DELHI PUBLIC SCHOOL, BAHADURGARH

Sample Paper 1

PHYSICS

CLASS-XII

Date-

Duration:3hr

SET: 1

General Instructions:-

- ***All questions are compulsory.***
- ***There are 30 questions in total. Questions 1 to 8 carry one mark each, Questions 9 to 18 carry 2 marks each, Questions 19 to 27 carry 3 marks each and questions 28 to 30 carry 5 marks each.***
- ***Use of calculators are not permitted.***

1. The power factor of an a.c circuit is 0.5. What will be the phase difference between voltage and current in this circuit?
2. What type of wavefront will emerge from a point source and a distant object?
3. Write the following radiations in ascending order in respect of their frequencies – X-rays, micro waves, UV rays, radio waves.
4. Magnetic field lines can be entirely confined within the core of a toroid, but not with a straight solenoid. Why?
5. An electric dipole of dipole moment 20×10^{-6}C m is enclosed by a closed surface. What is the net flux coming out of the surface?
6. You are given following three lenses. Which two lenses will you use as an eye piece and as an objective to construct astronomical telescope?

Lenses	Power(P)	Aperture(A)
L1	3D	8cm
L2	6D	1cm
L3	10D	1cm

7. An electron beam projected along +X-axis, experiences a force due to a magnetic field along +Y-axis. What is the direction of the magnetic field?
8. If the angle between the axis of the polarizer and analyser is 45°, write the ratio of the intensities of original light and the transmitted light after passing through the analyser.
9. Define electric lines of force and give its two important properties.

10. Derive an expression for drift velocity of free electrons in a conductor in terms of relaxation time.
11. Why does the electric field inside a dielectric decrease when it is placed in an external electric field?
12. State Biot-Savarts law.
13. Three point charges of +2μc,-3μc,-3μc are kept at kept at the vertices A,B,C respectively of a equilateral triangle of side 20cm as shown in the fig. What should be the sign and magnitude of the charge to be placed at the midpoint M of side BC so that the charge at A remains in equilibrium.

14. How does a charge q oscillating at certain frequency produce e.m waves? Sketch a schematic diagram depicting electric and magnetic field for an e.m wave propagating along Z-direction.
15. Draw V-I graph for ohmic and non-ohmic materials. Give one example for each.
16. Define the terms magnetic dip and magnetic declination with the help of relevant diagrams.
17. The image of a candle is formed by a convex lens on a screen. The lower half of the lens is painted black to make it completely opaque. Draw the ray diagram to show the image formation. How will this image be different from the one obtained when the lens is not painted black?
18. (i) Can two equipotential surfaces intersect each other?
    (ii) Two charges –q and +q are located at points A(0,0,-a) and B(0,0,+a) respectively. How much work is done in moving a test charge from point P(7,0,0) to Q(-3,0,0)?
19. Explain, with the help of diagram, the principle and working of an a.c generator. Write the expression for the emf generated in the coil in terms of its speed of rotation.
20. Three identical capacitors C1,C2,C3 of capacitance 6μF each connected to a 12V supply as shown

    Find
    (i) Charge on each capacitor
    (ii) Equivalent capacitance of network
    (iii) Energy stored in network of capacitors

21. Define self inductance. Write its S.I units. Derive an expression for self inductance of a long solenoid of length 'l', cross sectional area 'A' having 'n' number of turns.
22. An electric dipole is held in a uniform electric field. Using suitable diagram show that it does not undergo any translator motion. Derive an expression for the torque acting on it and specify its direction.
23. In a single slit diffraction experiment, when a tiny circular obstacle is placed in the path of light from a distant source, a bright spot is seen at the centre of the shadow of the obstacle. Explain why?
    State two points of difference between the interference pattern obtained in Young's double slit experiment and the diffraction pattern due to single slit.
24. Define resistivity and write its S.I unit. Derive the expression for the resistivity of a conductor in terms of number density of free electrons and relaxation time.
25. Derive the expression for force per unit length between two long straight parallel current carrying conductors. Hence define one ampere.
26. A thin conducting spherical shell of radius R has charge Q spread uniformly over its surface. Using Gauss's law, derive an expression for an electric field at a point outside the shell. Draw a graph of electric field E(r) with distance r from the centre of the shell for $0 \leq r \leq \infty$.
27. Explain with the help of a circuit diagram, how the thickness of depletion layer in pnp junction diode changes when it is forward biased. In the following circuit which one of the two diodes in forward biased and which is reverse biased?

28. How is zener diode fabricated so as to make it a special purpose diode? Draw I-V characteristics of zener diode and explain the significance of break down voltage. Explain briefly with the help of a circuit diagram how a p-n junction diode works as a half wave rectifier?
29. Draw the labeled ray diagram for the formation of image by a compound microscope. Derive the expression for magnifying power.
30. Draw the circuit diagram to study the input and output characteristics of an npn transistor in CE configuration. Draw its typical input and output characteristics.

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DELHI PUBLIC SCHOOL, BAHADURGARH
Sample Paper 2
PHYSICS
CLASS-XII

Date-

Duration:3hr
SET: 2

General Instructions:-

- ***All questions are compulsory.***
- ***There are 30 questions in total. Questions 1 to 8 carry one mark each, Questions 9 to 18 carry 2 marks each, Questions 19 to 27 carry 3 marks each and questions 28 to 30 carry 5 marks each.***
- ***Use of calculators are not permitted.***

1. What is the direction of the force acting on a charged particle q, moving with a velocity *v* in a uniform magnetic field *B*?
2. Name the part of the electromagnetic spectrum of wavelength 10-2 m and mention its one application.
3. A glass lens of refractive index 1.5 is placed in a trough of liquid. What must be the refractive index of the liquid in order to make the lens disappear?
4. A 500 m C Charge is at the centre of a square of side 10cm. Find the work done in moving a charge of 10 m C between two diagonally opposite points on the square.
5. How does the fringe width of interference fringes change, when the whole apparatus of Young's experiment is kept in a liquid of refractive index 1.3?
6. The plot of the variation of potential difference across a combination of three identical cells in series, versus current is as shown below. What is the emf of each, cell?
7. Derive the expression for the electric potential at any point along the axial line of an electric dipole?
8. Where on the surface of earth is angle of dip 90°?
9. Define magnetic susceptibility of a material. Name two elements, one having positive
susceptibility and the other having negative susceptibility. What does negative susceptibility signify?

10. Write the expression for Lorentz magnetic force on a particle of charge q moving with a velocity v in a magnetic field B. Show that no work is done by this force on the charged particle.
11. Derive an expression for the impedance of a.c. circuit consisting of an inductor and a resistor.
12. Distinguish between an intrinsic semiconductor and P-type semicondutor Give reason, why, a P-type semiconductor crystal is electrically neutral, although nh>>ne?
13. Draw a ray diagram of a reflecting telescope. State two advantages of this telescope over a refracting telescope.
14. A ray of light passing through an equilateral triangular glass prism from air undergoes minimum deviation when angle of incidence is 3/4th of the angle of prism. Calculate the speed of light in the prism.
15. How is a wave front defined? Using Huygen's construction draw a figure showing the
propagation of a plane wave refraction at a plane surface separating two media. Hence verify Snell's law of refraction.
16. A parallel plate capacitor is being charged by a time varying current. Explain briefly how amperes circuital theorem is generalized to incorporate the effect due to displacement current.
17. Let capacitance of three identical capacitors in series is 1μF. What will be their net capacitance if connected in parallel?
18. What are eddy currents? Write any 2 apllications of eddy currents.
19. A metallic rod of length *l* is rotated at a constant angular speed w, normal to a uniform magnetic field B. Derive an expression for the current induced in the rod, if the resistance of the rod is R.
20. The figure below shows the V-1 characteristic of a semiconductor diode.
    (i) Identify the semiconductor diode used.
    (ii) Draw the circuit diagram to obtain the given characteristic of this device.
    (iii)Briefly explain how this diode can be used as a voltage regulator.
21. An inductor 200mH, capacitor 500 m F, resistor 10W are connected in series with a 100 V, variable frequency a.c. source. Calculate the
    (i) frequency at which the power factor of the circuit is unity
    (ii) current amplitude at this frequency
    (iii) Q-factor
22. Prove that the current density of a metallic conductor is directly proportional to the drift speed of electrons.
23. A potentiometer wire of length lm is connected to a drive cell of emf 3 V as shown in the figure.

When a cell of 1.5 V mf is used in the secondary circuit, the balance point is found to be 60cm.

On replacing this cell and using a cell of unknown emf, the balance point shifts to 80cm

(i) Calculate unknown emf of the cell.

(ii) Explain with reason, whether the circuit works, if the drive cell is replaced with a cell emf 1V.

(iii) Does the high resistance R, used in the secondary circuit affect the balance point? Justify your answer.

24. A convex lens made of glass of refractive index 1.5 is dipped, in turn in (a)a medium of n=1.65 (b)a medium of n=1.33. will it behave as a converging or diverging lens in two cases? How will its focal length change in two media?

25. Show that in an a.c circuit containing a pure inductor, voltage is ahead of current by $\frac{\pi}{2}$ in phase.

26. A compound microscope uses an objective lens of focal length 10cm. An object is placed at 6cm from the objective lens. Calculate the magnifying power of compound microscope. Also calculate legth of microscope.

27. Draw a labelled diagram of full wave rectifier circuit. State its working principle. Show the input and output wave forms.

28. (a) Using Biot-Savart's law, derive an expression for the magnetic field at the centre of a circular coil of radius R, number of turns N, carrying current i.

(b) Two small identical circular coils marked 1, 2 carry equal currents and are placed with their geometric axes perpendicular to each other as shown in the figure. Derive an expression for the resultant magnetic field at O.

29. Draw a schematic diagram of a cyclotron. Explain its underlying principle and working, stating clearly the function of the electric and magnetic fields applied on a charged particle. Deduce an expression for the period of revolution and show that it does not depend on the speed of the charged particle.

30. (a) What is plane polarised light? Two polaroids are placed at 90° to each other and the transmitted intensity is zero. What happens when one more

Polaroid is placed between these two, bisecting the angle between them? How will the intensity of transmitted light vary on further rotating the third Polaroid?

(b) If a light beam shows no intensity variation when transmitted through a polaroid which is rotated, does it mean that the light is unpolarised? Explain briefly.

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