

PHYSICS - 2013

Time : 3 Hours |

Class : 12th

| M. M. : 75

- Note-**
- (i) All questions are compulsory.
 - (ii) Read the instruction of question paper carefully and write their answer.
 - (iii) There are two Sections- Section 'A' and Section 'B' in the question paper.
 - (iv) In Section 'A', Question Nos. 1 to 4 are objective type questions which contain Fill in the blanks, True/False, Match the columns and Choose the correct answers. Each question is allotted 5 Marks.
 - (v) Internal options are given in Question Nos. 5 to 16 of Section B.
 - (vi) Question Nos. 5 to 11 carry 4 marks each.
 - (vii) Question Nos. 12 to 14 carry 5 marks each.
 - (viii) Question Nos. 15 and 16 carry 6 marks each.
 - (ix) Draw neat and labelled diagrams wherever necessary.

(Section - A)

(Objective Type Questions)

- Q. 1. Choose the correct answer from the given options.
- (a) The intensity of electric field E due to charge Q at distance r :
- (i) $E \propto r$
 - (ii) $E \propto \frac{1}{r^2}$
 - (iii) $E \propto \frac{1}{r}$
 - (iv) $E \propto \frac{1}{r^3}$
- (b) The potential difference between the two plates of a parallel plate condenser is constant, When air between the plates is replaced by dielectric material, the electric field intensity:
- (i) decreases
 - (ii) remains unchanged
 - (iii) becomes zero
 - (iv) increases
- (c) The expression for capacity of a spherical conductor is:
- (i) $C = \frac{1}{4\pi \epsilon_0 R}$
 - (ii) $C = 4\pi \epsilon_0 R$
 - (iii) $C = 4\pi \epsilon_0 R^2$
 - (iv) $C = 4\pi \epsilon_0 R^3$

- (d) A moving charge produces:
- (i) only electric field
 - (ii) only magnetic field
 - (iii) both electric and magnetic fields
 - (iv) neither the electric field nor the magnetic field
- (e) Unit of specific resistance is:
- (i) Ohm
 - (ii) Ohm^{-1}
 - (iii) Ohm metre^{-1}
 - (iv) $\text{Ohm}^{-1} \text{ metre}^{-1}$

Q. 2. Fill in the blanks:

- (a) The sound waves are the longitudinal waves. The electromagnetic waves are.....
- (b) The time period of communication satellite is.....
- (c) Equivalent resistance when 2 and 3 ohm resistance are connected in series is.....
- (d) At polarising angle, the angle between the reflected ray and refracted ray from a surface is.....
- (e) $i_p + r = \dots\dots\dots$

Q. 3. Write True or False in the following statements:

- (a) The conductivity of intrinsic semiconductor decreases with increase in temperature.
- (b) A specially designed P-N junction diode converts the solar energy into electrical energy.
- (c) Zener diode is a voltage regulation device.
- (d) The kinetic energy of a charged particle moving in a uniform magnetic field remains unchanged.
- (e) To convert a galvanometer into an ammeter, a resistance is joined in series with it.

Q. 4. Match the right pairs:

- | 'A' | 'B' |
|------------------|---|
| (a) Attenuation | (i) Change the waveform |
| (b) Distortion | (ii) Mixing of external signals |
| (c) Interference | (iii) Ampere (A) |
| (d) Channel | (iv) Decrease of intensity of signal wave |
| (e) Current | (v) Medium which carries the signal |

(Section - B)

(Very Short Answer Type Questions)

- Q. 5. Three resistors r_1, r_2, r_3 are joined in series. Draw labelled diagram and obtain expression for its equivalent resistance. **(Or)**
If length of a wire is doubled after stretching, then what will be its resistance?
- Q. 6. If full scale of deflection is obtained in galvanometer, of resistance 99 ohms by passing a current 10^{-4} A in it, what arrangement is required to measure a current of 1 A from it? **(Or)**
A straight wire of length l and magnetic moment m is bent into shape of semicircle, then what will be new magnetic moment?
- Q. 7. Write the Lenz's law. **(Or)**
When a copper plate is placed below an oscillating magnetic needle, the magnetic needle soon stops but if a glass plate is placed below, it does not stop. Give reason.
- Q. 8. What are electromagnetic waves? Write its nature. **(Or)**
Write four differences between interference and diffraction.
- Q. 9. Derive the relationship between focal length and radius of curvature of spherical mirror. **(Or)**
At what distance in front of a concave mirror of focal length 10 cm, an object be placed so that its real image of size five times that of the object obtain?
- Q. 10. Write four laws of photoelectric effect. **(Or)**
Find energy of photon of wavelength $4000 \text{ \AA}$.
- Q. 11. What are carrier waves? Why do we need the carrier waves of high frequency for distant communication? **(Or)**
What is meant by population inversion and optical pumping?

(Short Answer Type Questions)

- Q. 12. What is meant by electric flux? Write its S.I. unit and dimensional formula. **(Or)**
State Gauss' theorem and uses it to derive the Coulomb's inverse square law.
- Q. 13. Describe terrestrial telescope on the basis of the following points:
(i) a clear labelled diagram.;
(ii) expression for magnifying power when the final image is at least distance of distinct vision D . **(Or)**

If length of astronomical telescope is 80 cm and its magnification is 15, then find focal length of objective lens and eyepiece.

Q. 14. Differentiate between the P and N type semiconductors. **(Or)**

At 300 K temperature the saturated current in Germanium diode is $10 \mu\text{A}$. Find the:

- (i) Forward voltage when diode current is 100 mA.
- (ii) Diode current at backward biased voltage 0.01 volt.

(Long Answer Type Questions)

Q. 15. Derive expression for the self-induction of solenoid. What factors affect its value and how? **(Or)**

For an A.C. circuit containing L-C-R establish the formula for impedance of the circuit and write the relationship between the alternating e.m.f. and current in each of the following case when:

(i) $\omega L > \frac{1}{\omega C}$

(ii) $\omega L < \frac{1}{\omega C}$

(iii) $\omega L = \frac{1}{\omega C}$

Q. 16. What are conjugate foci? Deduce the following relationship between the focal length f of a spherical mirror, distance of object u and distance of image v :

$$\frac{1}{u} + \frac{1}{v} = \frac{1}{f} \quad \textbf{(Or)}$$

Derive the following expression for the refraction at convex spherical surface:

$$\frac{u}{v} - \frac{1}{u} = \frac{u-1}{R}$$