ST. JOSEPH'S ACADEMY, DEHRADUN

2ND PRELIMINARY EXAMINATION 2024-25

SUBJECT: PHYSICS **CLASS: XII** **M.M.: 70 TIME: 3 HOURS**

NAME OF THE STUDENT..... *..CLASS/SECTION* *ROLL NO.*

*(Candidates are allowed additional 15 minutes for **only** reading the paper.*
They must NOT start writing during this time.)

All questions are compulsory.

Section A

*Question number 1 is of **fourteen** marks. All parts of this question are **compulsory.***

Section B

Question numbers 2 to 8 carry 2 marks each with two questions having internal choice.

Section C

Question numbers 9 to 17 carry 3 marks each with two questions having internal choice.

Section D

Question numbers 18 to 20 are long-answer type questions and carry 5 marks each.

SECTION-A [14 MARKS]
ANSWER **ALL** QUESTIONS

Question 1.

A. Choose the correct alternative (a),(b),(c),(d) for each of the questions given below:- **[7×1=7]**

(i) A non-conducting medium can have dielectric consonant K as:-

(a) -3 (b) 0 (c) 0.7 (d) 6.0

(ii) If resistance of each arm of Wheatstone's bridge and galvanometer is R, the resistance between the ends connecting the battery is :-

(a) R/2 (b) R (c) 2R (d) R/4

(iii) **Assertion** : Two parallel conducting wires carrying currents in opposite direction, come close to each other.

Reason : Parallel currents repel and anti-parallel currents attract.

(a) both assertion and reason are true and reason is the correct explanation of assertion.
(b) both assertion and reason are true but reason is not the correct explanation of assertion.
(c) assertion is true but reason is false.
(d) both assertion and reason are false.

(iv) **Assertion** : The electromagnetic waves are transverse in nature.
Reason : Waves of wavelength 10 mm are radiowaves and microwaves.

(a) both assertion and reason are true and reason is the correct explanation of assertion.
(b) both assertion and reason are true but reason is not the correct explanation of assertion.
(c) assertion is true but reason is false.
(d) both assertion and reason are false.

(v) In a microscope, if red colour light is replaced by blue colour what will be the effect on its resolving power :-

(a) Decreases (b) Increases
(c) Becomes half (d) No change

(vi) Who shows wave nature:-

(a) All the particles (b) All the moving particles
(c) Only charged particles (d) Only magnetic particles

(vii) In few substances charge can flow at normal temperature but not at very low temperature. They are known as:

(a) Conductor (b) Insulator
(c) Semi-conductor (d) Dielectric

THIS PAPER CONSISTS OF FIVE PRINTED SIDES

B. Answer the following questions briefly and to the point. [7×1=7]

(i) A p-n photo diode is made by a semiconductor of energy gap 2.8 eV. Can it detect a wavelength of 6000 Å?

(ii) If one microgram mass is completely converted into energy, calculate the energy released?

(iii) A light of wavelength 6000 Å is falling normally on slit of width 1×10^{-5}m. Find the width of central maxima of diffraction pattern.

(iv) Calculate the angle of minimum deviation for a regular glass prism. (Take refractive index of glass=1.6)

(v) A candle is placed at distance 3 cm in front of a concave mirror of radius of curvature 24 cm. Locate the position of image of candle.

(vi) Magnetic dipole moment of a current carrying loop is 8.0×10^{-25} A-m^2. Find the magnetic field at a point distant 2 Å from the centre on the axis of loop.

(vii) Inside a hollow sphere, a dipole of dipole moment 20×10^{-6} cm is placed. What is the flux passing through the surface of sphere?

SECTION- B [14 MARKS]

Question 2.

What is the work done in moving a 2 micro-coulomb point charge from corner A to corner B of a square ABCD when a 10μC charge exists at the centre of the square? [2]

OR

What is the effect on capacitance of a capacitor if area of plate is doubled and separation between plates is halved?

Question 3.

Draw graph of resistivity and temperature for metals and semiconductors. [2]

Question 4.

What is current sensitivity of moving coil galvanometer? [2]

Question 5.

Two small magnets which are placed on horizontal line such that their north poles are at a distance of 30 cm and 20 cm from a compass needle kept in between two magnets.
If there is no deflection in the needle, compare the magnetic moments of the magnet. [2]

Question 6.

Why are electromagnets made of soft iron and not from steel? Explain. [2]

Question 7.

A bar magnet is placed along the axis of a ring falls along the axis through the ring. Will the acceleration of magnet equal to g, less than g or more than g. Explain. [2]

OR

Find frequency of electro magnetic wave in (MHz) if its wave length is 5000 Å.

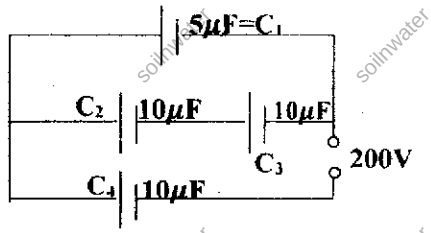
Question 8.

What do you mean by depletion layer in junction diode? [2]

SECTION-C [27 MARKS]

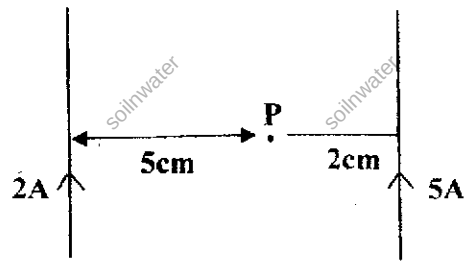
Question 9.

Find P D across each capacitor. [3]



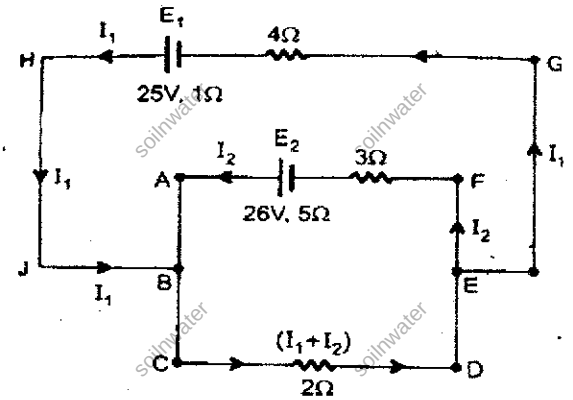
Question 10.

Find magnetic field at point P. [3]



Question 11.

Find i_1 and i_2 from the above fig. [3]



Question 12.

In a big jar of radius 0.2 m, glycerin (μ=1.4) is filled upto a height of 0.1 m. A point source of light is placed at the centre of base of jar. Find the area of glycerin surface from where light comes out. [3]

Question 13.

A student is performing some experiment based on convex and concave lenses. The examiner gives some instructions to the students and then asks some question to the students. State whether the responses of the students in each case are correct or incorrect. Give a reason for your answer. [3]

(i) Examiner : In what manner focal length of a lens depends on refractive index of the material of the lens?
Student : It varies directly with the refractive index.

(ii) Examiner : If radius of curvatures are same for both the surfaces of convex lens and then one of its surfaces is made plane by scrubbing it. What effect you observe on its focal length and power?
Student : Focal length will become double while power will become half.

(iii) Examiner : A glass lens is immersed in a liquid such that it is not visible. What will be the relationship between refractive index of glass and liquid.
Student : Refractive index of glass is more than liquid.

Question 14.

Derive the law of reflection by Huygen's principle. [3]

OR

Derive an expression from frige with Young's double slot experiment.

Question 15.

In a compound microscope, distance between real image formed by objective and objective is 18 cm. If f_o=0.4 cm, f_e=2.0 cm, find the magnifying power of microscope when

(i) eyes are relaxed

(ii) final image is at least distance of distinct vision . [3]

Question 16.

On the basis of Bohr's Theory derive the expression for the radius of nth orbit of electron of hydrogen atom. [3]

OR

To produce 3000 MW power in a nuclear reactor, how much U^{235} will be consumed per day? Assume that 200 MeV of energy is produced by fission of 1 nucleus of U^{235}.

Question 17.

Draw a circuit diagram for p-n junction diode in reverse bias. Discuss voltage-current characteristics curve in the reverse bias explaining avalanche breakdown. [3]

SECTION-D [15 MARKS]

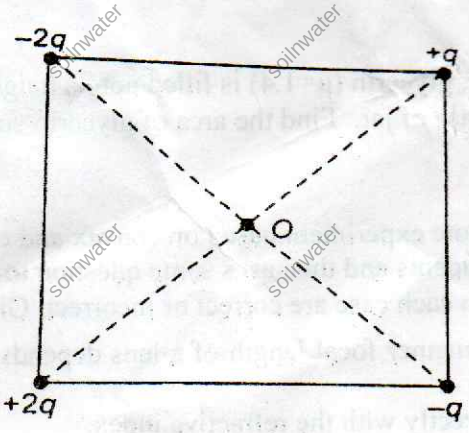
Question 18.

(a) When a coil is connected to a 12 V dc source then 4 A current flows through it. If same coil is connected to a ac source of 12 V, 50 radian/second, then a current of 2.4 A flows through it. Find the inductance of the coil. [2]

(b) If a capacitor of 2500 μF is connected in series with this coil, then find the impedance of the circuit, current and power loss. [3]

OR

Four point charges are placed at the corners of a square of side 2 cm as shown. Find the magnitude and direction of the electric field at the centre O of the square, if q=0.02 μC.



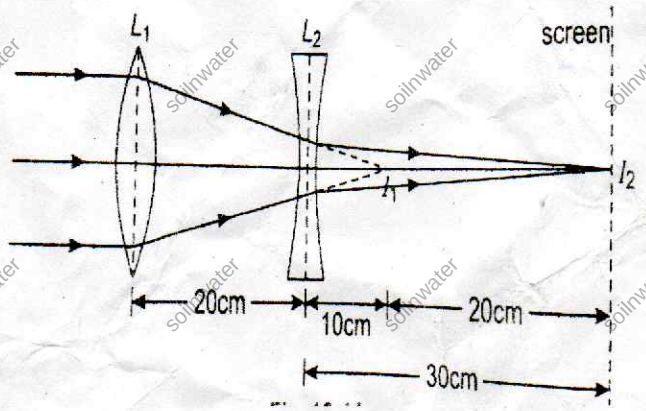
[5]

Question 19.

Wavelength of first member of the Balmer series is 6565 Å. Find wavelength of second and last number of the series. [5]

OR

In the given fig, rays coming from infinity after passing through both lenses meet at the screen placed at a distance of 30 cm from concave lens. Find the focal length of each lens.

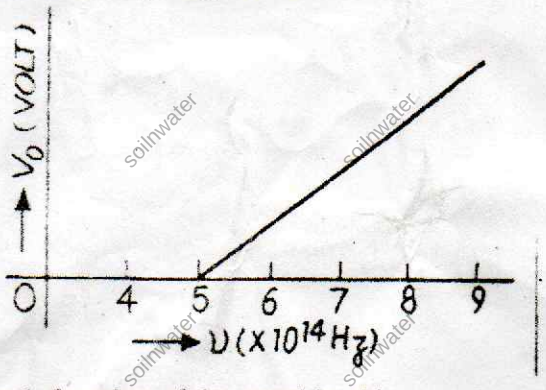


Question 20.

Read the passage and answer the following questions: [5]

When electromagnetic radiation of suitable frequency falls on a metallic surface, electrons are emitted from the surface. Energy of emitted photo electrons depend only on the frequency of incident radiation and number of emitted electrons depends on the intensity of incident light. There is a lower limit of frequency called threshold frequency below which no emission of photoelectrons take place, however high the intensity of the incident radiation may be.

(a) For photoelectric effect in a metal, the graph of the stopping potential V_0 versus frequency v of incident radiation is shown in the figure given below:



Calculate the value of work function of the metal in eV.
($h=6.6 \times 10^{-34}$ J-s and $e=1.6 \times 10^{-19}$ C)

(b) If the slope of the graph shown above is m, what will be the relation between m, h and e.

(c) If frequency v of incident radiation is increased keeping intensity (I) and work function (ϕ_0) constant, what will be the effect on stopping potential.

(d) The maximum kinetic energy of photo electrons emitted from a surface, when photons of energy 6 eV falls on it, is 4 eV. Find the stopping potential in volts.