International Indian School Dammam

First Terminal Examinations June 2013

Class XII

Subject -- Physics (Theory)

Time 3 Hours   Max Marks 70

General Instructions:

i. Attempt All questions. There is NO overall choice in question. Although internal choice is given in one question of 3 marks and all three questions of 5 marks. **Draw necessary diagram to explain your answer.**

ii. Symbols have their usual meaning. All parts of a question attempt together.

iii. Question No. 1 to 8 carry one marks each. Ques. No. 9 to 16 carry two marks each. Que. No. 17 to 25 carry three marks each. Ques. No. 26 is value based question and carry 4 mark weightage, Ques. No. 27 to 29 carry five marks each.

iv. Use of calculator not allowed. You may use log tables for calculations...

Set A

1. On what a factor does the magnitude of the emf induced in the circuit due to magnetic flux depends?

2. A electrostatic field cannot be discontinuous. Why?

3. A metal plate is introduced between the plates of a charged parallel plate capacitor. What is its effect on the capacitance of the capacitor.

4. A straight wire of mass 200 g and length 1.5 m carries a current of 2 A. It is suspended in mid air by a uniform horizontal magnetic field **B**. Calculate the magnitude of the magnetic field.

5. Are the paths of electrons straight lines between successive collisions(with the positive ions of the metal in the   (i) presence of electric field   (ii) absence of electric field

6. What is the advantage of using radial magnetic field in moving coil galvanometer?

7. Define electric dipole moment? Is it scalar or vector ?

8. Draw a graph to show the temperature dependence of resistivity for a semiconductor like silicon.

9. Why the connections between resistors in a meter bridge made of thick copper strips?

10. Why alnico and steel are more suitable than soft iron core in making permanent magnets?

11. In the following circuit , potential gradient along wire AB will increase or decrease , if resistance R increases.
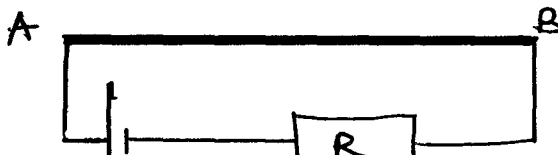
12. An infinite line charge produces a field of 9×10^4 N/C at a distance of 2 cm. Calculate ̶̶̶̶̶̶̶̶̶̶̶density.

13. Distinguish between ferromagnetic and diamagnetic substance on the basis of susceptibil̶̶̶̶ permeability with at least one example of each type.

14. A particle of mass m and charge q moving with a uniform velocity v enters in a region where unifor̶̶ electric and magnetic fields are present. It passes through the region without any change in its velocity. What you can conclude about (i) magnitude of **E** and **B** and (ii) relative directions of **E, B** and **v**.

15. State Gauss's law of magnetism. If monopole existed, how would the Gauss's law be modified?

16. How are the eddy currents reduced in a metallic core? Give any one use of eddy currents?

17. State Ampere's circuital law. Use it to derive expression for magnetic field due to a long solenoid.

18. Two charges 3×10^{-8} C and -2×10^{-8}C are placed 15 cm apart in air. At what point on the line joining the two charges is the electric potential zero? Take the electric potential at infinity to be zero.

19. Define the magnetic elements of earth.

20. Obtain the expression for the magnetic energy stored in a solenoid in terms of magnetic field B, area A and length l of the solenoid.

21. A parallel plate capacitor, each of plate area A and separation d between the two plates, is charged with charges +Q and –Q on the two plates. Deduce the expression for the energy stored in the capacitor.

22. In Bohr model of hydrogen atom, negatively charged electron is revolving around a positively charged nucleus. Derive the relation for magnetic dipole moment of it.

23. Two cells of emf E_1 and E_2 and internal resistances r_1 and r_2 respectively are connected in parallel combination. Derive the relation for equivalent emf and resistance.

24. Deduce an expression for the electric field at a point on the equatorial plane of an electric dipole of dipole length 2a.

25. Define (a) Meissner effect and (b) Curie's law in field of magnetism.

26. *Sheetal , a science student, while studying, was impressed that the nervous system in animals depends on the electrical signals to work. Neurons pass on signals from sense organs to the brain. The passage of an electrical signal constitutes an electric current. Sheetal was curious to know the range of currents in different situations. She found that current in domestic appliances is a few amperes. During lightning, the electric current is in tens of thousands of amperes, while in the nervous system, it is only a few microamperes. She further discussed with her teacher about the magnitude of the magnetic field created by these currents.*
   (a) What values did Sheetal have?
   (b) A galvanometer coil has a resistance of 15 ohms and the meter shows full scale deflection for a current of 4 milliampere. How will you convert the meter into an ammeter of range 0 m- 6 amperes?

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27.   (a) State Gauss's theorem of electrostatics.

(b) Derive the relation for electric field produced due to a uniformly charges plane meta$\qquad$
Gauss's theorem. (c) A point charge of 2×10^{-6}C is at the center of a cubic Gaussian surface $\qquad$
10 cm. What is the net electric flux through the surface?

OR

(a) **An** electric dipole of charge $+q$ and $-q$ and dipole length $2a$ placed in external uniform electric field **E**. Derive
the relation for torque and stored potential energy. (b) A 12×10^{-12} F capacitor is connected to a battery of 50
V. How much electrostatic energy is stored in the capacitor.

28.   (a) Derive relation between current and drift velocity of charge carrier in a conductor.

(b) Define mobility and give expression for it.
(c) A battery of emf 10 V and internal resistance 3Ω is connected to a external resistor. If the current in the 0.5 A,
what is the resistance of the resistor. What is the terminal voltage of the battery when the circuit is closed.

OR

(a) What is the principal of potentiometer? How can we use it to find internal resistance of a primary cell.
With help of circuit diagram explain in brief.
(b) In a potentiometer experiment ,a cell of emf 1.5 V gives a balance point at 350cm length of wire. If the cell
is replaced by another cell then balance point shifts to 490cm. What is the emf of second cell.

29.   (a) State the principle of cyclotron and derive the relation for radius of path and cyclotron frequency.

(b)What is the radius of the path of an electron moving at a speed of 3×10^7 m /s in a magnetic field of

6×10^{-4} T perpendicular to it. What is its frequency and kinetic energy.

OR

(a)State the principle and explain working of Moving coil galvanometer with help of diagram.

(b) in the magnetic meridian of a certain place, the horizontal component of earth's magnetic field is 0.26
G and the dip angle is 60^0. Determine the magnetic field of the earth at this palce.

Use

$c = 3 \times 10^{8}$ m/s	$1/4\pi\varepsilon_0 = 9 \times 10^9$ Nm^{2}C^{-2}	$e = 1.6 \times 10^{-19}$ C
$m_e = 9.1 \times 10^{-31}$ kg	$\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1}	