









**Sol.** Pitch =  $v_{||}T$

$$\text{K.E.} = \frac{1}{2}mv^2 \Rightarrow v = \sqrt{\frac{4e}{m}}$$

$$T = \frac{2\pi m}{qB}, v_{||} = v\cos 60^\circ$$

$$\text{Pitch} = \frac{2\pi m}{qB} \sqrt{\frac{4e}{m}} \times \frac{1}{2}$$

$$= \frac{2\pi m\pi}{e \times 2} \times \sqrt{\frac{e}{m}}$$

$$= \pi^2 \sqrt{\frac{m}{e}}$$

$$= \pi^2 \sqrt{\frac{1.6 \times 10^{-27}}{1.6 \times 10^{-19}}}$$

$$= \pi^2 \times 10^{-4} \text{ m}$$

$$\approx 1\text{mm}$$

**17.** A capacitor of capacitance  $150\mu\text{F}$  is connected with an AC source of emf  $\varepsilon = 36\sin(120\pi t)$ . Find the value of maximum current through the capacitor.

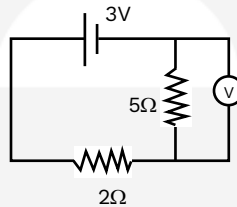
**Ans.** 2A

**18. Assertion (A) :** In forward biased p-n junction, diffusion current is from p-region to n-region.

**Reason (R) :** Diffusion takes place due to concentration gradient.

**Ans.** Both are correct and R is the correct explanation of A.

**19.** If potential difference across  $5\Omega$  resistance is 2V then find the internal resistance of voltmeter.



**Sol.**  $i = \frac{1V}{2} = 0.5\text{A}$

$$R_{\text{eq}} = \frac{\varepsilon}{i} = \frac{3}{0.5} = 6$$

$$\frac{5R}{5+R} + 2 = 6$$

$$R = 20\Omega$$

**20.** Two different photosensitive materials having work function 4.1 eV and 5.1 eV respectively, are illuminated with light of sufficient energy to emit electron. If the graph of stopping potential vs. frequency is drawn for these two different photosensitive materials, the ratio of slope of graph for these two materials is:

**Ans.** 1 : 1

**Sol.**  $eV_s = h\nu - \phi$

$$V_s = \left(\frac{h}{e}\right)\nu - \phi$$





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21. An object A is released from a height  $h$  such that the ratio of its speed before striking the ground and after striking the ground is 4 : 1. If loss of kinetic energy is  $\frac{x}{4}\%$ , then value of  $x$  is

**Ans.** 375

**Sol.**

$$\frac{x}{4} = \frac{\frac{1}{2}mu^2 - \frac{1}{2}mv^2}{\frac{1}{2}mu^2} \times 100$$
$$= \left(1 - \frac{v^2}{u^2}\right) \times 100$$
$$= \left(1 - \frac{1}{16}\right) \times 100 = \frac{15 \times 100}{16} = \frac{375}{4}$$

22. **Assertion :** When toothpaste is pressed, it follows Pascal's law.

**Reason :** When pressure is applied on a fluid it is distributed uniformly throughout the fluid in all direction and on the wall of the container.

**Ans.** Both are correct and R is the correct explanation of A.

