SINGLE CORRECT OPTION TYPE

1. A radioactive substance is being produced at a constant rate of 200 nuclei/s. The decay constant of the substance is $1\,s^{-1}$. After what time the number of radioactive nuclei will become 100. Initially there are no nuclei present _____

(A) 1 sec (B) $\frac{1}{\ln(2)}$sec (C) $\ln(2)$sec (D) 2 sec

2. A radioactive substance x decays into another radioactive substance y. Initially only x was present. λ_x and λ_y are the disintegration constants of x and y. N_x and N_y are the number of nuclei of x and y at any time 't'. Number of nuclei N_y will be maximum when _____.

(A) $\frac{N_y}{N_x - N_y} = \frac{\lambda_y}{\lambda_x - \lambda_y}$ (B) $\frac{N_x}{N_x - N_y} = \frac{\lambda_x}{\lambda_x - \lambda_y}$

(C) $\lambda_y N_y = \lambda_x N_x$ (D) $\lambda_y N_x = \lambda_x N_y$

3. A radioactive element x convert into another stable element y. Half life of x is 2 hrs. Initially only x is present. After some t, the ratio of atoms of x and y is found to be 1:4. Then t in hours is _____.

(A) 2 (B) 4 (C) between 4 & 6 (D) 6

4. If $_{92}U^{238}$ changes to $_{85}At^{210}$ by a series of α and β decays, the number of α and β decays undergone is _____.

(A) 7 and 5 (B) 7 and 7 (C) 5 and 7 (D) 7 and 9

5. In a sample of a radioactive substance what fraction of the initial number of nuclei will remain undecayed after a time $t = \frac{T}{2}$, where T = half life of radioactive substance.

(A) $\frac{1}{\sqrt{2}}$ (B) $\frac{1}{2\sqrt{2}}$ (C) $\frac{1}{4}$ (D) $\frac{1}{\sqrt{2}-1}$

6. The activity of a radioactive substance is R_1 at time t_1 and R_2 at time $t_2\,(>t_1)$ its decay constant is λ. Then _____

(A) $R_1 t_1 = R_2 t_2$ (B) $R_2 = R_1 e^{\lambda(t_1 - t_2)}$

(C) $\frac{(R_1 - R_2)}{t_2 - t_1} = \text{constant}$ (D) $R_2 = R_1 e^{\lambda(t_2 - t_1)}$

7. The minimum kinetic energy of an electron, hydrogen ion, helium ion required for ionization of a hydrogen atom is E_1 in case electron is collided with hydrogen atom. It is E_2 if hydrogen ion is collided and E_3 when helium ion is collided. Then

(A) $E_1 = E_2 = E_3$ (B) $E_1 > E_2 > E_3$ (C) $E_1 < E_2 < E_3$ (D) $E_1 > E_3 > E_2$

8. Magnetic field at the centre (at nucleus) of the hydrogen like atoms (atomic number = z) due to the motion of electron, in nth orbit is proportional to

(A) $\frac{n^3}{z^5}$ (B) $\frac{n^4}{z}$ (C) $\frac{z^2}{n^3}$ (D) $\frac{z^3}{n^5}$

9. The ratio between total acceleration of the electron in singly ionized helium atom and hydrogen atom (both in ground state is)
(A) 1 (B) 8 (C) 4 (D) 16

10. In a hydrogen atom, the electron is in nth excited state. It comes down to first excited state by emitting ten different wavelengths. The value of 'n' is _____
(A) 6 (B) 7 (C) 8 (D) 9

11. The ratio of the maximum wavelength of the Lymen series in hydrogen spectrum to the maximum wavelength in the Paschen series is _____
(A) $\frac{3}{105}$ (B) $\frac{6}{15}$ (C) $\frac{52}{7}$ (D) $\frac{7}{108}$

12. When an electron in the hydrogen atom in ground state absorbs as photon of energy 12.1 ev. Its angular momentum
(A) decreases by 2.11×10^{-34} J.s (B) decreases by 1.055×10^{-34} J.s
(C) increases by 2.11×10^{-34} J.s (D) increases by 1.055×10^{-34} J.s

13. The radius of second orbit of an electron in hydrogen atom is 2.116 Å. The de-Broglie wavelength associated with this electron in this orbit would be _____
(A) 6.64 Å (B) 1.058 Å (C) 2.116 Å (D) 13.28 Å

14. Let k_1 be the maximum kinetic energy of photoelectrons emitted by light of wavelength λ_1 and k_2 corresponding to wavelength λ_2. If $\lambda_1 = 2\lambda_2$. Then
(A) $2k_1 = k_2$ (B) $k_1 = 2k_2$ (C) $k_1 < \frac{k_2}{2}$ (D) $k_1 > 2k_2$

15. An electron and a photon have same wavelength. If 'p' is the momentum of electron and E the energy of photon. The magnitude of $\frac{P}{E}$ in SI unit is _____.
(A) 3.0×10^{8} (B) 3.33×10^{-9} (C) 9.1×10^{-31} (D) 6.64×10^{-34}

16. The binding energies of nuclei x and y are E_1 and E_2 respectively. Two atoms of x fuse to give one atom of y and an energy Q is released. Then
(A) $Q = 2E_1 - E_2$ (B) $Q = E_2 - 2E_1$ (C) $Q < 2E_1 - E_2$ (D) $Q > E_2 - 2E_1$

17. A potential difference of 10^3v is applied across an x-ray tube. The ratio of the de-Broglie wavelength of the incident electrons to the shortest wavelength of x-rays produced is – ($e/m = 1.8\times10^{14}$ c/kg for an electron)
(A) $\frac{1}{20}$ (B) $\frac{1}{100}$ (C) 1 (D) $\frac{1}{10^4}$

18. In hydrogen and hydrogen like atoms the ratio of difference of energies E_{4n-2n} and $E_{2n} - E_n$ varies with atomic number z and principle quantum number 'n' as
(A) $\frac{z^2}{n^2}$ (B) $\frac{z^4}{n^4}$ (C) $\frac{z}{n}$ (D) none of these

19. The shortest wavelength of the brackett series of a hydrogen like atom (atomic number = z) is the same as the shortest wavelength of the Balmer series of hydrogen atom. The value of 'z' is
(A) 2 (B) 3 (C) 4 (D) 6

20. If the binding energy of the electron in a hydrogen atom is 13.6 ev, the energy required to remove the electron from the first excited state of LI^{++} is _____.
(A) 122.4 ev (B) 30.6 ev (C) 13.6 ev (D) 3.4 ev

INTEGER TYPE

21. If a potential difference of 20000 volts is applied across an x-ray tube, the cutoff wavelength will be $n(3.105)\times10^{-11}$m. Find 'n' value?

22. The count rate from $100cm^3$ of a radioactive liquid is c. Some of this liquid is now discarded. The count rate of the remaining liquid is found to be $\frac{c}{10}$ after three half lives. The volume of the remaining liquid is $n(10)cm^3$. The value of 'n' is _____.

23. When a hydrogen atom emits a photon is going from $n=5$ to $n=1$, its recoil speed is almost $2x\ m/s$. Find the value of 'x'?

24. Let T be the mean life of a radioactive sample 75% of the active nuclei present in the sample initially will decay in time is $x(\ln2)T$. The value of 'x' is _____.

25. In a Coolidge tube the potential difference across the tube is 20 kv, and 10 mA current flows through the voltage supply. Only 0.5% of the energy carried by the electrons striking the target is converted into x-rays. The x-ray beam carries a power is xw the value of 'x' is _____.

KEY

1.	C	**2.**	C	**3.**	C	**4.**	B	**5.**	A
6.	B	**7.**	C	**8.**	D	**9.**	B	**10.**	A
11.	D	**12.**	C	**13.**	A	**14.**	C	**15.**	B
16.	B	**17.**	C	**18.**	D	**19.**	A	**20.**	B
21.	2	**22.**	8	**23.**	2	**24.**	2	**25.**	1

❇ *Wish You esf all the Best* ❇