

HIGHER SECONDARY MODEL EXAMINATION FEB-2012

HSE (II)

PART III
PHYSICS

Reg. No.:

Name :

Time : 2 Hours

Max Score : 60

General Instruction to Candidates :

There is a 'cool-off time' of 15 minutes in addition to the writing time of 2 Hrs.

You are not allowed to write your answer nor to discuss anything with others during the 'cool-off' time.

Use the 'cool-off' time to get familiar with questions and to plan answers.

Read questions carefully before answering.

All questions are compulsory and only internal choice is allowed.

When you select a question, all the sub- questions must be answered from the same question itself.

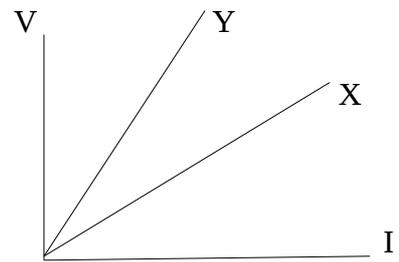
Calculations, figures and graphs should be shown in the answer sheet itself.

1.Fill in the blanks

A dipole length is.....	Dipole moment $p=2qa$	Torque on a dipole of in a field E is $\tau = \dots\dots$
Electric field E is normal to a surface A	$E.A = \dots\dots\dots$	Over the surface $dV/dX = \dots\dots$
An electron accelerated in 1 V gains 1 eV energy	1 eV =	An electron accelerated in 100 V gains.....J
A dipole is rotated through Θ in a field E	Work done in rotation =	Potential energy change in rotation =

Score (2)

2. The V-I graph of two conductors are given below.



(a) Which one has greater resistance?

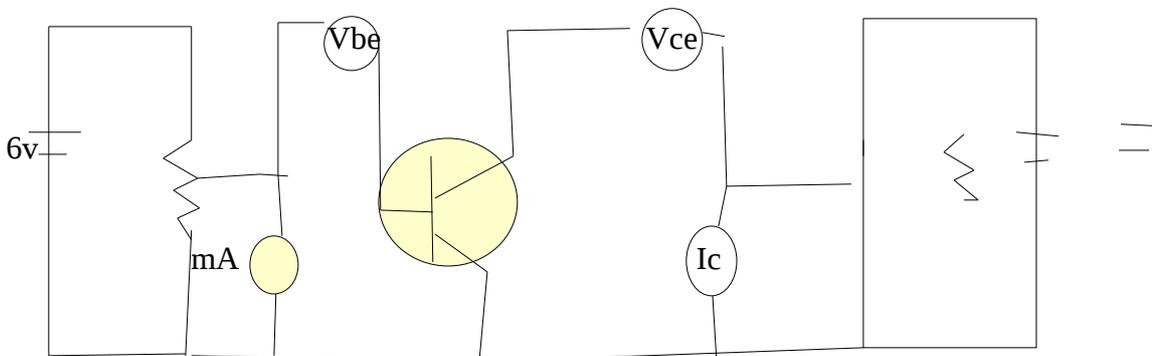
(b) Deduce Ohm's law and hence find what are the factors affecting resistance of a conductor?

(c) Use your equation to explain that resistivity of a material is a constant for the material at given temperature.

(d) A wire of resistance 10 W and resistivity r stretched to double its original length. Find new resistivity and resistance.

{1 + 2 + 2 + 2 = 7}

3 A physics teacher conducted transistor characteristic experiment in lab. Teacher asked the students to draw the circuit diagram of this experiment. Teacher noticed that Rahul has drawn the wrong circuit diagram in his practical diary.



(a) Correct Rahul's circuit diagram.

(b) In which mode (CB, CC and CE) is the transistor connected. How will you identify this?

(c) Teacher gave all apparatus and box containing diode, IC, capacitor, transistor. How will the student detect

transistor from other semiconductor devices.

d) Students measured the current between Emitter-Base and Collector- Base with multimeter.

In which case does the multimeter show more current. Explain your argument.

(e) Draw the i/p and o/p characteristic curve, if they had performed the experiment in the correct way.

(2 +1+1+2 + 2= 8 Score)

4. Young's double slit experiment demonstrates the interference of light.

(a) Give the conditions to be satisfied for getting sustained interference pattern.

1

(b) Obtain the conditions for maxima and minima.

2

(c) What change would you expect in the fringe width if whole of the apparatus of Young's double slit experiment is immersed in water? Justify.

2

OR

Diffraction at a single slit is an example of Fraunhofer diffraction.

(a) State the difference between Fresnel diffraction and Fraunhofer diffraction.

1

(b) Obtain the conditions for maxima and minima.

2

(c) Among the following which one undergo maximum diffraction radio waves, gamma rays, visible light . Justify your answer

2

5.A lens forms image by refraction at its refracting faces. The refraction obeys the general equation

$$(-n_1/u) + (n_2/v) = (n_2 - n_1)/R \quad (n_2 > n_1)$$

(a) An object 'O' be placed in front of a thin lens. Draw the ray diagram to locate the position of final image formed by it.

(1)

(b) Write down expression for refraction at both of its refracting faces and arrive at lens maker's formula.

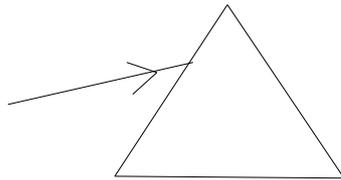
(3)

(c) Give a situation where a convex lens act as a concave lens.

(1)

OR

.A ray of light enters the face AB of a prism.

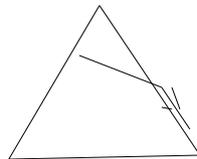


a. Complete the ray diagram to show the refraction,when the prism is in the minimum deviation position (1)

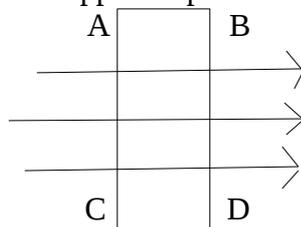
b. what is the relation between angle of incidence,angle of emergence,angle of the prism and angle of minimum deviation. (1)

c. At the minimum deviation position what is the relation between A and D? (1)

d. Suppose a ray of light falls normally on the surface AB of the prism of refractive index 1.5.Find the angle of the prism A,if the ray just grazes the second face AC. (2)



6.A rectangular loop ABCD made of copper suspended in a magnetic field B is shown in this figure.



Here the conductors AC and BD are perpendicular to the field. A current I is passed through the loop.

- Write down the expression for the force acting on a current carrying conductor placed in a magnetic field. (1)
- Using the above expression find the force loop and torque acting on this loop. (1)
- What is the difference in torque acting on a rectangular loop when it is rotated in a radial and parallel magnetic field (1)

7. An audio signal $10\sin 2\pi (1500t)$ amplitude modulates a carrier $40\sin 2\pi (100000t)$

i) Sketch the AM Wave and what will be the percentage of modulation?

ii) Calculate the area of region covered by TV broadcast by a tower of height 200m. (Radius of earth $R = 6.4 \times 10^6$ m)

[2+2]

8. De Broglie suggested that matter also possess dual nature like radiations. Einstein's photon picture depicts the dual nature of radiations.

(a) What is the meaning of matter wave?

(b) Calculate the de Broglie wavelength of a body of mass 2 kg moving with a velocity 10 m/s. {1 + 2 = 3}

9. The line spectrum of hydrogen was successfully explained by Bohr.

a) What are the postulates of the above model?

b) Write the expression for energy and radius of orbit.

c) Find the longest wavelength in Lyman series and radius of second energy level. [1+2+2=5]

10 a) Define half-life period of a radioactive substance. Establish its relation with the decay constant?

(1)

(b) Deduce an expression for energy of an electron in an atom on the basis of Bohr atom model?

(3)

(c) Graphically represent the variation of Binding energy / Mass number with Mass number? (1)

11. One can determine the direction of electric field around a stationary charge with the help of field lines.

(a) What do you know understand by the term 'electric flux'? Give its SI unit. (1)

(b) State Gauss's theorem in electrostatics and express it in mathematical form. (1)

(c) Consider a spherical shell of radius 'R' is uniformly charged with charge 'q'. By using Gauss's theorem, find the electric field intensity at a point 'p'.

(i) Outside this spherical shell

(ii) Inside this spherical shell (3)

12. An inductor and capacitor are connected in series to an AC source

$V = V_0 \sin \omega t$

(a) Draw a circuit diagram of LC series circuit with applied AC voltage. (1)

(b) Find the expression for impedance of LC series circuit using phasor diagram. (2)

(c) Obtain the condition for resonance in the given circuit. (2)

13. A substance is weakly repelled by magnetic field

a) Identify the substance. Give example

b) How is its susceptibility dependent on temperature?

c) Why is iron core preferred in transformer core [1+1+1]