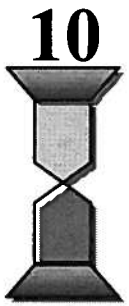
J. GRIFFIN 12/10/07 B©

If the nth allowed level of a Hydrogen atom has an electron energy of $-13.6/n^2$ in units of eV (electron volts), what is the energy (in eV) of the photon emitted when an electron jumps from the n = 3 orbit to the n = 1 orbit



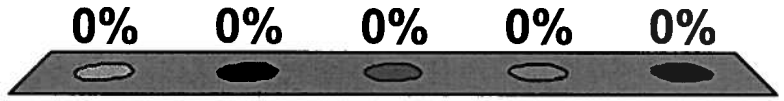
a) 13.6 eV

b) 5.4 eV

c) 1.5 eV

d) 0.85 eV

✔ **e) 12.1 eV**



J. Griffin 12/10/07 B (d)

The correct answer is e) 12.1 eV:

- Because the photon carries away the difference energy between the initial and final states, its energy is

$$E_{3->1} = h f_{3->1} = E_3 - E_1.$$

- We compute this as

$$E_3 - E_1 = -13.6(1/3^2 - 1/1^2)$$
$$= +13.6(1 - 1/9) = 13.6*(8/9)$$
$$= 12.09 \text{ eV}$$

- Therefore, Answer (e) is correct: 12.1 eV. (One could also calculate the photon frequency: $f_{3->1} = (E_3 - E_1)/h$.)