DPP - 3

1. The photon radiated from hydrogen corresponding to the second line of Lyman series is absorbed by a hydrogen-like atom X in the second excited state. Then, the hydrogen-like atom X makes a transition of nth orbit.

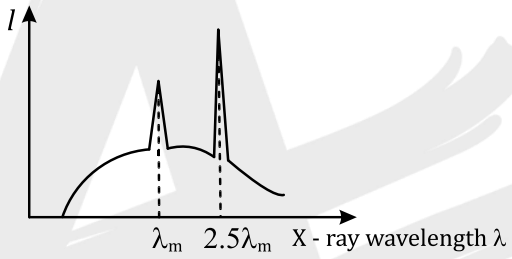
(A) $X = He^{+}, n = 4$ (B) $X = Li^{++}, n = 6$ (C) $X = He^{+}, n = 6$ (D) $X = Li^{++}, n = 9$

2. The element which has a K_αX-rays line of wavelength 1.8Å is

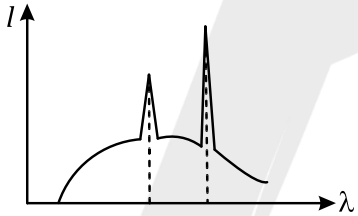
$\left(R = 1.1 \times 10^{7}\ m^{-1}, b = 1 \text{ and } \sqrt{5/33} = 0.39\right)$

(A) Co, Z = 27 (B) Fe, Z = 26 (C) Mn, Z = 25 (D) Ni, Z = 28

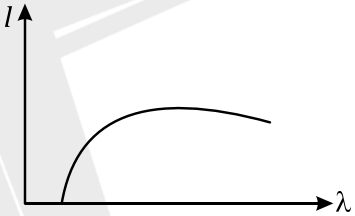
3. When an electron accelerated by potential difference U is bombarded on a specific metal, the emitted X-ray spectrum obtained is shown in figure. If the potential difference is reduced to U/3, the correct spectrum is



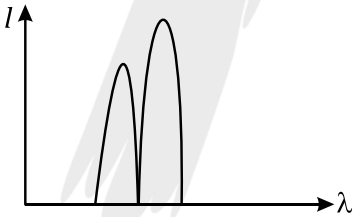
(A)



(B)



(C)



(D)

4. When the voltage applied to an X-ray tube increases from $V_1 = 10kV$ to $V_2 = 20kV$, the wavelength interval between K_α line and cut-off wavelength of continuous spectrum increases by a factor of 3. Atomic number of the metallic target is

(A) 28 (B) 29 (C) 65 (D) 66

5. Mark out the correct statement regarding X-rays.

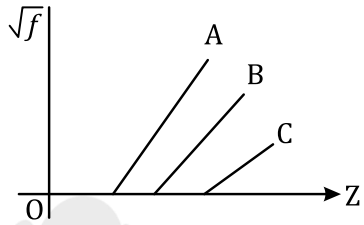
(A) When fast moving electrons strike the metal target, they enter the metal target and in a very short time span come to rest, and thus an accelerated charged electron produces electromagnetic waves (X-rays).

(B) Characteristic X-rays are produced due to transition of an electron from higher energy levels to vacant lower energy levels.

(C) X-rays spectrum is a discrete spectra just like hydrogen spectra.

(D) Both (1) and (2) are correct.

6. Figure shows Moseley's plot between $\sqrt{f}$ and Z, where f is the frequency and Z is the atomic number. Three lines A, B, and C shown in the graph may represent



(A) K_α, K_β, and K_γ lines, respectively (B) K_γ, K_β, and K_α lines, respectively

(C) K_α, L_α, and M_α lines, respectively (D) Nothing

7. The potential difference across the Coolidge tube is 20kV 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 power carried by the X-ray beam is P. Then

(A) $P = 0.1$ W (B) $P = 1$ W (C) $P = 2$W (D) $P = 10$ W

8. K_α wavelength emitted by an atom of atomic number $Z = 11$ is λ. The atomic number for an atom that emits K_α radiation with wavelength 4λ is

(A) 6 (B) 4 (C) 11 (D) 44

ANSWER KEY

1. (D) **2.** (A) **3.** (B) **4.** (B) **5.** (B) **6.** (D) **7.** (B)
8. (A)