DPP 02

1. A photon collides with a stationary hydrogen atom in the ground state inelastically. Energy of the colliding photon is 10.2eV. Almost instantaneously, another photon collides with same hydrogen atom inelastically with an energy of 15eV. What will be observed by the detector?

(A) Two photons of energy 10.2eV

(B) Two photons of energy 1.4eV

(C) One photon of energy 10.2eV and one electron of energy 1.4eV

(D) One electron having kinetic energy nearly 11.6eV

2. In hydrogen spectrum, the shortest wavelength in Balmer series is the λ. The shortest wavelength in the Brackett series will be

(A) 2λ (B) 4λ (C) 9λ (D) 16λ

3. An electron of energy 11.2eV undergoes an inelastic collision with a hydrogen atom in its ground state. [Neglect recoiling of atom as $m_H \gg m_e$]. Then in this case

(A) the outgoing electron has energy 11.2eV

(B) the entire energy is absorbed by the H atom and the electron stops

(C) 10.2eV of the incident electron energy is absorbed by the H atom and the electron would come out with 1.0eV energy

(D) none of these

4. A neutron having kinetic energy 5eV is incident on a hydrogen atom in its ground state. The collision

(A) must be elastic (B) must be completely inelastic

(C) may be partially elastic (D) information is insufficient

5. An electron collides with a hydrogen atom in its ground state and excites it to $n = 3$. The energy given to hydrogen atom in this inelastic collision is [Neglect the recoiling of hydrogen atom]

(A) 10.2eV (B) 12.1eV (C) 12.5eV (D) None of these

6. Hydrogen atom from excited state comes to the ground state by emitting a photon of wavelength λ. The value of principal quantum number ' n ' of the excited state will be (R : Rydberg constant)

(A) $\sqrt{\frac{\lambda R}{\lambda - 1}}$ (B) $\sqrt{\frac{\lambda R}{\lambda R - 1}}$ (C) $\sqrt{\frac{\lambda}{\lambda R - 1}}$ (D) $\sqrt{\frac{\lambda R^2}{\lambda R - 1}}$

7. Choose the correct option from the following options given below

(A) In the ground state of Rutherford's model electrons are in stable equilibrium. While in Thomson's model electrons always experience a net-force.

(B) An atom has a nearly continuous mass distribution in a Rutherford's model but has a highly non-uniform mass distribution in Thomson's model.

(C) A classical atom based on Rutherford's model is doomed to collapse.

(D) The positively charged part of the atom possesses most of the mass in Rutherford's model but not in Thomson's model.

8. In Bohr's atomic model of hydrogen, let K, P and E are the kinetic energy, potential energy and total energy of the electron respectively. Choose the correct option when the electron undergoes transitions to a higher level.

(A) All K, P and E increase. (B) K decreases, P and E increase.

(C) P decreases, K and E increase. (D) K increases, P and E decrease.

9. Imagine that the electron in a hydrogen atom is replaced by a muon (μ). The mass of muon particle is 207 times that of an electron and charge is equal to the charge of an electron. The ionization potential of this hydrogen atom will be

(A) 331.2eV (B) 2815.2eV (C) 13.6eV (D) 27.2eV

ANSWER KEY

1. (D) **2.** (B) **3.** (C) **4.** (A) **5.** (B) **6.** (B) **7.** (C)
8. (B) **9.** (B)