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HALF YEARLY EXAMINATION 2016

CLASS XII PHYSICS

MM: 70 **TIME : 3 Hrs**

General Instructions

1.All questions are compulsory.

2. 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. Section E contains three questions of five marks each.

3. There is no overall choice.An internal choice has been provided in one question of two marks , one question of three marks and all questions of five marks. Attempt only one of the choices.

SECTION A

1.What is the work done in moving a test charge of **q** coulomb through a distance of 1cm along the equatorial axis of an electric dipole? (1)

2. A charge **Q** is placed at the center of a cube of side **a** units. What is the electric flux passing through two opposite faces of the cube? (1)

3.How does the mutual inductance of a pair of coils change when (a) distance between the coils is increased (b) number of turns of the coil is increased.? (1)

4.How does focal length of a lens change when red light incident on it is replaced by violet light? (1)

5.In a single slit experiment the width of the slit is doubled. How does this affect the size and intensity of the central diffraction band? (1)

SECTION B

6.Explain the term drift velocity of electrons in a conductor. Hence obtain expression for current through a conductor in terms of drift velocity.

OR Describe briefly with circuit diagram how a potentiometer is used to determine internal resistance of a cell . (2)

7.The velocities of two alpha particles A and B entering a uniform magnetic field at right angles to it are in the ratio 4 : 1 . Find the ratio of the radii of their paths on entering the field. What is the work done by Lorentz force on these particles? (2)

8.State the underlying principle of an AC generator. Derive expression for the instantaneous emf induced in an AC generator.
(2)

9. The electric field part of a plane EM wave is $E = 3.1\ N/C \cos\{(1.8\ rad/m)y + (15.4 \times 10^6\ rad/s)t\}\mathbf{i}$. What is the direction of propagation of the wave? What is the wavelength and frequency of the wave? (2)

10. Draw a labeled diagram of a refracting telescope in near point adjustment. Write the expression for its magnifying power. (2)

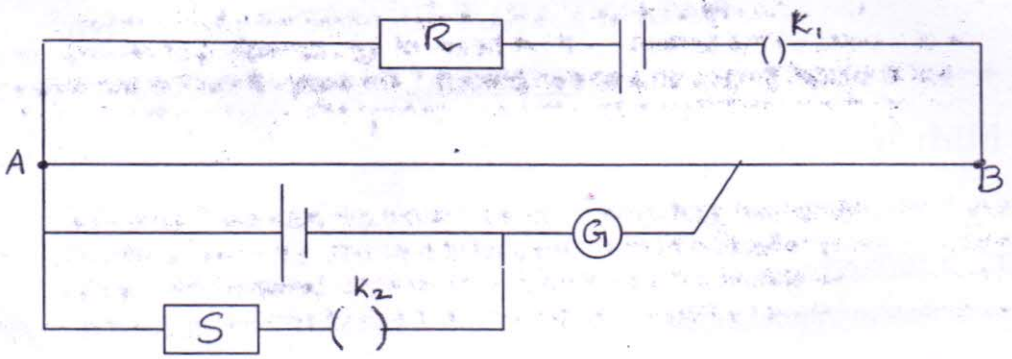
SECTION C

11.Derive expression for the torque and force acting on an electric dipole placed in an external uniform electric field. (3)

12. In a parallel plate capacitor with air between the plates , each plate has an area $6 \times 10^{-3}\ m^2$ and the separation between the plates is 3mm . Calculate the capacitance of the capacitor .If this capacitor is connected to a 100V supply What would be the charge on each plate? How would the charge be affected if a 3mm thick mica sheet of k = 6 is inserted between the plates while voltage supply remains connected? (3)

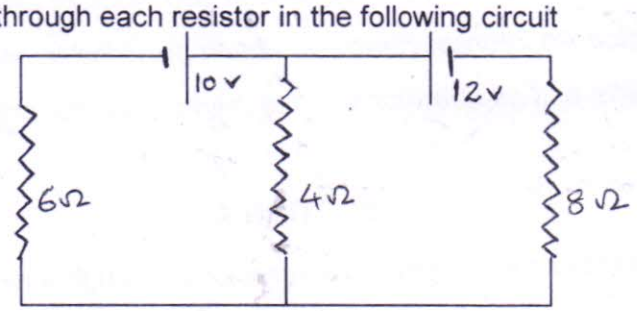
13. Derive an expression for resistivity of a conductor in terms of number density of electrons. Explain how it depends on temperature for metals and semiconductors . (3)

14. Two students X and Y perform an experiment on potentiometer separately .



How will the position of the null point be affected if (a) X increases the value of R keeping K1 closed and K2 open . (b) Y decreases the value of S keeping k1 closed and k2 open . (3)

15.Determine the current through each resistor in the following circuit (3)



16. Define angle of dip. How does it vary on the surface of the earth? What is the relation between the horizontal and vertical components of the earth's magnetic field ? (3)

17. Show that two parallel conductors carrying currents in the same direction attract each other. Hence define one ampere. (3)

18. What are eddy currents ? Explain anyone application of eddy current. What are the ways in which it is reduced? (3)

19. Derive the phase relation between current and voltage in an ac circuit containing a capacitor. An alternating voltage v = 280sin50πt V is connected across a pure resistor 40 ohm. Find the frequency of the source and rms current through the resistor.

OR An alternating voltage of frequency f is applied across a series LCR circuit. Write the condition for which the current in the circuit will lag , lead or remain in phase with the applied voltage . Explain the condition when current and voltage are in phase. (3)

20. Electromagnetic waves with wavelength λ_1 is used in satellite communication , λ_2 is used to kill germs in water purifiers, λ_3 used to detect leakage in underground oil pipes, λ_4 is used to improve visibility in foggy conditions. Identify the waves and arrange them in ascending order of wavelength. Write how they are produced? (3)

21.Derive lens makers formula with necessary assumptions and ray diagram. (3)

22. A concave lens of focal length 20cm is placed coaxially with a convex mirror of radius of curvature 20cm. The two are kept 15cm apart. A point object is placed 60cm in front of the convex lens . Find the position and nature of image formed . (3)

SECTION D

23.A group of students noticed a box marked " Danger H. T . 2200 V " at a substation. They did not understand the utility of such a high voltage while they argued thay supply is only 220V. Next day they asked their teacher who explained the reason to the whole class.

(a) What is the device used to bring down high ac voltage to low value? What is the principle of its working?

(b) Why transmission of ac occurs at such high voltages?

(c) Write the values displayed by the teacher and the students? (4)

SECTION E

24. (a) In the Young's double slit experiment , derive the conditions for constructive and destructive interference at a point on the screen. (b) A beam of light consisting of two wavelengths 800nm and 600nm is used to obtain fringes on a screen placed 1.4m away . If the two slits are separated by 0.28mm calculate the least distance from the central bright fringe where the bright fringes of the two wavelengths coincide .

OR

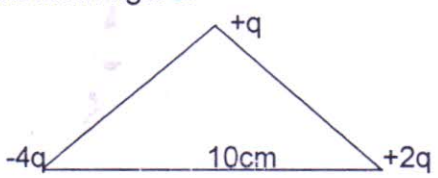
(a) How does unpolarised light incident on a Polaroid get polarised? Describe with necessary diagram polarisation of light by reflection from a transparent medium. (b) Two polaroids A and B are kept in crossed position .How should a third Polaroid C be placed between them so that the intensity of polarised light transmitted by Polaroid B reduces to 1/8 th of intensity of unpolarised light incident on A (5)

25. (a)Using Gauss' law derive an expression for the electric field intensity at any point outside a uniformly charged spherical shell of radius R . Represent the dependence of intensity on distance graphically. (b) A uniformly charged conducting sphere of 2.5m diameter has a surface charge density 100μ C m^{-2} .Calculate the charge on the sphere and total electric flux passing through the sphere

OR

(a) Define electrostatic potential energy of a charge. Derive expression for the potential energy of a system of charges . (b) calculate the work done to dissociate a system of three charges placed at the vertices of an equilateral triangle as shown in figure.

$q = 1.6 \times 10^{-10}$ C



(5)

26. (a)State the Biot –Savart law for magnetic field due to a current carrying element.Use this law to obtain magnetic field at axial point of a circular loop of radius R carrying a current I .Sketch the field pattern .Also write expression for magnetic field at the center of the coil. (b) An electron moving along positive X axis inprescence of a uniform magnetic field along negative Y axis .What is the direction of the force acting on it?

OR

(a) Draw a labeled diagram of a moving coil galvanometer. Describe its principle and working. Why is it necessary to introduce a cylindrical soft iron core inside the coil. (b) Which of the two ammeter or milliammeter has higher resistance ? Why? (5)