Bharatiya Vidya Bhavan's
Vallabhram Mehta Public School
(Vidyashram) Vadodara

54 YEARS

Let noble thoughts come to us from every side-Rigveda, 1-89-i

Date:	**SAMPLE PAPER-6**	**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:

$c = 3x10^{-8}m/s$
$h = 6.63x10^{-34}Js$
$e = 1.6x10^{-19}C$
$\mu_0 = 4\pi x10^{-7}$ Tm/A
$1/4\pi\varepsilon_0 = 9x10^9$ Nm^2/C^2
$m_e = 9.1x10\text{-}^{31}kg$
$m_p = 1.675x10^{-27}kg$
$m_n = 1.673x10^{-27}kg$

1.A charge 'q' is placed at the centre of a cube. What is the electric flux Passing through a single face of the cube?

2.How does the mutual inductance of a pair of coils change when
(i) Distance between the coils is increased and
(ii) Number of turns in the coils is increased.

3.Why should a photodiode be operated in reverse bias?

4.Sketch a graph showing variation of resistivity of carbon with temperature?

5.The motion of copper plate is damped when it is allowed to oscillate between the two poles of a magnet. What is the cause of this damping?

6.Draw typical output characteristic of an n – p – n transistor in CE configuration. Show how there characteristic can be used to determine output Resistance.

7.The biconvex lens has a focal length $\frac{2}{3}$ times the radius of curvature of either surface. Calculate the refractive index of lens material.

8.Net capacitance of three identical capacitors in series is 1 μF. What will be their net capacitance if connected in parallel? Find the ratio of energy stored in the two configurations if they are both connected to the same source.

9.A slab of material of dielectric constant K has the same area as that of the plates of a parallel plate capacitor but has the thickness $\frac{d}{2}$, where d is the separation between the plates. Find out the expression for its capacitance when the slab is inserted between the plates of the capacitor.

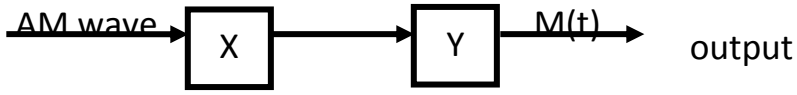
10.Derive an expression for drift velocity of free electrons in a conductor in terms of relaxation time.

OR

State the principle of working of a potentiometer. Define potential gradient and write it SI unit?

11.A ray of light incident on an equilateral glass prism (μ_g)=$\sqrt{3}$ moves parallel to the base. Find the angle of incidence for this ray.

12.Figure shows a block diagram of a detector for amplitude modulated signal. Identify the boxes 'X' and 'Y' and write their functions.

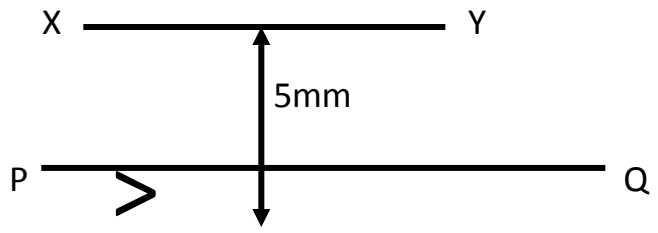


13.Identify the logic gates masked 'X' and 'Y' in the following figure. Obtain the output Z of combination for all possible inputs A and B

14.(a) For a given a.c, $i=i_m$ Sin ωt, show that the average power dissipated in a resistor R over a complete cycle is $\frac{1}{2} i_m^2$ R.

(b) A light bulb is rated at 100w for a 220v a.c supply. Calculate the resistance of the bulb.

15.A long straight conductor ‘PQ’, carrying a current of 75A, is fixed horizontally. Another long conductor ‘XY’ is kept parallel to ‘PQ’ at a distance of 5mm, in air. Conductor ‘XY’ is free to move and carries a current ‘I’. Calculate the magnitude and direction of current I for which the magnetic repulsion just balances the weight of conductor ‘XY’ (Mass Pre Unit length for conductor ‘XY’ is 10^{-2} Kg/m).



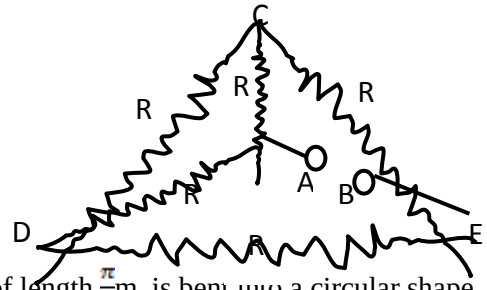
OR

How will a dia, para and a ferromagnetic material behave when kept in a non-uniform external magnetic field? Give one example of each of these materials.

16.

(i) Calculate the equivalent resistance of the given electrical network between points A and B.

(ii) Also calculate the current through, CD and ACB, if a 10v d.c. source is connected between A and B,and the value of R is assumed as 2Ω

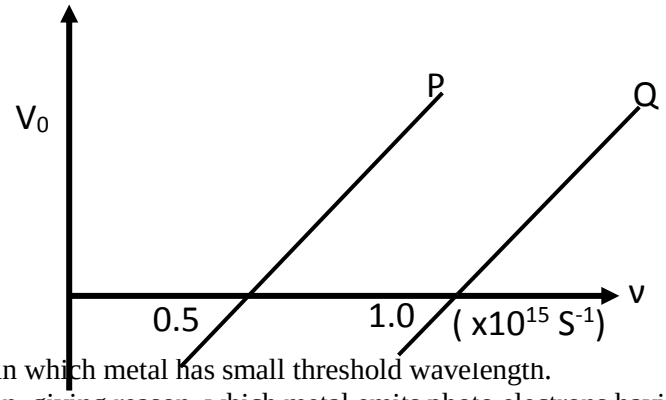


17.A straight wire, of length $\frac{\pi}{2}$m, is bent into a circular shape. If the wire were to carry a current of 5A, calculate the magnetic field, due to it, before bending, at a point distance 0.01 times the radius of the circle formed from it. Also calculate the circular loop formed, for the same value of current.

18.Draw the circuit diagram of a common emitter amplifier using n-P-n transistor. What is the phase difference between the input signal and output voltage? State two reasons why a common emitter amplifier is preferred to a common base amplifier.

19.Draw a schematic diagram of a reflecting telescope (cassegnain). Write two important advantages that the reflecting telescope has over a refracting type.

20.The following graph shows the variation of stopping potential V_0 with the frequency of the incident radiation for two photo sensitive metals P and Q.



(i) Explain which metal has small threshold wavelength.
(ii) Explain, giving reason, which metal emits photo electrons having smaller kinetie energy.

21.Which mode of propagation is used by short wave broadcast services having frequency range from a few MHz upto 30 MHz. Explain diagrammatically how long distance communication can be achieved by this mode. Why there an upper limit to frequency of waves used in this mode.

22.Using Huygens Principle draw a diagram showing how a plane wave gets refracted when it is incident on the surface separating a rarer medium from a denser medium. Hence verify snell's laws of refraction.

23.Some friends were playing near a pond. Pond appeared shallow to them. So, they decided to have fun by playing in pond water. Kundan happened to pass through. He noticed the intention of the children. Immediately he approached them and instructed no to indulge in the adventure. He explained that pond was much deeper than it appeared. This way he avioded a misshappening.
(a) What qualities Kundan displayed?
(b) With the help of a ray diagram explain, why water appeared less deeper than what actually it was?

24.State Ampere's circuital law :
a) Use it to derive an expression for mangetic field inside, along the axis of an air cored solenoid.
b) Sketch the magnetic field lines for a finite solenoid. How are these field lines different from the electric field lines from an electric dipole?

OR

Draw a schematic sketch of a cyclotron. State its working principle. Describe briefly how it is used to accelerate charged particles. Show that the period of revolution of an ion is independent of its speed or radius of the orbit. Write two important uses of a cyclotron.

25.Explain the principle of a device that can build up high voltages of the order of a few million volts.Draw a schematic diagram and explain the working of this device.Is there any restriction on the upper limit of the high voltages set up in this machine? Explain.

OR

Derive an expression for the energy stored in a parallel plate capacitor with air as the medium between its plates.Air is now replaced by a dielectric medium of dielectric constant K. How does it change the total energy of the capacitor if
(i) The capacitor remains connected to the same battery?
(ii) The capacitor is disconnected from the battery?

26. Using Bohr's postulates, derive the expression for the frequency of radiation emmitted transition from higher energy state (quantum number n_i) to the lower state, (n_f). When energy state $n_i = 4$ to $n_f = 3, 2, 1$, identify the spectral series to which the emmission lines belong.

OR

(a) Draw a plot of potential energy of a pair of nucleons as a function of their separation.write two important conclusions which you can draw regarding the nature of nuclear forces.

(b) Derive the law of radio active deeay

$$N = N_0 e^{-\lambda t}$$

(c) Draw a plot of potential energy of a pair of nucleons as a function of their separation.

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