

Q2: When a certain photosensitive surface is illuminated with monochromatic light of frequency f , the stopping potential for the photocurrent is $(-V_0/2)$. When the surface is illuminated by monochromatic light of frequency $f/2$, the stopping potential is $-V_0$. The threshold frequency for photoelectric emission is

- (a) $4f/3$
- (b) $2f$
- (c) $5f/3$
- (d) $3f/2$

Solution:

From Einstein's equation -

$$hf = \phi + K$$
$$hf = \phi + \frac{V_0 e}{2} \quad \text{--- (i)}$$
$$\frac{hf}{2} = \phi + V_0 e \quad \text{--- (ii)}$$

2. eq (i) - eq (ii)

$$2hf - \frac{hf}{2} = \phi$$
$$\frac{3hf}{2} = \phi$$
$$f = \frac{2\phi}{3h}$$
$$f_c = f_{\text{threshold}} = \frac{\phi}{h}$$

Therefore, $f = \frac{2}{3} f_c$ $f_c = \frac{3}{2} f$

Ans: option D