

1. The ratio of the speed of electrons in the ground state of hydrogen to the speed of light in vacuum is

(A) $1/2$

(B) $2/137$

(C) $1/137$

(D) $1/237$

Sol: (C) Speed of electron in n^{th} orbit of hydrogen atom $v = \frac{e^2}{2\epsilon_0 nh}$

In ground state $n=1 \Rightarrow v = \frac{e^2}{2\epsilon_0 h}$

$$\Rightarrow \frac{v}{c} = \frac{e^2}{2\epsilon_0 ch} = \frac{(1.6 \times 10^{-19})^2}{2 \times 8.85 \times 10^{-12} \times 3 \times 10^8 \times 6.6 \times 10^{-34}} = \frac{1}{137}$$