Answer on Question 59096, Physics, Atomic and Nuclear Physics

Question:

A spectral line is emitted when an atom undergoes transition between two levels with a difference in energy of $2.4\ eV$. What is the wavelength of the line?

a) $287\ nm$

b) 507 Å

c) 377 Å

d) $518\ nm$

Solution:

We can find the wavelength of the line from the inverse relationship between the energy of the photon and the wavelength of the light given by the equation:

$$\Delta E = E_1 - E_2 = \frac{hc}{\lambda},$$

here, ΔE is the difference in energy when an atom undergoes transition between two levels, $h = 4.135 \cdot 10^{-15}\ eV \cdot s$ is the Planck's constant, c is the speed of light, λ is the wavelength of the spectral line we are searching for.

Therefore, from this equation we can calculate the wavelength of the line:

$$\lambda = \frac{hc}{\Delta E} = \frac{4.135 \cdot 10^{-15}\ eV \cdot s \cdot 3 \cdot 10^8\ \frac{m}{s}}{2.4\ eV} = 517 \cdot 10^{-9}\ m \approx 518\ nm.$$

Answer:

d) $518\ nm$