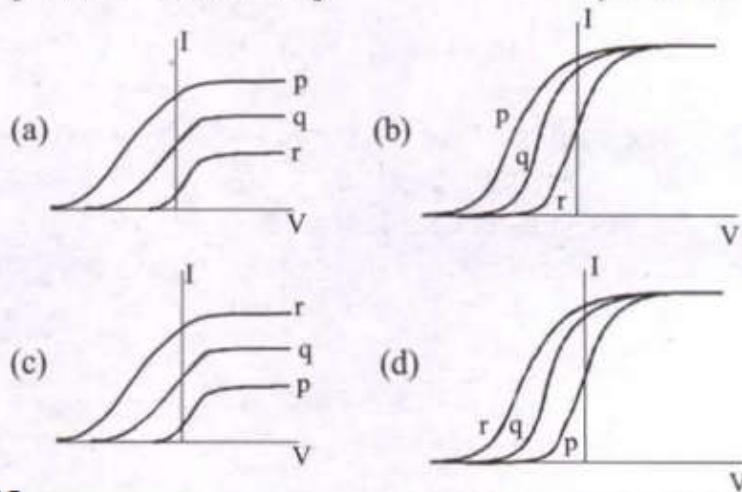


**Q 04** Photoelectric effect experiments are performed using three different metal plates p, q and r having work functions  $\phi_p = 2.0$  eV,  $\phi_q = 2.5$  eV and  $\phi_r = 3.0$  eV, respectively. A light beam containing wavelengths of 550 nm, 450 nm and 350 nm with equal intensities illuminates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

[Take  $hc = 1240$  eV nm]

[Main 2009]



**ANS**

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

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

The energy possessed by photons of wavelength

$$450 \text{ nm } E_2 = \frac{1240}{450} = 2.76 \text{ eV}$$

The energy possessed by photons of wavelength

$$350 \text{ nm } E_3 = \frac{1240}{350} = 3.54 \text{ eV}$$

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.