44.	B	60.	B	76.		92.		108.	
13.	D	29.	C	45.	A	61.		77.		93.		109.	
14.	B	30.	B	46.	C	62.		78.		94.		110.	
15.	C	31.	D	47.	C	63.		79.		95.		111.	
16.	A	32.	B	48.	B	64.		80.		96.		112.	