

- Q 04**
- a. In the explanation of the photoelectric effect, we assume one photon of frequency  $\nu$  collides with an electron and transfers its energy. This leads to the equation for the maximum energy  $E_{\max}$  of the emitted electron as
- $$E_{\max} = h\nu - \phi_0$$
- here  $\phi_0$  is the work function of the metal. If an electron absorbs 2 photons (each of frequency  $\nu$ ) what will be the maximum energy for the emitted electron?
- b. Why is this fact (two photon absorption) not taken into consideration in our discussion of the stopping potential?

**Sol.**

- a. Here, 2 photons transfer its energy to one electron as  $E = h\nu$

$$\therefore E_e = E_p$$

$$h\nu_e = 2h\nu$$

$$\nu_e = 2\nu$$

The maximum energy of the emitted electron is given by :-

$$E_{\max} = h\nu_e - \phi_0 = h(2\nu) - \phi_0 = 2h\nu - \phi_0$$

- b. The probability of absorbing 2 photons by an electron is very low due to their mass difference. So the possibilities of such emission of electrons are negligible.