



INDIAN SCHOOL MUSCAT

CLASS :.....XII.....

SUBJECT:.....Physics.....

WORKSHEET 12



DATE :.....

TOPIC/SUB-TOPIC :.....Semiconductor : materials ,devices and simple circuits.....

Section A Conceptual and application type questions

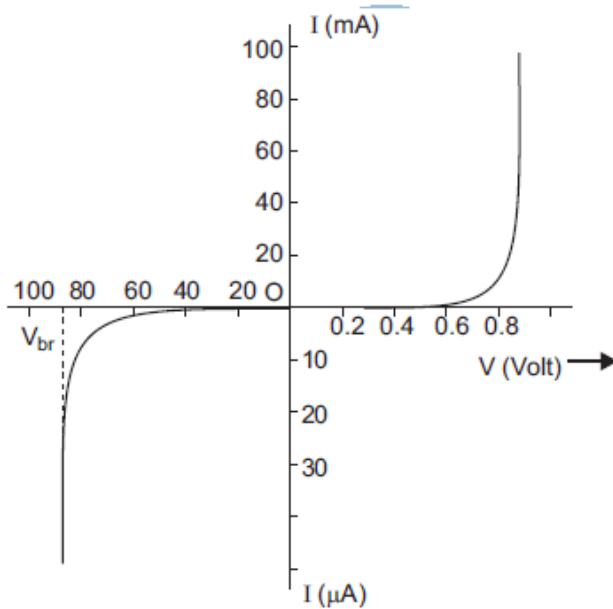
- |   |   |        |
|---|---|--------|
| 1 | State one difference between  | 1      |
|   | i) a diode and a zener diode  |        |
|   | ii) solar cell and photodiode   |        |
|   | iii) LED and photodiode   |        |
| 2 | What is the efficiency of a i) half wave rectifier ii) full wave rectifier?   | 1      |
| 3 | The current in the forward bias is known to be more (mA) than the current in the reverse bias ( $\mu$ A). What is the reason then to operate the photodiodes in reverse bias? | 1      |
| 4 | Why are Si and GaAs are preferred materials for solar cells?  |        |
| 5 | Draw energy band diagram for  | 1 mark |
|   | i) copper   | each   |
|   | ii) pure germanium  |        |
|   | iii) diamond  |        |
|   | iv) silicon doped with phosphorous  |        |
|   | v) silicon doped with aluminium   |        |
| 6 | State two differences between the circuits of a i) half wave rectifier ii) full wave rectifier?.  | 2      |
| 7 | Mention the uses of light emitting diode (LED)  | 2      |
| 8 | Mention the advantages of light emitting diode (LED) over conventional lighting sources   | 2      |
| 9 | What happens to the depletion layer and internal potential barrier of a pn junction diode   | 2      |

during i) forward bias ii) reverse bias ?

10 The figure adjoining shows the V-I characteristics of a semiconductor diode.(i) Identify the semiconductor diode used. 2

(ii) Draw the circuit diagram to obtain the given characteristic of this device.

(iii) Briefly explain how this diode can be used as a voltage regulator.



11 Explain the working of solar cell with a neat circuit diagram 3

12 With a neat circuit diagram explain the working of photo diode . 3

13 State the differences between N - type and P- type semiconductors 3

14 State the differences between intrinsic and extrinsic semiconductors 3

15 What is doping of intrinsic semiconductor? Mention the characteristics of dopant atoms. 3

16 With a neat circuit diagram and input and output wave forms , explain the working of a half wave rectifier . 3

17 With a neat circuit diagram and input and output wave forms, explain the working of a full wave rectifier . 3

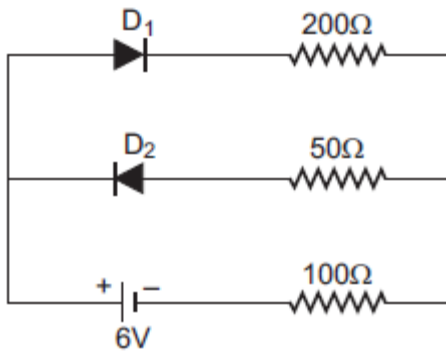
Section B Numerical problems

- 1 A p-n photodiode is fabricated from a semiconductor with band gap of 2.8 eV. Can it detect a wavelength of 6000 nm?,

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- 2 The circuit shown in the figure contains two diodes each with a forward resistance of  $50\ \Omega$  and infinite backward resistance. Calculate the current in the  $100\ \Omega$  resistance.

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- 3 Suppose a pure Si crystal has  $5 \times 10^{28}$  atoms  $\text{m}^{-3}$ . It is doped by 1ppm concentration of penta valent As. Calculate the number of electrons and holes. Given that  $n_i = 1.5 \times 10^{16} \text{m}^{-3}$ .

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- 4 Calculate the resistance of the diode at (a)  $I_D = 15 \text{mA}$  and (b)  $V_D = -10 \text{V}$ .

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