Name Kirti Nagpal Class & Section XII-A Roll No. 3

FIRST TERMINAL EXAMINATION–2015-2016

Class–XII

Subject–Physics

Time Allowed : 3 Hrs. **M.M. : 70**

Please check the total marks

Do not write any answers on the question paper.

General Instructions

1. *All questions are compulsory. There are 26 questions in all.*
2. *This question paper has five sections: Section A, Section B, Section C, Section D and Section E.*
3. *Section A contains five questions of one mark each, Section B contains five questions of two marks each, Section C contains twelve questions of three marks each, Section D contains one value based question of four marks and Section E contains three questions of five marks each.*
4. *There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all the three questions of five marks weightage. You have to attempt only one of the choices in such questions.*
5. *You may use the following values of physical constants wherever necessary.*

$c = 3 \times 10^{8}$ m/s

$h = 6.63 \times 10^{-34}$ Js

$e = 1.6 \times 10^{-19}$ C

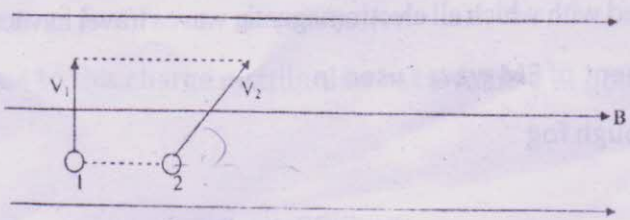
$\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1}

$\varepsilon_0 = 8.854 \times 10^{-12}$ $C^2 N^{-1} m^{-2}$

SECTION A

1. A potential difference V is applied across conductor of length L. What happens to the drift velocity, when temperature is increased? (1)

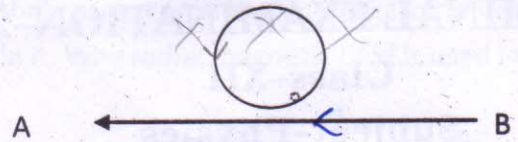
2. Two particles, having same charges but different velocities, are moving in a uniform magnetic field. The particles' velocity vector, drawn to scale is shown in the figure. Which particle experiences greater magnetic Lorentz force? Justify your answer. (1)



$F = qvB\sin\theta$

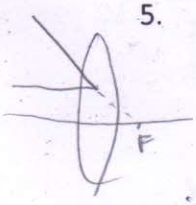
qvB

3. The electric current in a wire in the direction from B to A is increasing. What is the direction of induced current in the metallic loop kept above the wire as shown? Give reason. (1)



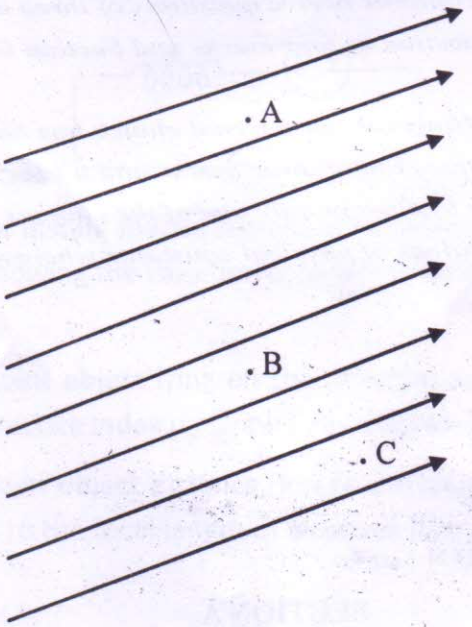
4. The electric field of a propagating EM wave through vacuum is given by $E_x = 300 \sin(2 * 10^{14} t - kz)$. Find the amplitude of associated magnetic field. (1)

5. A convex lens of refractive index μ_1 is kept in a medium of refractive index μ_2, with $\mu_2 > \mu_1$. Draw a ray diagram to show how a ray of light, incident parallel to the principal axis, behaves on passing through the lens. (1)



SECTION B

6. At which of the points A, B and C in a uniform electrostatic field as shown, will the electric potential be (a) minimum (b) maximum? Give reason. (2)



7. A long thick conductor of radius 'a' carries a current I. Find the ratio of magnetic field at point 'a/2' from the surface inside and outside the conductor. (2)

8. State two difference between conduction current and displacement current. (2)

OR

What is the displacement current in a capacitor when it is completely charged? Write the expression for the constant speed with which all electromagnetic waves travel in vacuum. (2)

9. Name the component of EM waves used in

(i) Seeing through fog

(ii) LASIK eye surgery

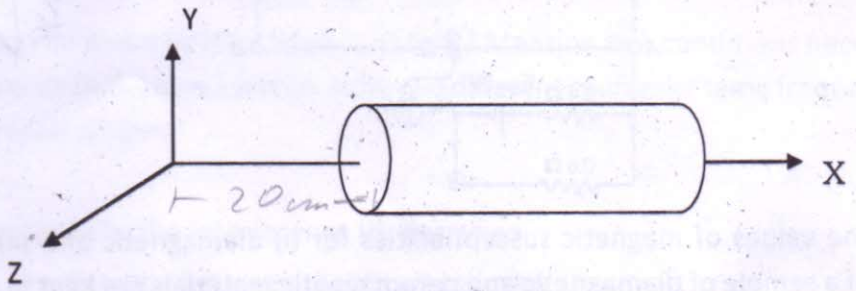
(iii) Checking for fault in metal surfaces

(iv) RADAR (2)

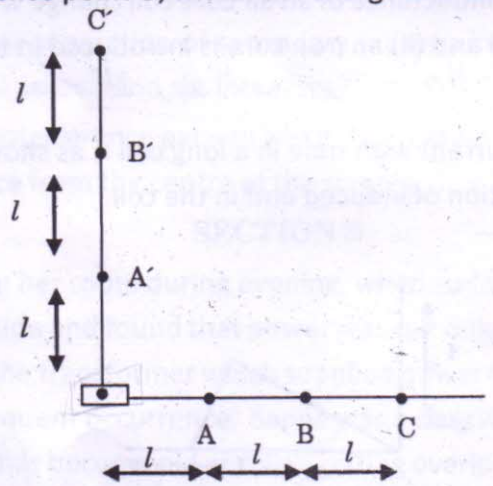
10. The ratio of intensity in interference pattern maxima and minima is 25:9. Find the ratio of intensity of the incident coherent waves. (2)

SECTION C

11. A cylinder of length 40 cm and radius 7 cm is kept in an electric field $E_x = (10x^2 + 4x)$ N/C, $E_y = E_z = 0$ as shown in the figure. If the left face of the cylinder is 20 cm from the origin, find the net flux passing through the cylinder. Also find the net charge enclosed by the cylinder. (3)



12. The following data was obtained for the dependence of the magnitude of electric field, with distance, from a reference point O, within the charge distribution in the shaded region.



Field Point	A	B	C	A'	B'	C'
Magnitude of electric field	E	E/8	E/27	E/2	E/16	E/64

(i) Identify the charge distribution and justify your answer.

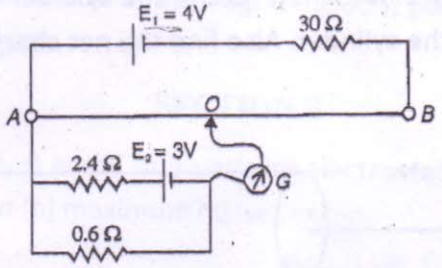
(ii) Which value is wrong? Justify your answer.

(iii) If the potential due to this charge distribution has a value V at point A, what is its value at the point A'? (3)

13. A 600 pF capacitor is charged by a 200V supply. It is then disconnected from the supply and is connected to another uncharged 600 pF capacitor. Find (i) common potential (ii) initial and final energies (iii) loss of electrostatic energy. (3)

14. Two cells of emf E_1 and E_2 and internal resistances r_1 and r_2 are connected in parallel. Find an expression for effective emf and effective internal resistance of the combination. (3)

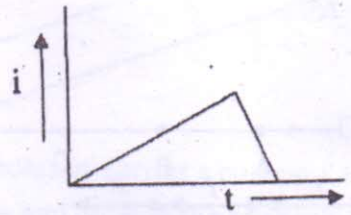
15. AB is 2 meter long uniform wire of 20 Ω resistance. The other data are shown in the diagram. Calculate (i) potential gradient along AB, and (ii) length AO of the wire, when the galvanometer shows no deflection. (3)



16. What are the values of magnetic susceptibilities for (i) diamagnetic and (ii) paramagnetic materials? If a sample of diamagnetic and paramagnetic materials are kept in magnetic field, show using a diagram how the magnetic field lines get modified. (3)

17. (a) How does the self inductance of an air core coil change when (i) the number of turns in the coil is doubled and (ii) an iron core is introduced in the coil? Give reason for your answers.

(b) The variation of current with time in a long coil is as shown in the figure. Plot a graph showing the variation of induced emf in the coil. (3)



18. An ac circuit having an inductor and a resistor in series draws a power of 560 W from an ac source marked 210 V, 60 Hz. If the power factor of the circuit is 0.8, calculate (i) the impedance of the circuit and (ii) the inductance of the inductor used. (3)

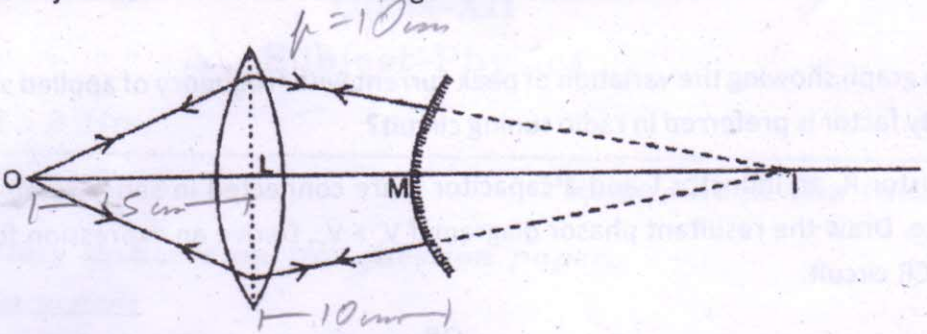
19. State the reasons for the following observations:

i) Danger signals are always red in colour

ii) Sky appears dark on moon

iii) Focal length of convex lens increases when immersed in water. (3)

20. An object is placed at a distance of 15 cm from a convex lens of focal length 10 cm. On the other side of the lens; a convex mirror is placed such that its distance, from the lens, equals the focal length of the lens. The image formed by this combination is observed to coincide with the object itself. Find the focal length of the convex mirror. (3)



21. What do you mean by interference of light? Mention two conditions necessary for sustained interference pattern on a screen. Why two different sources of same frequency cannot produce interference pattern? (3)

Or

What happens to the interference fringes when

(i) The distance between the slits is reduced

(ii) Monochromatic light is replaced by white light

(iii) The whole apparatus is immersed in water. (3)

22. How does the angular separation of secondary maxima in diffraction pattern change when the distance between screen and slit increases?

Distinguish between interference pattern and diffraction pattern by drawing graph of intensity variation with distance from the centre of the screen. (3)

SECTION D

23. Sapna was studying in her room during evening, when suddenly there was a power cut in her house. She went outside and found that power was out only for few houses near her house. It was discovered that the transformer which supplied power to those homes had broken down. It was becoming a frequent occurrence. Sapna was a class XII science student, so she guessed that the transformer has become old and was getting overloaded. She talked to her father and other neighbours and convinced them to write to BSES to replace the old transformer by a new one. After some effort from her father and others, the transformer was replaced. Sapna was happy that her persuasion has brought result.

(i) Name two moral values displayed by Sapna.

(ii) What is the role of transformer in the transmission of electric power? (2+2=4)

SECTION E

24. Draw a labelled diagram of the cyclotron. Explain the role played by electric field and magnetic field in its working. Why a charged particle cannot be accelerated to the order of speed of light using a cyclotron? (1+2+2 = 5)

OR

What is the principle of moving coil galvanometer? Draw a labelled diagram of a moving coil galvanometer. Show that current produced in the galvanometer is directly proportional to the deflection produced in it. Why radial magnetic field is used in the galvanometer?

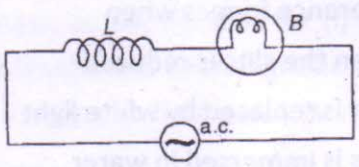
(1+1+2+1=5)

25. Plot a graph showing the variation of peak current with frequency of applied source. Why high quality factor is preferred in radio tuning circuit?

A resistor R, an inductor L and a capacitor C are connected in series to an alternating emf source. Draw the resultant phasor diagram if $V_L > V_C$. Derive an expression for impedance of the LCR circuit. (2+3=5)

OR

An inductor 'L' of reactance X_L is connected in series with a bulb B to an ac source as shown. Briefly explain how does the brightness of the bulb change when (i) number of turns of the inductor is reduced and (ii) a capacitor of reactance $X_L = X_C$ is introduced in the circuit.



Derive an expression for instantaneous current in pure inductive circuit and draw its phasor diagram. Plot a graph showing the variation of inductive reactance with frequency of applied source. (1+1+2.5+0.5 = 5)

26. A ray of light from a point object lying on the principal axis in air is incident on a convex spherical surface of refractive index μ_2. Draw a ray diagram showing the image formation.

Derive a relation between object distance, image distance and radius of curvature of the surface. What happens to the focal length of a convex lens when it is cut vertically? Explain. (1+3+1=5)

OR

Draw a ray diagram for an astronomical telescope when the image is formed at least distance of distinct vision. Derive an expression for the magnifying power in this case. What is the characteristics of lenses used for objective and eye piece? (1+3+1=5)