

7. Based on the equation  $\Delta E = -2.0 \times 10^{-18} \text{ J } (1/n_2^2 - 1/n_1^2)$  the wavelength of the light that must be absorbed to excite hydrogen electron from level  $n = 1$  to level  $n = 2$  will be ( $h = 6.625 \times 10^{-34} \text{ Js}$ ,  $C = 3 \times 10^8 \text{ ms}^{-1}$ )

- (1)  $2.650 \times 10^{-7} \text{ m}$
- (2)  $1.325 \times 10^{-7} \text{ m}$
- (3)  $1.325 \times 10^{-10} \text{ m}$
- (4)  $5.300 \times 10^{-10} \text{ m}$

**Solution:**

$$\begin{aligned}\Delta E &= -2.0 \times 10^{-18} \text{ J } (1/n_2^2 - 1/n_1^2) \\ &= -2.0 \times 10^{-18} (1/2^2 - 1/1^2) \\ &= -2.0 \times 10^{-18} (1/4 - 1/1) \\ &= -2.0 \times 10^{-18} (-3/4) \\ &= 1.5 \times 10^{-18}\end{aligned}$$

$$\text{Also } \Delta E = hc/\lambda$$

$$\text{So } \lambda = hc/\Delta E$$

$$\begin{aligned}&= 6.625 \times 10^{-34} \times 3 \times 10^8 / 1.5 \times 10^{-18} \\ &= 13.25 \times 10^{-8} \\ &= 1.325 \times 10^{-7} \text{ m}\end{aligned}$$

Hence option (2) is the answer.