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) $E \propto \dfrac{1}{r^2}$

(iii) $E \propto \dfrac{1}{r}$ (iv) $E \propto \dfrac{1}{r^3}$

(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) $C = \dfrac{1}{4\pi \in_0 R}$ (ii) $C = 4\pi \in_0 R$

(iii) $C = 4\pi \in_0 R^2$ (iv) $C = 4\pi \quad R^3$

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(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) Ohm^{-1} metre^{-1}

Q. 2. Fill in the blanks:

(a) The sound waves are the longitudinal waves. The electro-magnetic 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 = $ ....

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

(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? http://www.mpboardonline.com

Q. 10. Write four laws of photoelectric effect. **(Or)**

Find energy of photon of wavelength 4000 $\overset{o}{A}$.

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 μA. 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) $\omega L > \dfrac{1}{\omega C}$

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

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

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 υ:

$$\frac{1}{u} + \frac{1}{\upsilon} = \frac{1}{f}$$

(Or)

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

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