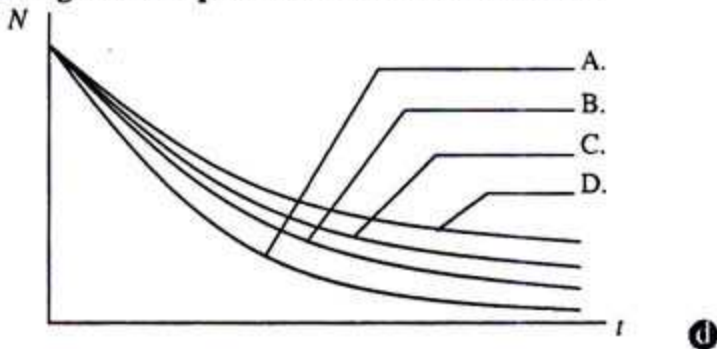


# Chapter Nine : Atomic Model and Nuclear Physics

1. Who conducted the alpha particle scattering experiment?  
 (a) Thomson (b) Rutherford (c) Bohr (d) Becquerel **(b)**
2. According to Bohr's postulate, the angular momentum of electron in a fixed orbit is— [S.B. -15]  
 (a)  $L = \frac{nh}{2\pi}$  (b)  $L = \frac{2\pi}{nh}$  (c)  $L = n \frac{2\pi}{h}$  (d)  $L = n \frac{h}{\pi}$  **(d)**
3. If an electron moves from  $E_2$  energy level to lower  $E_1$  energy level then from which of the following equations the wavelength of the radiated energy can be known? [Ctg. B. -15]  
 (a)  $\lambda = \frac{E_2 - E_1}{hc}$  (b)  $\lambda = \frac{hc}{E_2} - \frac{hc}{E_1}$  (c)  $\lambda = \frac{c}{h(E_2 - E_1)}$  (d)  $\lambda = \frac{hc}{E_2 - E_1}$  **(d)**
4. The half life of tritium is 12.5 years. After 25 years what portion of tritium will be left?  
 (a)  $\frac{1}{2}$  portion (b)  $\frac{1}{3}$  portion (c)  $\frac{1}{4}$  portion (d)  $\frac{1}{8}$  portion **(c)**
5. When electron radiates energy, its energy does not become zero, because—  
 (a) Radiated energy is quantized (b) Radiate electromagnetic wave (c) Electron stays in lower energy level after radiation (d) Voltage power is never zero **(a)**
6. What is the momentum of the electron in the 2<sup>nd</sup> orbital of hydrogen atom?  
 (a)  $\frac{2h}{\pi}$  (b)  $\frac{h}{\pi}$  (c)  $\frac{h}{2\pi}$  (d)  $\frac{h}{4\pi}$  **(b)**
7. According to Bohr's atomic model angular momentum,  $L = ?$  [C. B. -16]  
 (a)  $n \frac{h}{2\pi}$  (b)  $n \frac{h}{2\pi}$  (c)  $n \frac{2\pi}{h}$  (d)  $\frac{h}{2\pi n}$  **(b)**
8. What is the angular momentum of the electron in the lowest orbit of hydrogen atom? [Ctg. B. -17]  
 (a)  $h$  (b)  $\frac{h}{2}$  (c)  $\frac{h}{2\pi}$  (d)  $\frac{2\pi}{h}$  **(c)**
9. Ratio of the radius of the first and second excited orbits of hydrogen atom is— [R. B. -16]  
 (a) 1 : 3 (b) 1 : 4 (c) 4 : 9 (d) 9 : 16 **(c)**
10. What is the radius of the second orbit containing electron of hydrogen atom?  $h = 6.63 \times 10^{-34}$  J·s,  $m = 9.11 \times 10^{-31}$  kg  
 (a)  $1.21 \times 10^{-10}$  m (b)  $2.128 \times 10^{-10}$  m (c)  $5.5 \times 10^{-19}$  m (d)  $1.128 \times 10^{-10}$  m **(b)**
11. Equation of the radius of hydrogen atom's  $n^{\text{th}}$  orbit is —  
 (a)  $r_n = n \times 0.53 \text{ \AA}$  (b)  $r_n = n^2 \times 0.53 \text{ \AA}$  (c)  $r_n = \frac{0.53}{n^2} \text{ \AA}$  (d)  $r_n = \frac{0.53}{n} \text{ \AA}$  **(b)**
12. Half life and mean life are each other— [All Board -18]  
 (a) Proportional (b) Inversely proportional (c) Equal (d) Double **(a)**
13. The following nuclei are called?  
 ${}^3_1\text{H}$   ${}^3_2\text{He}$  [J. B. -17]  
 (a) Isotope (b) Isotone (c) Isomer (d) Isobar **(d)**
14. Which nucleus of the following has the equal proton and neutron number— [J. B. -15]  
 (a)  ${}^1_1\text{H}^1$  (b)  ${}^7_3\text{Li}^7$  (c)  ${}^{12}_6\text{C}^{12}$  (d)  ${}^{23}_{11}\text{Na}^{23}$  **(c)**
15. Which nucleus of the following has the same proton and neutron number? [D. B. -16]  
 (a)  ${}^{27}_{13}\text{Al}^{27}$  (b)  ${}^7_3\text{Li}^7$  (c)  ${}^4_2\text{He}^4$  (d)  ${}^1_1\text{H}^1$  **(c)**
16.  ${}^{40}_{20}\text{Ca}$  and  ${}^{39}_{19}\text{K}$  are— [C. B. -15]  
 (a) Isotope (b) Isobar (c) Isomer (d) Isotone **(d)**
17. 2 amu equals what? [All Board -18]  
 (a) 1863 MeV (b) 1863 eV (c) 931.5 MeV (d) 931.5 MeV **(a)**
18.  $\alpha$ -particle is— [D. B. -15]  
 (a)  ${}^4_2\text{He}^{2+}$  (b)  ${}^3_1\text{H}^{1+}$  (c)  ${}^3_2\text{He}^{2+}$  (d)  ${}^2_1\text{H}^{1+}$  **(a)**
19. What happens incase of radioactivity?  
 (a) Some light elements break down spontaneously (b) An element is depleted by breaking (c) Any external force cannot stop this process (d) This process emits four types of rays **(c)**
20. Which of the following is the property of beta rays?  
 (a) Wavelength (b) Particle (c) No charge (d) No inertia **(b)**
21.  ${}^{222}_{86}\text{X} \longrightarrow {}^{214}_{82}\text{Y} + n\alpha$ , how many  $\alpha$ - particles are emitted in this reaction? [C. B. -17]  
 (a) 1 (b) 2 (c) 4 (d) 8 **(b)**
22. The half life of three radioactive elements A, B and C are  $T_A$ ,  $T_B$  and  $T_C$  respectively and their decay constants are  $\lambda_A$ ,  $\lambda_B$  and  $\lambda_C$ . [Here,  $\lambda_A > \lambda_B > \lambda_C$ ] [All Board -18]  
 Which of the following relations is correct?  
 (a)  $T_C > T_B > T_A$  (b)  $T_B > T_A > T_C$  (c)  $T_C > T_A > T_B$  (d)  $T_A > T_B > T_C$  **(a)**
23. 1 Ci means the break down of how many radioactive elements? [Ctg. B. -16]  
 (a)  $3.7 \times 10^{10} \text{ s}^{-1}$  (b)  $3.7 \times 10^7 \text{ s}^{-1}$  (c)  $3.7 \times 10^4 \text{ s}^{-1}$  (d)  $1 \text{ s}^{-1}$  **(a)**
24. Mass of radioactive tritium is 100 gm with a massless vessel. Half life of tritium is 12.5 years. After 25 years what will be the mass of the remaining portion with the vessel's mass?  
 (a) Less than 100 gm (b) Equals 50 gm (c) Equals 25 gm (d) Equals 0 gm **(c)**



25. Which of the following lines in the graph indicates the highest life span of radioactive substance?



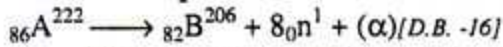
26. Half life of a radioactive element is 1.8 days. After 5.4 days what portion of that element will be decayed? [R. B. -15]
- (a)  $\frac{1}{3}$  portion (b)  $\frac{2}{3}$  portion  
(c)  $\frac{1}{8}$  portion (d)  $\frac{7}{8}$  portion
27. After two hours  $\frac{1}{16}$  portion of the initial quantity of a radioactive element is decayed. Half life of the radioactive element will be— [S. B. -15]
- (a) 15 minutes (b) 30 minutes  
(c) 45 minutes (d) 1 minute
28. If  $m_p = 1.00728$  a.m.u.  $m_n = 1.00876$  a.m.u.  $M({}_2^4\text{He}) = 4.00276$  a.m.u and  $1\text{a.m.u.} = 931$  MeV then, what is the binding energy of  $\alpha$ -particle— [Dj. B. -15]
- (a) 27.297 MeV (b) 37.78 MeV  
(c) 39.16 MeV (d) 72.57 MeV
29. Weak nuclear force is produced due to— [C. B. -15]
- (a) Decay of beta particles  
(b) Decay of protons  
(c) Decay of gamma particles  
(d) Decay of neutron
30. Which is the weakest force? [J. B. -15]
- (a) Weak nuclear force  
(b) Electromagnetic force  
(c) Nuclear force  
(d) Gravitational force
31. If the mass defect of a nucleus is 0.0377 a.m.u. then what is its binding energy?
- (a) 31.2 MeV (b) 32.5 MeV  
(c) 33.1 MeV (d) 35.1 MeV
32. If a piece of uranium-235 is hit by neutron then the rate of uranium disintegration—
- (a) Decrease exponentially  
(b) Increase proportionally  
(c) Increase geometrically  
(d) Disintegrate at the same rate
33. Complete ionic state of an atom is called—
- (a) Solid state (b) Liquid state  
(c) Gaseous state (d) Plasma state
34. Two up and one down quarks form?
- (a) Neutron (b) Proton

- (c) Meson (d) Meon

35. Sun gets energy from which process? [B. B. -16]
- (a) Nuclear fission (b) Nuclear fusion  
(c) Nuclear reactor (d) Chemical process
36. Electron cannot stay inside the nucleus because— [B. B. -15]
- i. Electron energy is not more than 4 MeV  
ii. Electron energy should be 37.6 MeV  
iii. Uncertainty of electron's position will be not less than  $2 \times 10^{-14}$  m
- Which of the following is correct?
- (a) i & ii (b) ii & iii  
(c) i & iii (d) i, ii & iii
37. Properties of ' $\beta$ ' particles— [R. B. -15]
- i. Penetrating power is more than 'X'- rays  
ii. Negatively charged  
iii. Velocity is about the velocity of light
- Which of the following is correct?
- (a) i & ii (b) ii & iii  
(c) i & iii (d) i, ii & iii
38. Centrifugal force acting upon an electron rotating in an orbit —
- i.  $F_c = \frac{mv^2}{r}$   
ii.  $F_c = m\omega^2 r$   
iii.  $F_c = mr^2$
- Which of the following is correct?
- (a) i & ii (b) i & iii  
(c) ii & iii (d) i, ii & iii
39. Bohr's atomic model can explain— [Crg. B. -16]
- i. Stability of atom  
ii. Wavelengths of hydrogen atom's absorption and emission spectrum  
iii. Radiation energy of the electron while rotating
- Which of the following is correct?
- (a) i & ii (b) i & iii  
(c) ii & iii (d) i, ii & iii
40. Principal properties of nuclear force—
- i. Attractive force ii. Charge neutral  
iii. Low scales
- Which of the following is correct?
- (a) i & ii (b) i & iii  
(c) ii & iii (d) i, ii & iii
- Read the stimulus and answer the questions 41 & 42:
- $A \xrightarrow{\beta} B \xrightarrow{\alpha} C \xrightarrow{\gamma} D$
- The mass number of the above element D is 210 and atomic mass is 82. [S. B. -17]
41. What is the atomic number of element B?
- (a) 84 (b) 82  
(c) 80 (d) 78
42. The above elements A & B are —
- (a) Isomer (b) Isotope  
(c) Isotone (d) Isobar



Answer the questions 43 & 44 from the stimulus:



43. How many  $\alpha$ -particles will be emitted from the reaction?  
 (a) 2 (b) 4  
 (c) 6 (d) 8
44. How many  $\beta$ -particles will be released?  
 (a) 0 (b) 2  
 (c) 4 (d) 16

Read the stimulus and answer the questions 45 & 46:

Charge of a positively charged ray is twice the charge of a proton. The ray creates fluorescence on photographic plate.

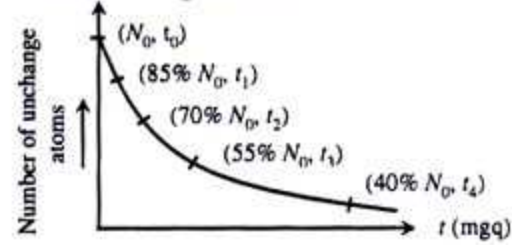
45. At what speed will the ray emit?  
 (a)  $1.10 - 2.96 \times 10^8 \text{ m}\cdot\text{s}^{-1}$  (c)  $2.96 \times 10^8 \text{ m}\cdot\text{s}^{-1}$   
 (b)  $3 \times 10^8 \text{ m}\cdot\text{s}^{-1}$  (d)  $1.4 - 2.3 \times 10^7 \text{ m}\cdot\text{s}^{-1}$
46. The ray-  
 i. has a mass four times the hydrogen atom  
 ii. can produce fluorescence in barium platinocyanide  
 iii. has greater ionizing power  
 Which of the following is correct?  
 (a) i & ii (b) i & iii  
 (c) ii & iii (d) i, ii & iii

Answer the questions 47 & 48 from the stimulus:

Mass of a radioactive sample is 10 gm and half life 5 days. [J. B. -15]

47. In how many days will the sample decay 7.5 gm?  
 (a) 5 (b) 10  
 (c) 15 (d) 20
48. How much will the sample decay within its mean life—  
 (a) half (b) less than half  
 (c) more than half (d) completely

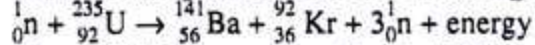
Answer the questions 49 & 50 from the stimulus:



In the figure the graph indicates decaying of radon whose half life is 3.8 day. [D. B. -15]

49. Determine the radioactive decay constant of radon.  
 (a)  $0.118 \text{ d}^{-1}$  (b)  $0.182 \text{ d}^{-1}$   
 (c)  $0.369 \text{ d}^{-1}$  (d)  $0.693 \text{ d}^{-1}$
50. According to the stimulus, which time difference has the highest rate of decadence?  
 (a)  $t_4 - t_3$  (b)  $t_0 - t_1$   
 (c)  $t_2 - t_1$  (d)  $t_3 - t_2$

Answer the questions 51 & 52 reading the stimulus:



51. Which type of reaction is this?  
 (a) Fusion (b) Fission  
 (c) Nuclear heat reaction (d) Addition reaction
52. How much energy is produced in this reaction?  
 (a) 192 MeV (b) 200 MeV  
 (c) 210 MeV (d) 220 MeV

Answer the questions 53 & 54 from the stimulus :

Hydrogen atom has energy levels with  $-0.54 \text{ eV}$  and  $-1.51 \text{ eV}$  energies [J. B. -16]

53. What will be the wavelength of the emitted ray when an electron of this hydrogen atom moves from a higher energy level to a lower one?  
 (a)  $1.1 \times 10^{-6} \text{ m}$  (b)  $1.2 \times 10^{-6} \text{ m}$   
 (c)  $1.3 \times 10^{-6} \text{ m}$  (d)  $1.4 \times 10^{-6} \text{ m}$
54. In which of the light spectrum does this wavelength belong?  
 (a) Infrared (b) Ultra violet  
 (c) Visible light (d) X-ray