



27. As an electron makes a transition from an excited state to the ground state of hydrogen - like atom/ion:

- (1) Its kinetic energy increases but potential energy and total energy decrease
- (2) Kinetic energy, potential energy and total energy decrease
- (3) Kinetic energy decreases, potential energy increases but total energy remains same
- (4) Kinetic energy and total energy decrease but potential energy increases

Answer:

We know that Potential energy of electron in hydrogen atom $U = -\frac{1}{4\pi\epsilon_0} \frac{e^2}{r} \rightarrow (1)$

Therefore P.E decreases.

Kinetic energy $= \frac{1}{8\pi\epsilon_0} \frac{e^2}{r} \rightarrow (2)$

Therefore K.E increases

Total energy $E = -\frac{1}{4\pi\epsilon_0} \frac{e^2}{r} + \frac{1}{8\pi\epsilon_0} \frac{e^2}{r} = -\frac{1}{8\pi\epsilon_0} \frac{e^2}{r}$

Therefore as r decreases total energy decreases.

Correct option is (1)