



Date:	SAMPLE PAPER-7	Subject:PHYSICS
Class: XII	Name of the student:	Max. Marks:70

General Instructions:

- All questions are compulsory.
- Questions 1 to 5 are one mark questions.
- Questions 6 to 10 are two marks questions.
- Questions 11 to 22 are three marks questions.
- Question 23 is value based question carrying four marks.
- Question 24 to 26 are five marks questions.
- There is no overall choice in the question paper. However, an internal choice has been provided in one question of two marks, one question of three marks and all three questions of five marks each. You have to attempt only one of the choices in such questions.
- Use of calculator is not permitted. However you may use log tables if necessary.
- You may use the following values of physical constants wherever necessary:

$$c = 3 \times 10^8 \text{ m/s}$$

$$h = 6.63 \times 10^{-34} \text{ Js}$$

$$e = 1.6 \times 10^{-19} \text{ C}$$

$$\mu_0 = 4\pi \times 10^{-7} \text{ Tm/A}$$

$$1/4\pi\epsilon_0 = 9 \times 10^9 \text{ Nm}^2/\text{C}^2$$

$$m_e = 9.1 \times 10^{-31} \text{ kg}$$

$$m_p = 1.675 \times 10^{-27} \text{ kg}$$

$$m_n = 1.673 \times 10^{-27} \text{ kg}$$

1.The velocity of propagation (in vacuum) and the frequency of (i) x rays and (ii) radio waves are denoted by (v_x, n_x) and (v_R, n_R) respectively.

How do the values of (a) v_x and v_R (b) n_x and n_R compare with each other?

2.How will the intensity of maxima and minima, in the Young's double slit experiment change, if one of the two slits is covered by a transparent paper which transmits only half of the light intensity?

3.Show the variation of photo current with collector plate potential for different intensity but same frequency of incident radiation.

4.The short wavelength limits of the Lyman, Paschen and Balmer series, in the hydrogen spectrum, are denoted by λ_L , λ_P and λ_B respectively. Arrange these wavelengths in increasing order.

Charges of magnitudes $2Q$ & $-Q$ are located at points $(a, 0, 0)$ and $(4a, 0, 0)$. Find the ratio of the flux of electric field, due to these charges, through concentric spheres of radii $2a$ and $8a$ centered at the origin.

5. A parallel combination of two cells of Emf's E_1 & E_2 , and internal resistances r_1 and r_2 is used to supply current to a load of resistance R . Write the expression for the current through the load in terms of E_1 , E_2 , r_1 and r_2 .

6. Write one condition under which an electric charge does not experience a force in a magnetic field?

7. How does the mutual inductance of a pair of coils change, when (i) distance between the coils is increased (ii) number of turns in each coil is decreased?

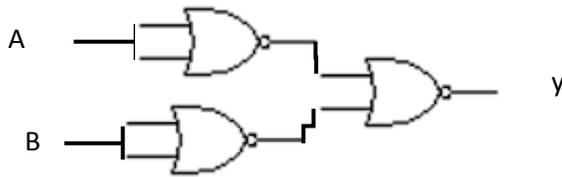
8. Name the electromagnetic waves used for the following and arrange them in increasing order of their penetrating power.

- (a) Water purification (b) Remote Sensing (c) Treatment of cancer

9. A light beam is incident on the boundary between two transparent media. At a particular angle of incidence, the reflected ray is perpendicular to the refracted ray. Obtain an expression for this angle of incidence. Does this angle depend on the wavelength of light used?

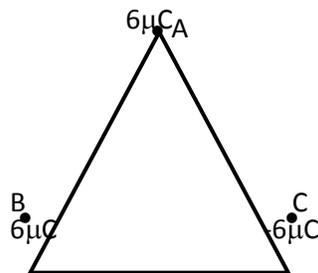
10. Calculate the half life period of a radioactive substance if its activity drops to $\frac{1}{16}$ th of its initial value in 30 years.

11. Inputs A & B are applied to the logic gate set up as shown below. Complete the truth table given below, and name the equivalent gate formed by this 'set-up'.



A	B	A'	B'	Y
0	0			
0	1			
1	0			
1	1			

12. Find the amount of work done in arranging the three point charges, on the vertices of an equilateral triangle, ABC, of side 10cm, as shown in the figure.



13. Write the relation for current sensitivity and voltage sensitivity of a moving coil galvanometer. Using these relations, explain the fact that increasing the current sensitivity may not necessarily increase the voltage sensitivity.

OR

Using the relation for potential energy of a current carrying planar loop, in a uniform magnetic field, obtain the expression for the work done in moving the planar loop from its unstable (equilibrium) position to its stable (equilibrium) position.

- a) If the magnetic monopoles were to exist, how would the Gauss's law of magnetism get modified?
- b) How will the angle of dip vary when one goes from a place, where the acceleration due to gravity is maximum, to a place where it is minimum, on the surface of earth?

14. Draw a plot of the variation of 'amplitude' versus ' ϕ ' for an amplitude modulated wave. Hence explain the need for keeping the broadcast frequencies sufficiently spaced out.

15. In the double slit experiment, the pattern on the screen is actually a superposition of single slit diffraction from each slit and the double slit interference pattern. In what way is the diffraction from each slit related to the interference pattern in a double slit experiment? Explain.

Hence draw the intensity distribution curve, obtained on the screen, in the double slit experiment.

- i) When the width of each slit is comparable to wavelength of monochromatic light used.
- ii) Then the width of each slit is relatively large compared to wavelength of monochromatic light.

16. Which two main observations in photoelectricity led Einstein to suggest the photon theory for the interaction of light with the free electrons in a metal? Obtain an expression for the threshold frequency for photoelectric emission in terms of the work function of the metal.

17. Derive the expression for the radius of the n^{th} orbit of hydrogen atom using Bohr's postulates. Show graphically the (nature of) variation of the radius of orbit with the principal quantum number, n .

OR

18. What is the frequency of radiation emitted when a hydrogen atom de-excites from level x to level $(x-1)$? For large x , show that this frequency equals the classical frequency of revolution of the electron in the orbit.

19. State various modes of propagation of electromagnetic waves. Explain using a proper diagram, the mode of propagation used in the frequency range from a few MHz upto 40 MHz.

20. A 5 cm long needle is placed 10 cm from a convex mirror of focal length 40 cm. Find the position, nature and size of the image of the needle.

What happens to the size of image when the needle is moved farther away from the mirror?

21. Write the nature of path of free electrons in a conductor in the

- (i) Presence of electric field
- (ii) absence of electric field.

Between two successive collisions each free electron acquires a velocity from 0 to V where $V = \frac{eE}{m} \tau$.

What is the average velocity of a free electron in the presence of an electric field? Do all electrons have the same average velocity?

How does this average velocity of the free electrons, in the presence of an electric field, vary with temperature?

22. A wire AB is carrying a current of 12A and is lying on the table. Another wire CD, carrying a current of 5A, is arranged just above AB at a height of 1mm. What should be the weight, per unit length of this wire so that CD remains suspended at its position? Indicate the direction of current in CD and the nature of force between the two wires.

23. In Niketan's neighbourhood, there are small workshops which use electrical generator. These generators generate lot of pollution. Niketan along with his friends did a survey and found out that like in multistoried apartments, a common generator could be set up for all these small workshops so that the noise and air pollution could be reduced considerably. They had a tough time convincing the local bodies and now they are going to the NGOs and some financiers to help them organize funds to do the needful.

(i) What values did Nike tan and his friends have?

(ii) Kamla Pedals a stationary bicycle, the pedals of which are attached to a 100 turn coil of area 0.10 m^2 . The coil rotates at half a revolution per second and is placed in a uniform magnetic field of 0.01 T per pendicular to the axis of rotation of the coil. What is the maximum voltage generated in the coil?

24. Find the expression for the electric field intensity, and the electric potential, due to a dipole at a point on the equatorial line. Would the electric field be necessarily zero at a point where the electric potential is zero? Give an example to illustrate your answer.

OR

Find the expression for the capacitance of a parallel plate capacitor of area A and plate separation d if (i) a dielectric slab of thickness t , and (ii) a metallic slab of thickness t , there ($t < d$) are introduced one by one between the plates of the capacitor. In which case would the capacitance be more and why?

25. Draw a ray diagram for a compound microscope. Derive an expression for the magnifying power when the final image is formed at the least distance of distinct vision. State the expression for the magnifying power then the image is formed at infinity. Why is the focal length of the objective lens of a compound microscope kept quite small?

OR

Derive the lens formula giving the relation between u , v and f for a thin convex lens. Define the term 'linear magnification' and draw a graph showing the variation of linear magnification with image distance for a thin convex tens. How can this graph be used for finding the focal length of the lens?

26. Draw the circuit diagram of an n-p-n transistor in common emitter configuration to study its (i) input and (ii) output characteristics. Draw approximate shapes of these characteristics using these characteristics, explain how you would find input and output resistance of the transistor.

OR

Explain the formation of the depletion region for a P-N junction. How does the width of this region change when the junction is (i) forward biased, and (ii) reverse biased. (iii) How does an increase in the doping concentration affect the width of the depletion region?