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:

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

$= 10.2$

$E = h\nu$

$\nu = 10.2/h$

$E = 13.6(1)[(1/n_1^2 - 1/n_2^2)]$

$10.2 = 13.6[(1/n_1^2 - 1/n_2^2)]$

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

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.