CLASS XII
SAMPLE PAPER-01
PHYSICS (THEORY)

Time: Three Hours **Full Marks: 70**

General Instructions:

- All questions are compulsory.
- 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 questions of five marks. You have to attempt only one the choice in such questions.
- Question numbers 1 to 5 are very short answer type questions, carrying 1 mark each.
- Questions numbers 6 to 10 are short answer type questions carrying 2 marks each.
- Question numbers 11 to 22 are also short answer type questions, carrying 3 marks each.
- Question numbers 23 is a value based type question, carries 4 marks.
- Question numbers 24 to 26 are long answer type questions, carrying 5 marks each.
- Use of calculators is not permitted. However, you may use log tables, if necessary.
- You may use the following values of physical constants wherever necessary:

  $C = 3 \times 10^8$ ms^{-1},

  $h = 6.626 \times 10^{-34}$ Js,

  $e = 1.602 \times 10^{-19}$ C

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

  $1/4\pi\varepsilon_0 = 9 \times 10^9$ Nm^2 C^{-2}

  $M_e = 9.1 \times 10^{31}$ kg.

1. A charge of 200 μC is moved between two points on an equipotential surface. Calculate work done during this process. 1
2. The maximum kinetic energy of photoelectron for a metal is 3 eV. What is its stopping potential? 1
3. At what angle of incidence a light beam should strike on a glass slab of refractive index 3/2, so that the reflected and the refracted rays are perpendicular to each other. 1
4. What should be the length of the dipole antenna for a carrier wave of frequency 3×10^8 Hz?

5. Why is the conductivity of n-type semiconductor greater than that of the p-type semiconductor even when both of these have same level of doping?
6. Show that an electric dipole will be in translator equilibrium in external uniform electric field.
7. An iron bar falling vertically through the hollow region of a thick cylindrical shell made of copper experiences a retarding force and attains a terminal velocity. What can you conclude about the iron bar?
   Or
   Explain Faraday's law of electromagnetic induction.
8. What is total internal reflection? What are conditions for it? Name any one of its practical application.
9. A transmitting antenna at the top of a tower has a height 32 m and the height of the receiving antenna is 50 m. What is the maximum distance between them for satisfactory communication in LOS mode? Given radius of earth 6.4×10^6 m.
10. Name the device used for data transmission from one computer to an other. Justify the name.Using this device draw the block diagram for data Communication and explain it briefly
11. Define the term current density of a metallic conductor. Deduce the relation between current density and the conductivity of the conductor, when an electric field E is applied to it.
12. A short bar magnet of magnetic moment m = 0.32 JT^{-1} is placed in a uniform external magnetic field of 0.15 T. If the bar magnet is free to rotate in the plane of the field, which orientation would correspond to (i) its stable and (ii) unstable equilibrium? What is potential energy of the magnet in each case?
13. A small compass needle of magnetic moment m is free to turn about an axis perpendicular to the direction of uniform magnetic field B. The moment of inertia of the needle about the axis is I. The needle is slightly disturbed its stable position and then released. Prove that it executes simple harmonic motion. Hence deduce the expression for its time period.
14. A voltage $V = V_o \sin \omega t$ is applied to a series LCR circuit. Dreive the expression for the average power dissipated over a cycle.
    Under what condition is (i) no power dissipated even through the current flows the circuit, (ii) maximum power dissipated in the circuit?

15. Find the wavelength of electromagnetic wave of frequency 5×10^{19} Hz in free space. Give its two application.

16. A double convex lens of glass of refractive index 1.5 has its both surfaces of equal radius of curvature of 20 cm each. An object of height 5 cm is placed at a distance of 15 cm from the lens. Calculate size of image formed.
    Or
    A converging lens has a focal length of 23 cm in air. It is made of a material of refractive index 1.5. It is immersed in a liquid of refractive index 1.2. Calculate its new focal length.
17. Draw a labelled ray diagram to show the image formed in a reflecting telescope. Write its two advantages over refracting type telescope. On what factors does its resolving power depend?
18. Write Einstein's photoelectric equation and point out any two characteristic properties of photons on which this equation is based.
    Briefly explain the three observed features which can be explained by this equation.
19. Discuss in brief the distance of closest approach.
20. (a) Using Bohr's postulates, obtain the expression for total energy of the electron in the n^{th} orbit of hydrogen atom.
    (b) What is the significance of negative sign in the expression for the energy?
21. (a) Why is zener diode fabricated by heavily doping both p- and n-sides of the junction ?
    (b) Draw the circuit diagram of zener diode as a voltage regulator and briefly explain its working.
22. State the principle of working of p-n diode as a rectifier. Explain, with the help of a circuit diagram, the use of p-n diode as a full wave rectifier or half wave rectifier. Draw a sketch of the input and output waveforms.

23. Kumaran wanted to pay electricity bill that day. He realized that the consumption shown by the meter was unbelievably low. He thought that the meter must have been faulty. He wanted to check the meter. But unfortunately he did not have any idea as to how to do this. There came his friend Subhash to help him. He told Kumaran to run only the electric heater rated 1kW in his house for some time keeping other appliances switched off. He also calculated the power consumed in kilowatt hour and compared the value with the meter. . Kumaran was happy and thanked Subhash for his timely help and the knowledge.
    (1) What are the values displayed by the friends?
    (2) Express kWh in joules. Find the resistance of the heater.

24. derive the mirror formula which gives the relation between u,v and f. What is the corresponding formula for a thin lens? 5

Or

Draw the ray diagram to show the formation of image of a distinct object by an astronomical telescope in the normal adjustment position. Obtain an expression for the magnifying power of the telescope in this adjustment. Define resolving power of a telescope. How would it change with increase of (i) aperture of an objective and wavelength of light. 5

25. (a) Draw a labelled circuit diagram of a moving coil galvanometer. Prove that in a radial magnetic field, the deflection of the coil is directly proportional to the current flowing in the coil.
(b) How a galvanometer can be converted into a voltmeter or ammeter.

Or

Obtained an expression for the magnetic field at a point on the axis of a current carrying circular loop.

26. An a.c. source of voltage $V = V_o \sin \omega t$ is connected one by one to three circuit elements X,Y and Z. It is observed that the current flowing in them:
(i) is in phase with the applied voltage for element X.
(ii) lags the applied voltage, in phase by $\pi/2$ for element Y.
(iii) leads the applied voltage, in phase by $\pi/2$ for element Z.
Identify the three circuit elements.
Find an expression for the (a) current flowing in the circuit, (b) net impedance of the circuit, when the same a.c. source is connected across a series combination of the elements X,Y and Z.
If the frequency of the applied voltage is varied, set up the condition of the frequency when the current amplitude in the circuit is maximum. Write the expression for this current amplitude.

Or

What does the phasors in a.c. circuit analysis mean?
An a.c. source of voltage $V = V_o \text{ Sin } \omega t$, is applied across a pure inductor of inductance L. Obtain an expression for the current i flowing in the circuit. Also draw the
(i) phasor diagram.
(ii) graphs of V and i versus ωt for this circuit.

CBSE Physics Sample Paper-II

Subject: Physics (theory)

Time: Three Hours **Full Marks: 70**

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

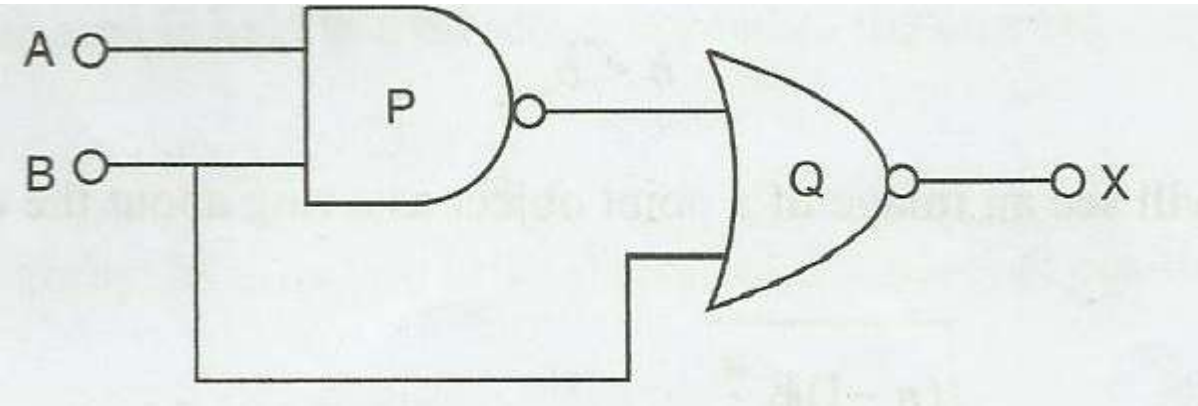
  $1/4\pi\varepsilon_0 = 9 \times 10^{9}\ Nm^2\ C^{-2}$

  $M_e = 9.1 \times 10^{31}\ kg$

1. A carbon resistor of 47 kΩ is to be marked with rings of different colours for its identification. Write the sequence of colours of rings.
2. The two slits in the Young's double slit experiment have widths in the ratios 9:4. Find the ratio of the light intensity at maximum and minima in interference pattern.
3. What fraction of tritium will remain undecayed after 25 years? Given half life is 12.5 Years.
4. What do you mean by the forbidden gap in semiconductors?
5. An electron and a proton possess same amount of kinetic energy, which of the two has greater de Broglie wavelength? Justify your answer.
6. Define critical angle. Obtained relation between critical angle and refractive index of a medium.
7. A radioactive nucleus has a decay constant $\lambda = 0.3465\ (day)^{-1}$. How long would it take the nucleus to decay to 75% of its initial amount ?

8. Drive an expression for covering range of a transmission tower.
9. Name three different types of modulation and define them. Draw a block diagram of a simple modulator for obtaining AM signal.

10. (i) Identify the logic gates marked P and Q in the given logic circuit.



(ii) Write down the output at X for the inputs A = 0 , B = 0 and A = 1 , B = 1.

Or

The output of an OR gate is connected with both the inputs of a NAND gate. Draw the logic circuit of this combination of gates and write its truth table.

11. Two 200 gram pith balls are suspended from a point through two strings of equal length 50 cm. When equal charges are given on the balls, they are repelled and gets separated by 4 cm. Estimate the charge on each ball.

    Or

    Equal charges q are situated at the four corners of a square of side a. How much charge should be placed at the centre of the square so that whole system is in equilibrium.
12. State the principle of working of a potentiometers. How internal resistance of a cell can be determined using potentiometer.
13. State Kirchhoff's law and obtain condition for balance of a whetstone bridge using it
14. What is hysteresis in a magnetic material? Draw a typical hysteresis loop. Define coercivity and retentivity
15. Define self inductance and give its SI unit. Derive an expression for self inductance of a long air cored solenoid of length l, radius r and having N number of turns,
16. Write the expression for energy density of electric and magnetic field. Show that their ratio is equal to one.

17. Define equivalent lens. Obtain expression for equivalent focal length of combination of two lenses placed coaxially.
18. In a Young's double-slit experiment, the slits are separated by 0.28 mm and the screen is placed 1.4 m away. The distance between the central bright fringe and the fourth bright fringe is measured to be 1.2 cm. Determine the wavelength of light used in the experiment.
19. Describe briefly how Davisson – Germer experiment demonstrated the wave nature of electrons.
20. Define the terms: 'half-life period' and 'decay constant' of a radioactive sample. Derive the relation between these terms.
21. What is photo diode. ? Briefly explain its working and draw its V – I characteristics.
22. Explain the following terms:
    (i) Ground waves (ii) Sky waves (iii) Space waves

23. Rajiv lived in a metropolitan city. Some of his villagers came to visit. Rajiv decided to visit them by metro train. When they came to metro station, the secuirity guard asked them to pass through a metal detector. They were scared of it. They decided not to travel by metro train. Rajiv explained them the purpose and working of metal detector. Then they ready for travelling.
    (i) Draw the necessary circuit diagram.
    (ii) What is a metal detector? How does it work?
24. Define dipole moment of an electric dipole. Show that the electric field intensity due to short dipole at a distance d along its axis is twice the intensity at the same distance along the equatorial line. 5

    Or

    Derive an expression for the capacitance of a parallel plate capacitor with a dielectric medium of dielectric constant K between the plates. Also obtain the expression for the energy stored in the above case. 5
25. (a Draw a labelled circuit diagram of moving coil galvanometer. Prove that in a radial magnetic field, the deflection of the coil is directly proportional to the current flowing in the coil.

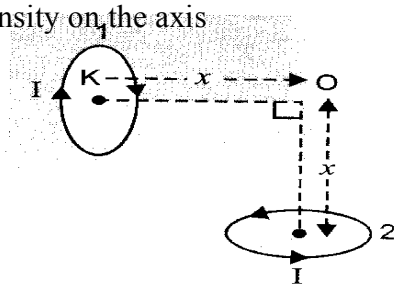
    (b) How a galvanometer can be converted into a voltmeter to measure upto:
    (i) V volts by connecting a resistance R_1 in series with coil.
    (ii) V/2 volts by connecting a resistance R_2 in series with its coil.

Or

(a) State Biot savart's law.

(b) Using Biot Savart's law derive an expression for magnetic field intensity on the axis of a circular coil carrying current.

(c) Two small circular loops marked 1 and 2 carrying equal currents are placed with the geometrical axis perpendicular to each other as shown in fig. Find the magnitude and direction of the net magnetic field produced at the point O.



26. (i) Explain the phenomenon of diffraction of light at a single slit to show the formation of diffraction fringes.

(ii) State the essential condition for the diffraction of light take place. A parallel beam of monochromatic light falls normally on a narrow slit and light coming out of the slit is obtain on the screen. Derive an expression for angular width of the central bright maxima obtained on the screen.

Or

(a) Derive the relation between the focal length of a convex lens in terms of the radii of curvature of the two surfaces and refractive index of its material. Write the sign conventions and two assumptions used in the derivation of this relation,

(a) convex lens of focal length 40 cm and a concave lens of focal length - 25 cm are kept in contact with each other. What is the value of power of this combination?

CBSE Physics Sample Paper-III

Subject: Physics (theory)

Time: Three Hours **Full Marks: 70**

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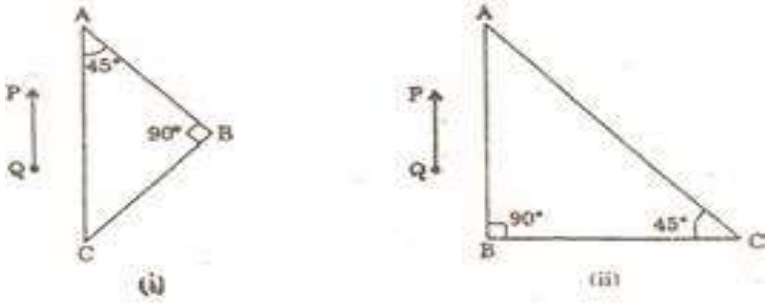
  $M_e = 9.1 \times 10^{31}$ kg

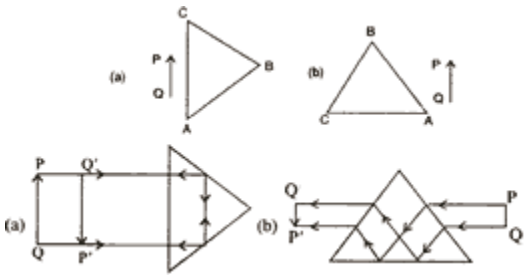
1. What do you mean by resistivity of a material? Write SI unit of resistivity.
2. In a plane e.m. wave, the electric field oscillates sinusoidally with amplitude 48 Vm^{-1}. What is the amplitude of the oscillating magnetic field?
3. The refractive index of glass is 1.5 for light whose □□= 6000Å in vacuum. Calculate the wavelength of the light when it passes through glass.
4. What is depletion region in p-n junction?
5. Two metals A and B have work functions 2 eV and 4 eV respectively. Which metal has a lower threshold wavelength for photoelectric effect?
6. State the condition under which the phenomenon of resonance occurs in a series LCR circuit. Plot a graph showing variation of current with frequency of a.c. source in a series LCR circuit.
7. Distinguish between the terms 'average value' and 'rms value' of an alternating current. The instantaneous current from an a.c. source is I = 5 sin (314 t) ampere. What are the average and rms values of the current ?

8. Name the constituent radiation of electromagnetic spectrum which
   (a) is used in satellite communication.
   (b) is used for studying crystal structure.
   (c) is similar to the radiations emitted during decay of radioactive nuclei.
   (d) has its wavelength range between 390 nm and 770 nm.
   (e) is absorbed from sunlight by ozone layer.
   (f) produces intense heating effect.
9. A right-angled crown glass prism with critical angle 41 0 is placed before an object PQ, in two positions as shown in the figures (i) and (ii). Trace the paths of the rays from P and Q the prisms in the two cases.



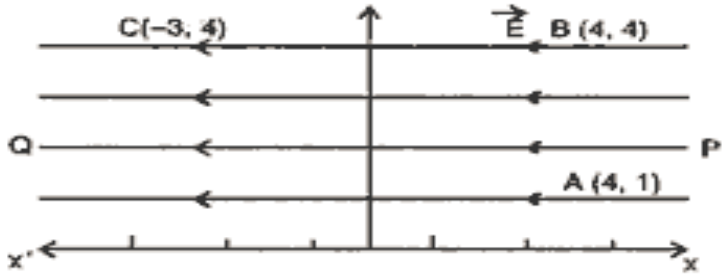
Or

An object is placed in front of a right angled prism ABC in two positions (a) and (b) as shown. The prism is made of crown glass with critical angle of 41^0. Trace the path of two rays from P and Q, (i) in (a), normal to the hypotenuse and (ii) in (b), parallel to the hypotenuse



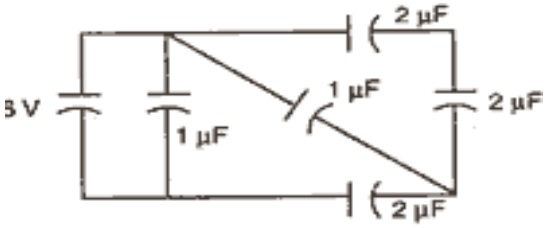
10. With the help of a bb diagram, explain the principle of an optical communication system.
11. What is an equipotential surface?

    A uniform electric field of $\vec{E}$ 300 NC^{-1} is directed along PQ. A, B and C are three points in the field having x and y coordinates (in metres) as shown in the figure. Calculate potential difference between the points (i) A and B and (ii) B and C



Or

Find the total energy stored in the capacitors in the given network.



12. Two cells of emf 1.5 V and 2 V and internal resistance 1 ohm and 2 ohm respectively are connected in parallel to pass a current in the same direction through an external resistance of 5 ohm.
    (i) Draw the circuit diagram.
    (ii) Using Kirchhoff's laws, calculate the current through each branch of the circuit and potential difference across the 5 ohm resistor.
13. What is meant by 'drift velocity of free electrons'? Derive Ohm's law on the basis of the theory of electron drift.
14. Two straight, parallel, current carrying conductors are kept at a distance 'r' from each other, in air. The direction of current in both the conductors is the same. Find the magnitude and direction of the force between them. Hence define one ampere.
15. Derive the relation between distance of object, distance of image and radius of curvature of a convex spherical surface, when refraction takes place from a rarer medium of refractive index μ_1 it to a denser medium of refractive index μ_2 and the image produced is real.
16. A small bulb is placed at the bottom of a tank containing water to a depth of 80cm. What is the area of the surface of water through which light from the bulb can emerge out? Refractive index of water is 1.33. (Consider the bulb to be a point source.)
17. Define the term 'work function' of a metal. The threshold frequency of a metal is f_0. When the light of frequency $2f_0$ is incident on the metal plate, the maximum velocity of

electrons emitted is v_1. When the frequency of the incident radiation is increased to $5f_0$, the maximum velocity of electrons emitted is v_2. Find the ratio of v_1 to v_2.

18. Draw a graph showing the variation of binding energy per nucleon with mass number for different nuclei. Explain, with the help of this graph, the release of energy by the process of nuclear fusion.
19. The half-life of $_{92}U^{238}$ undergoing α-decay is 4.5×10^9 years. What is the activity of 1g sample of $_{92}U^{238}$?
20. On the basis of the energy band diagrams distinguish between metals, insulators and semiconductors.
21. Explain, with the help of a schematic diagram, the principle and working of a Light Emitting Diode. What criterion is kept in mind while choosing the semiconductor material for such a device ? Write any two advantages of Light Emitting Diode over conventional incandescent lamps.
22. What is a digital signal ? Explain the function of modem in data communication. Write two advantages of digital communication.
23. Rajiv lived in a metropolitan city. Some of his villagers came to visit. Rajiv decided to visit them by metro train. When they came to metro station, the secuirity guard asked them to pass through a metal detector. They were scared of it. They decided not to travel by metro train. Rajiv explained them the purpose and working of metal detector. Then they ready for travelling.
    (i) Draw the necessary circuit diagram.
    (ii) What is a metal detector? How does it work?
24. What is principle of capacitor? Obtain an expression for energy stored in a capacitor and then energy density of capacitor 5

    Or

    Describe principle, construction and working of Van-de Graff generator. How is the leakage of charge is minimized from the generator.

25. (a) A rod length l is moved horizontally with a uniform velocity v in a direction perpendicular to its length through a region in which a uniform magnetic field is acting vertically downward. Derive the expression for the emf induced across the ends of the rod.

    (b) How does one understand this motional emf by involving the Lorentz force acting on the free charge carriers of the conductor? Explain.

    Or

(a) derive the expression for the torque on a rectangular current carrying loop suspended in a uniform magnetic field.
(b) A proton and a deuteron having equal momenta enter in a region of uniform magnetic field at right angle to the direction of the field. Depict their trajectories in the field.

26. (a) Draw a ray diagram showing the passes of light through a glass prism. Hence, obtain a relation between the angle of deviation, incidence, emergent and the the angle of prism.
(b) Show that no ray can pass through a prism whose refracting angle A is greater than twice the critical angle for the material of the prism.

Or
(a) Define the term wavefront. Draw the wavefront and corresponding rays in the case of a (i) diverging spherical wave, (ii) plane wave.
(b) Using Huygens' construction of a wavefront, explain the refraction of a plane wavefront at a plane surface and hence verify Snell's law.

Retain In Memory: Learn all the facts related question given in the above sample papers for obtained high marks.

Papers Submitted By:

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