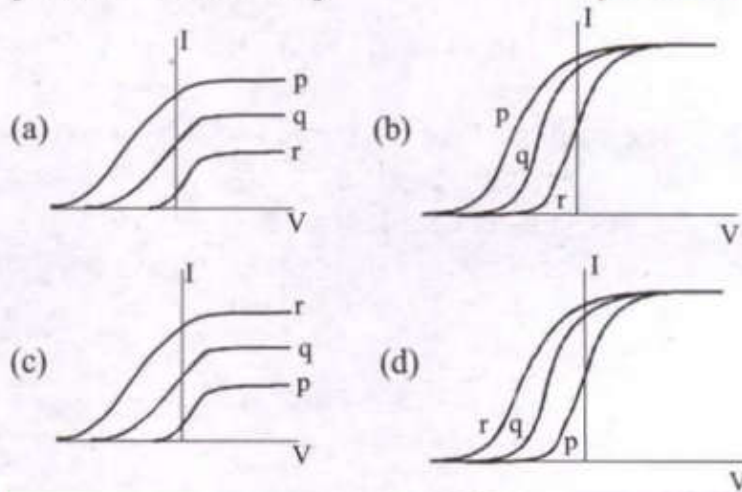**Q 04.** Photoelectric effect experiments are performed using three different metal plates p, q and r having work functions $\phi_p = 2.0$ eV, $\phi_q = 2.5$ eV and $\phi_r = 3.0$ eV, respectively. A light beam containing wavelengths of 550 nm, 450 nm and 350 nm with equal intensities illuminates each of the plates. The correct I-V graph for the experiment is

[Take $hc = 1240$ eV nm]   **[Main 2009]**

(a)

(b)

(c)

(d)

Ans

(a) Energy of photon $E = \dfrac{hc}{\lambda} = \dfrac{1240}{\lambda}$ The energy possessed by photons of wavelength 550 nm

$$E_1 = \frac{1240}{550} = 2.25 \, eV$$

The energy possessed by photons of wavelength

450 nm $E_2 = \dfrac{1240}{450} = 2.76 \, eV$

The energy possessed by photons of wavelength

350 nm $E_3 = \dfrac{1240}{350} = 3.54 \, eV$

Work function of $\phi_p = 2.0 \, eV$ is least among p, q, and r so it can emit photoelectrons by E_1, E_2 and E_3 or from all three wavelengths. Hence magnitude of V and I both will be maximum for metal plate P.