I-PRE BOARD EXAMINATION

PHYSICS PAPER–1

(THEORY)

(Time allowed : Three hours)

(maximum Marks : 70)

Candidates are allowed additional 15 minute for ONLY reading the paper. They must NOT start writing during this time.

ALL questions are compulsory.

This question paper is divided in 4 sections A, B, C, D.

SECTION 'A'

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

SECTION 'B'

Question 2 to 12 carry 2 marks each with two questions having internal choice.

SECTION 'C'

Question number 13 to 19 carry 3 marks with two questions having internal choice.

SECTION 'D'

Question number 20-22 are long answer type questions and carry 5 marks each. Each question has internal choice.

The intended marks for questions or parts of questions are given in brackets [ ].

All working, including rough work, should be done on the same sheet as and adjacent to the rest of the answer. Answer to sub part of the same question must be given in the one place only.

A list of useful physical constants is given at the end of this paper.

A simple scientific calculator without a programmable memory may be used for calculation.

SECTION 'A'

(Answer all questions)

Question 1

(A) Choose the correct alternative (a), (b),(c) or (d)for each of the questions given below: [5×1]

(i) Ohm s law in **vector** form is:

(a) $V = IR$

(b) $J = \sigma E$

(c) $J = \rho E$

(d) $E = \sigma J$

(ii) A wire of length L is drawn such that it's diameter is reduced to $\frac{1}{2}$ of it's original diameter. If the initial resistance of wire was 20 Ω. It's new resistivity becomes :

(a) 4 times

(b) 16 times

(c) same

(d) one fourth

(iii) A thin lens of glass (μ=1.5) of focal length +10cm is immersed in water $\left(n = \frac{4}{3}\right)$. The new focal length is :

(a) 20 cm

(b) 40 cm

(c) 48 cm

(c) 12 cm

(iv) Two circular coils A and B are made from similar wire but radius of B is twice that of A. The value of potential difference across them so that the magnetic induction at their centre may be the same, will be :

(a) $V_B = 2V_A$

(b) $V_B = 3V_A$

(c) $V_B = 4V_A$

(c) $V_B = \frac{1}{4}V_A$

(v) Mean life of a radioactive sample is 100 s. Its half-life (in minutes) is :

(a) 0.693

(b) 1

(c) 10

(d) 1.155

(B) Answer the following questions briefly and to the point: [7×1]

(i) Fractional change in resistance per kelvin for semiconductor will be positive or negative ?

(ii) How will the position of null point in a potentiometer change with increase in resistance of its wire ?

(iii) Why is soft iron preferred to steel in making the core of a transformer?

(iv) When would a moving charged particle travel in helical path in a uniform magnetic field ?

(v) Define wavefront

(vi) State two conditions to obtain sustained interference of light.

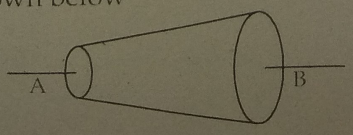
(vii) Define stopping potential.

SECTION B

Answer all questions.

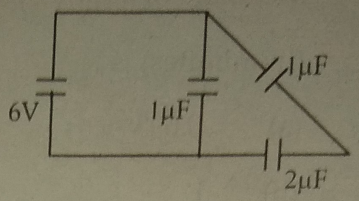
Question 2 [2]

Write an expression for drift velocity of free electron in terms of relaxation time and field applied across a conductor. What will be the change from A to B in the conductor shown below



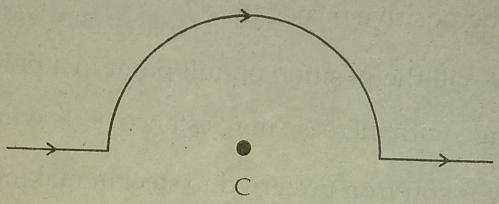
Question 3 [2]

Find total energy stored in capacitors given in the circuit.



Question 4 [2]

a) A long straight wire is bent as shown in the figure. Find resultant magnetic field "B" at the centre C of circular path of radius 2 cm if a current I of 5A is passed trough the wire .



Question 5 [2]

(a) Briefly explain the following terms :

(i) Curie law

(ii) Self inductance

OR

(b) A transformer is used to step up an alternating emf of 200 V to 440 V. If the primary coil has 1000 turns. Calculate the no. of turns in the secondary coil.

Question 6 [2]

A thin convex lens of focal length 20 cm is kept in contact with a thin concave lens of focal length 15 cm find power of the lens combination.

Question 7 [2]

What is meant by dispersive power? Write an expression of dispersive power in terms of refractive indices.

Question 8 [2]

The work function of Cs is 2.14 eV. Find :

(a) threshold wavelength for Cs.

(b) wavelength of incident light if photo electric current is brought to zero by stopping potential by 0.6V

Question 9 [2]

Write expression for (i) radius of n^{th} Bohr's orbit in Hydrogen atom

(ii) velocity of electron in n^{th} Bohr orbit of hydrogen like atom.

Question 10 [2]

Write Kirchhoff's Laws.

Question 11 [2]

What is the significance of peaks in B.E. curve.

OR

Define B.E. and mass defect.

Question 12 [2]

Plot a labelled graph of stopping potential photo electrons versus frequency of incident radiation. State how you will obtain the value of Planck's constant "h" from graph.

SECTION C

Answer all questions.

Question 13 [3]

Obtain an expression for electric field intensity '*E*' at a point on the broad side-**on position** i.e. equatorial position of an electric dipole.

Question 14 [3]

A storage battery is of emf 8V and internal resistance 0.5 ohm. It is being charged by d.c. supply of 120 V using a resistor of 15.5Ω :

(a) Draw a labelled circuit diagram.

(b) Calculate potential difference across the battery.

Question 15 [3]

(a) Obtain the balancing condition for the **Wheatstone bridge.**

OR

(b) Draw a labelled circuit diagram of a **potentiometer** to measure the ratio of emf of two cells. Write its principle.

Question 16 [3]

Derive expression of focal length for a combination of two thin lenses in contact.

OR

Derive $\frac{n}{v} - \frac{1}{u} = \frac{n-1}{R}$ for the refraction at single convex surface.

Question 17 [3]

Derive Snell's law of refraction using **Huygen's** Wave Theory.

Question 18 [3]

Energy of electron in first excited state in Hydrogen atom is - 3.4 eV.

Find K.E. and P.E. of electron if its angular momentum is $2h/\pi$.

Question 19 [3]

With reference to semi-conductors explain:

(i) p-n junction

(ii) Biasing

(iii) majority charge carrier.

SECTION D

Answer all questions.

Question 20 [5]

(a) (i) Find expression of de Broglie wavelength.

(ii) Find expression of Momentum of photon.

(iii) Find de Broglie wavelength of electrons moving with a speed of 70 m/s

OR

(b) Derive expression the magnetic field at the centre of a current carrying coil.

(b) Intensity of electric field at a perpendicular distance of 0.5 m from an infinitely long line charge having linear charge density (λ) is 3.6×10^{3} Vm^{-1}. find value of λ .

Question 21 [5]

(a) Draw a neat labelled diagram of **Young's** Double Slit experiment. Show that fringe width is $\beta = \frac{D}{d}\lambda$ *(either for bright or dark fringe).*

OR

b) In young's double slit experiment, the slits are separated by 0.5 mm and screen is placed 1.0 m away from the slit. It is found that 5th bright fringe is at a distance of 4.13 mm from the second dark fringe. Find wavelength of light used..

Question 22 [5]

a) (i) Draw a labelled circuit diagram of a **full wave rectifier** and give its output waveform.

(ii) Draw a circuit diagram of a p-n function diode under reverse bias and explain break down.

OR

b) (i) Explain diffraction.

(ii) Draw intensity pattern for single slit diffraction ad youngs double slit experiment.

(iii) Explain fringe width

(iv) Write position of n^{th} order maxima.

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