CLASS XII
SAMPLE PAPER
PHYSICS

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

General Instructions:

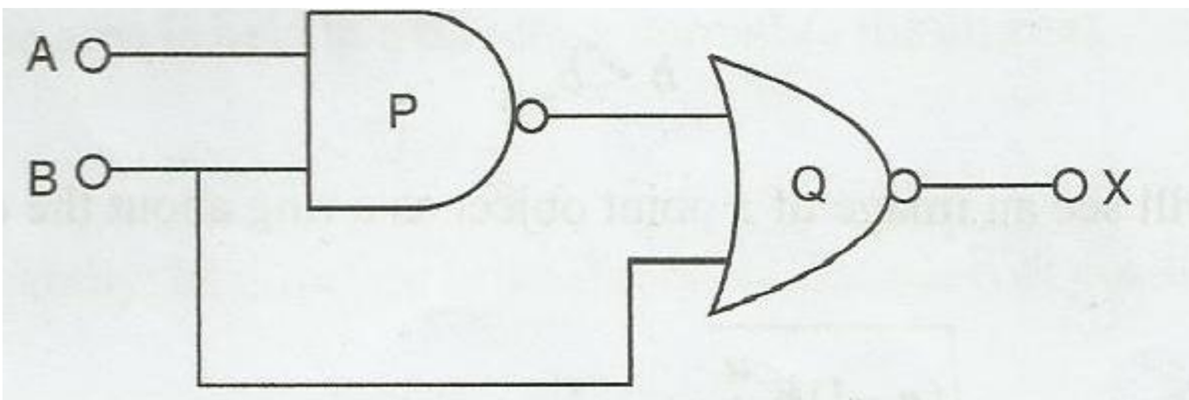
- All questions are compulsory.
- There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all questions of five marks. You have to attempt only one the choice in such questions.
- Question numbers 1 to 5 are very short answer 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 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 $\lambda = 0.3465\ (\text{day})^{-1}$. 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

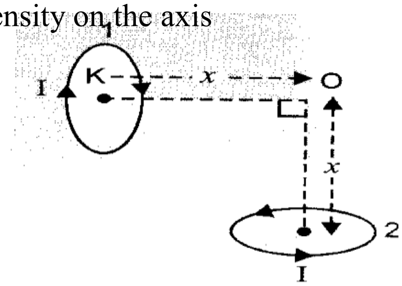
    Derive an expression for the capacitance of a parallel plate capacitor with a dielectric medium of dielectric constant K between the plates. Also obtain the expression for the energy stored in the above case. 5

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?

Papers Submitted By:

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