

6. The frequency of light emitted for the transition $n = 4$ to $n = 2$ of He^+ is equal to the transition in H atom corresponding to which of the following

(1) $n = 3$ to $n = 1$

(2) $n = 2$ to $n = 1$

(3) $n = 3$ to $n = 2$

(4) $n = 4$ to $n = 3$

Solution:

$$E = 13.6 \times 4 \left[\left(\frac{1}{4} \right) - \left(\frac{1}{16} \right) \right]$$

$$= 10.2$$

$$E = h\nu$$

$$\nu = 10.2/h$$

$$E = 13.6(1) \left[\left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right) \right]$$

$$10.2 = 13.6 \left[\left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right) \right]$$

$$102/136 = (n_2^2 - n_1^2) / n_1^2 n_2^2$$

Substitute the given options and find n_1 and n_2

$$51/68 = (n_2^2 - n_1^2) / n_1^2 n_2^2$$

$$0.75 = (4-1)4 = \frac{3}{4} = 0.75$$

Hence option (2) is the answer.