

**Guess Paper – 2014**  
**Class – XII**  
**Subject – Physics**

**Time: 3 Hours**

**Max. Marks : 70**

**General Instructions**

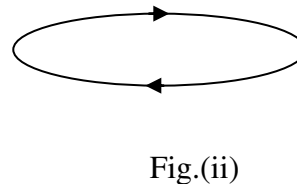
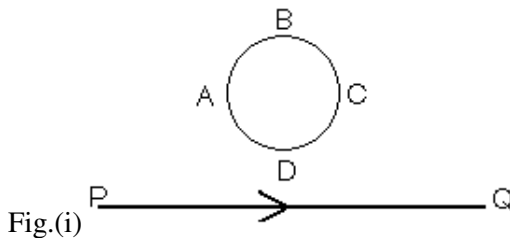
- All questions are compulsory.
- There is no overall choice. However, some internal choices have been provided in some questions.
- Question number 1 to 8, carrying one mark each, 9 to 18 carrying two marks each, 19 to 27 carrying three marks each, 28 to 30 carrying five marks each.
- Use of calculator is not permitted. However you may use log tables if necessary. You may use the following values of physical constants wherever necessary:

$$c = 3 \times 10^8 \text{ ms}^{-1}; \quad h = 6.6 \times 10^{-34} \text{ Js}; \quad e = 1.6 \times 10^{-19} \text{ C}$$

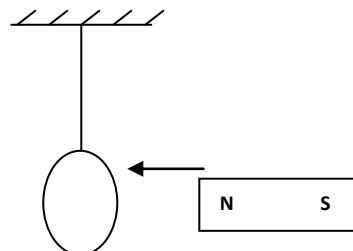
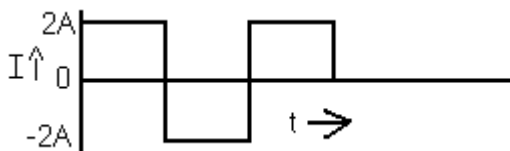
$$\mu_0 = 4\pi \times 10^{-7} \text{ T m A}^{-1}; \quad \text{Boltzmann constant } k = 1.38 \times 10^{23} \text{ JK}^{-1}$$

$$\text{Avogadro's number } N_A = 6.023 \times 10^{23} / \text{mole} \quad \text{Mass of neutron } M_n = 1.6 \times 10^{-27} \text{ kg}$$

1. Two electric lines never cross each other. Why?
2. What is the work done by the magnetic force on a charged particle moving perpendicular to the magnetic field?
3. What is the magnitude of the induced current in the circular loop-A B C D of radius r, if the straight wire PQ carries a steady current of magnitude I ampere?



4. Soap bubble shows beautiful colours in sunlight. Why?
5. The fig. (ii) Shows a circular loop carrying current I. Show the direction of magnetic field with the help of line of force.



6. Calculate the r.m.s. value of alternating current shown in the figure (iii).

7. Give the direction in which the induced current flows in the wire loop when the magnet moves towards it as shown in fig. (iv).
8. Suppose that the lower half of a concave mirror's reflecting surface is covered with an opaque non-reflecting material. What effect will this have on the image of an object placed in front of the mirror?
9. A wire of  $50 \Omega$  resistance is stretched to twice of its original length. What will be its (i) new resistivity and (ii) new resistance?
10. Which of the following statement is true & why?
  - (A)  $E_x = E_y = E_z$
  - (B)  $E_x > E_y > E_z$
  - (C)  $E_x = E_z < E_y$
  - (D)  $E_x < E_y < E_z$

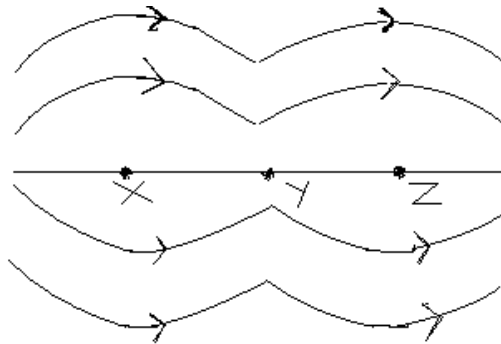


Fig.(v)

11. A charge of  $10 \mu\text{c}$  is brought from point A (0, 4 cm, 0) to C (3 cm, 0, 0) via point B (0, 0, 6 cm) in vacuum. Calculate the work done if the charge at origin is  $20 \mu\text{c}$ .

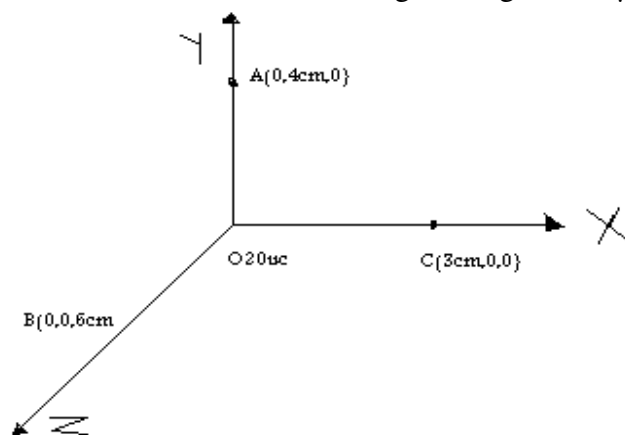


Fig.(vi)

**OR**

A charged particle is free to move in an electric field. Will it always move along an electric line of force? Justify your answers?

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12. N number of identical resistors each of resistance R is combined to get the maximum and minimum resistances, what is the ratio of the maximum to minimum resistance.
13. Draw V-I graph for ohmic and non-ohmic materials. Give one example for each.
14. What is the focal length of a convex lens of focal length 30 cm in contact with a concave lens of focal length 20 cm? Is the system is converging or diverging lens? Ignore the thickness of the lenses.
15. The refractive index of the material of a concave lens is  $\mu_1$ . It is immersed in a medium of refractive index  $\mu_2$ . A parallel beam of light is incident on the lens. Trace the path of emergent rays when  $\mu_2 > \mu_1$ .
16. Calculate the refractive index of the material of an equilateral prism for which the angle of minimum deviation is  $45^\circ$ .
17. State Lenz's law. Show that it is in accordance with the law of conservation of energy.

18. A light bulb and an open coil inductor are connected to an ac source as shown in fig (vii). The switch is closed and after some time, an iron rod is inserted into the interior of the inductor. The glow of light bulb (a) increases, (b) decreases (c) is unchanged as the iron rod is inserted; Give your answer with reasons.

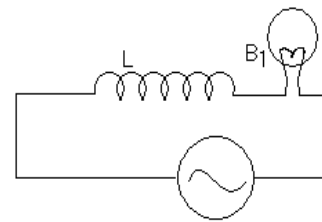
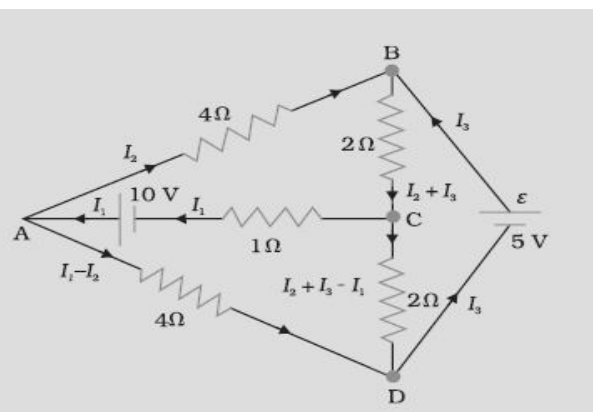


Fig (vii)

19. A small candle, 3 cm in size is placed at 24 cm from in front of a concave mirror of radius of curvature 36 cm. At what distance from the mirror should a screen be placed in order to obtain a sharp image? Describe the nature and size of the image. If the candle is moved closer to the mirror, how would the screen have to be moved?
20. A plane electromagnetic wave of frequency 50 MHz travel in free space along the x-direction. At a particular point in space and time the electric vector is  $\vec{E} = 6.3 \text{ V/m } \hat{j}$ . Calculate  $\vec{B}$  at this point.
21. What is dipole moment of an electric dipole? Derive an expression for the electric field on the equatorial line of an electric dipole.
22. If  $C_1 = 5\text{pF}$  and  $C_2 = 3\text{pF}$ , calculate the equivalent capacitance of the given network between points A & B?



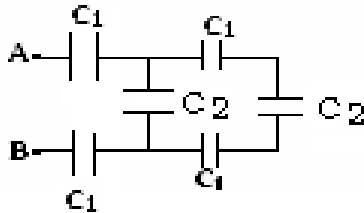


Fig (viii)

Fig(ix)

23. Determine the currents  $I_1$ ,  $I_2$ ,  $I_3$  in the network shown in fig (ix) using Kirchhoff's laws.

**OR**

State Kirchhoff's laws of an electrical network and draw the network diagram.

24. Figure (a), (b) and (c) Show three alternating circuits with equal currents. If frequency of alternating emf be increased, what will be the effect on currents in the three cases? Explain.

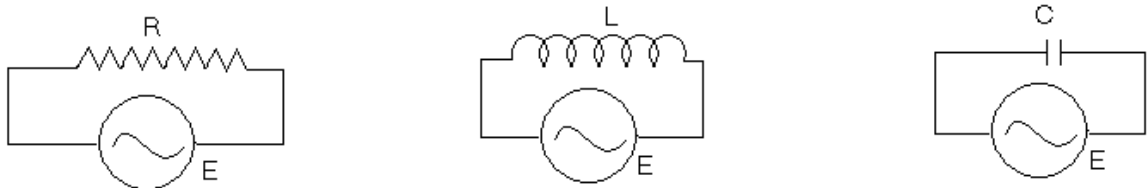


Fig.(x)

25. Discuss the phase relationship between current and e.m.f. in an a.c. circuit containing a capacitor only.

**OR**

Show that in an inductor, voltage leads to current by  $\pi/2$ .

26. A capacitor and a resistor are connected in series with an ac source. If the potential difference across the C, R are 120V and 90V respectively and if rms current of the circuit is 3 A, calculate the (i) impedance and (ii) power factor of the circuit.

27. Give reasons for the following: (i) Rainbow is not formed on the surface of the moon. (ii) The sun looks red at sunrise and sunset as viewed from the surface of the earth.

28. State Biot-Savart's law for the magnetic field due to a current carrying element. Use this law to obtain a formula for magnetic field at the Centre of a circular loop of radius R carrying a steady current I, sketch the magnetic field lines for a current loop clearly indicating the direction of the field.

**OR**

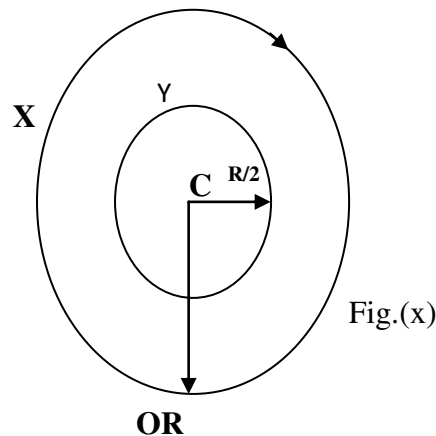
Draw a neat and labeled diagram of cyclotron. State the underlying principle and explain how a positively charged particle gets accelerated in this machine. Show mathematically that the cyclotron frequency does not depend upon the speed of the particle.

29. Describe an astronomical telescope. Derive expression for its magnifying power when final image is (i) at infinity, (ii) at least distance of distinct vision.

**OR**

Draw a graph to show variation of angle of deviation with angle of incidence in case of a prism. Hence derive prism formula.

30. Two circular coils 'X' and 'Y' having radii  $R$  and  $R/2$  respectively are placed in horizontal plane with their centers coinciding with each other. Coil X has a current  $I$  flowing through it in the clockwise sense. What must be the current in coil 'Y' to make the total magnetic field of the two coils, zero? With the same currents flowing in the two coils, if the coil 'Y' is now lifted vertically upwards through a distance  $R$ , what would be the net magnetic field at the centre of coil Y?



- (i) State and explain gauss theorem.  
 (ii) Using the gauss' theorem, find electric field due to  
 (a) Spherical shell.  
 (b) Infinite sheet of positive charge.

**Paper Submitted by:**

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