

**Note-** ( i ) All questions are compulsory. Internal options are given in each question from question Nos. 5 to 18. ( ii ) Each question from Question Nos. 1 to 4 carry 5 marks and each sub-question carries 1 mark. ( iii ) Each question from Question Nos. 5 to 8 carry 2 marks and word limit for each answer is approx. 30 words. ( iv ) Each question from Questions Nos. 9 to 13 carry 4 marks and word limit for each answer is approx. 75 words. ( v ) Each question from Question Nos. 14 to 16 carry 5 marks and word limit for each answer is approx. 120 words. ( vi ) Each question from Questions Nos. 17 and 18 carry 6 marks and word limit for each answer is approx. 150 words. ( v ) Draw neat and labelled diagrams wherever necessary.

1. Select and write the correct option from the options given in each question :

(i) The angle between electric lines of force and equipotential surface is :

- (a)  $0^\circ$  (b)  $180^\circ$   
(c)  $90^\circ$  (d)  $45^\circ$

(ii) The conductivity of superconductor is :

- (a) Infinity (b) Very less  
(c) Very large (d) Zero

(iii) The Magnetic effect of current was discovered by :

- (a) Fleming (b) Oersted  
(c) Faraday (d) Ampere

(iv) Eddy currents are used in :

- (a) electrolysis  
(b) making a galvanometer dead beat  
(c) electroplating  
(d) to increase the sensitivity of galvanometer

(v) The formula for the velocity of electromagnetic waves in vacuum is given by :

- (a)  $c = \sqrt{\mu_0 \epsilon_0}$  (b)  $c = 1/\sqrt{\mu_0 \epsilon_0}$   
(c)  $c = \sqrt{\frac{\mu_0}{\epsilon_0}}$  (d)  $c = \sqrt{\frac{\epsilon_0}{\mu_0}}$

2. Fill in the blanks :
- Meter bridge works on the principle of .....
  - In a parallel plate capacitor with increase in distance between the plates, its capacity .....
  - An air bubble inside water behaves like a ..... lens.
  - Zener diode is used as .....
  - For healthy eye least distance of distinct vision is .....
3. Select the appropriate option from column 'B' for each statement of column 'A' and match the correct pair :

**Column 'A'**

**Column 'B'**

- |                            |  |
|----------------------------|--|
| (a) Brewster law           | (i) Modulator and demodulator                |
| (b) Quantization of charge | (ii) Refraction of light                     |
| (c) Snell's law            | (iii) Undamped oscillation of high frequency |
| (d) Modem                  | (iv) Polarization of light                   |
| (e) Oscillator             | (v) $Q = \pm ne$                             |

4. Give answer in one sentence each :
- How can a galvanometer be converted into voltmeter?
  - Write the use of Fax Machine.
  - How are N-type of semiconductors prepared?
  - What is the value of specific charge of an electron?
  - The mass of a moving particle is  $m$  and velocity is  $v$ , then write the formula for de-Broglie wavelength  $\lambda$ .
5. What is greenhouse effect? Explain.
- (Or) Which waves are used as signal through fog and why?
6. When an object is kept in between optical centre and focus in front of convex lens, draw ray-diagram of image formation.
- (Or) Write any two differences between regular and irregular (diffused) reflection.
7. Define the following:  
Threshold frequency and work function.
- (Or) The work function of a metal is 0.1 eV. Calculate the threshold frequency for photo-electric emission.
8. Write the meaning of laser and two uses.
- (Or) Write any two advantages of optical communication.
9. Prove that:
- $$I^2 = H^2 + V^2 \text{ and } \tan\theta = \frac{V}{H}$$
- where for terrestrial magnetism  $\theta$  angle of dip, H horizontal component and V vertical component.
- (Or) State Biot-Savart's law. Define unit of current.

10. Prove that for A.C. circuit :  

$$P_{av} = V_{r.m.s.} \times I_{r.m.s.} \cos\theta.$$
- (Or) Write the causes of energy loss and ways to reduce them in transformer (any four).
11. Write down four differences between interference and diffraction.
- (Or) Establish relation  $d = \sqrt{2hR}$  between height  $h$  of the TV antenna and distance  $d$  upto which TV signal can be transmitted, where  $R$  = Radius of earth.
12. Describe the astronomical telescope on the basis of the following points :
- Labelled Ray diagram
  - Derivation of formula for magnifying power, when final image is formed at the least distance of distinct vision.
- (Or) Describe the compound microscope on the following headings :
- Labelled Ray diagram of formation of image
  - Magnifying power when final image is formed at least distance of distinct vision.
13. Differentiate between amplitude modulation and frequency modulation (any four). <http://www.mpboardonline.com>
- (Or) What are analog and digital signals? Explain with diagrams.
14. Prove that potential at point on transverse (equatorial) position of electric dipole is zero.
- (Or) Establish the formula for the capacity of spherical capacitor.
15. What is d.c. motor? Explain its construction and working with the help of labelled diagram.
- (Or) A resistance and inductance are connected in series with a source of alternating e.m.f. Derive an expression for resultant voltage, impedance and phase difference between current and voltage in alternating circuit.
16. Explain the use of P-N junction diode as full wave rectifier on the basis of the following points.
- Labelled circuit diagram
  - Working method
  - Graph between input and output potential with the variation of time.

( Or ) Write down 5 differences between N-type and P-type semiconductors.

17. Describe the experiment to compare the e.m.f. of two cells using potentiometer under the following points :

- (i) Labelled electric circuit diagram      (ii) Derivation of formula  
(ii) Observation table      (iv) Two precautions.

( Or ) A Leclanche cell gets balanced on the wire of potentiometer at 280 cm. If a Daniel cell is joined in series with Leclanche cell, then the balance point is obtained at 480 cm. Compare the e.m.f. of two cells.

18. Establish Lens maker's formula :

$$\frac{1}{f} = (\mu - 1) \left( \frac{1}{R_1} - \frac{1}{R_2} \right)$$

( Or ) Define deviation without dispersion. Derive an expression for its essential condition and resultant deviation.

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