HIGHER SECONDARY MODEL EXAMINATION 2009-10

HSE II PART III Max Score : 60

Time : 2 hrs

PHYSICS

General instruction to candidates

- Read all the questions carefully
- Total time for examination is 2 hrs 15 minutes including ' cool off ' time
- First 15 minutes is cool off time during which neither answer the questions nor have discussion with others
- All questions are compulsory and only internal choice is allowed
- Choice is given for question numbered '6'

1) Two charges +3 μC and -3 μC are separated by a distance of 5 mm.

a) What is the name of above configuration?

b) If the above arrangement is placed in a uniform electric field of intensity 3×10^{-5}N/C with its axis perpendicular to the direction of the field, what is the torque acting on it?

c) If the arrangement is placed in a non-uniform electric field, what happens?

[1+2+1]

2) A cubical block is given a charge of +40 mC and placed in vacuum.

a) Give the direction of electric field at the centre of each face.

b) Calculate the net flux through each face.

c) Will there be any change in flux if it is placed under water. Justify your answer. (Dielectric constant of water = 81)

[1+2+1]

3) The emf of a dry cell is 1.5 V.

a) What do you mean by emf?

b) Potentiometer is a better instrument than a voltmeter to measure emf of cell .why?

c) How will you use a potentiometer to compare the emf of two cells?

d) While measuring the emf, the primary circuit of the potentiometer should not change. Why? **[1+1+2+1]**

4) A galvanometer is an instrument used for measuring small currents.

a) What is the principle behind a galvanometer?

b) How is a galvanometer converted to ammeter and voltmeter?

c) Which has a higher resistance, millivoltmeter or microvoltmeter? Justify

[1+2+2]

5) Using Biot-savart's law, we can find the magnetic field due to current distributions.

a) State the above law

b) State another law which can be used for finding magnetic field due to current distributions

c) A torroid having inner and outer radius of 25 cm and 26 cm has 1000 turns carrying current of 5 A. What is the magnetic field inside and outside the core of torroid?

[1+1+2]

6) Faraday found that electric current can be generated with the help of magnetic field.

a) State the laws of electromagnetic induction

b) Find an expression for self-inductance of a solenoid

c) Mention any two uses of eddy currents. **[2+2+1]**

OR

6) A LCR series circuit can be used as tuning circuits.using resonance condition.

a) Draw the corresponding phasor diagram.

b) Find the expression for resonant frequency.

c) The current passing through inductor or capacitor only circuit is called wattless current. Why? **[2+2+1]**

7) 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]

8) A ray of light falls on one side of a prism whose refracting angle is A. The angles of incidence and refraction at at the first face are i_1 and r_1 while at second face is i_2 and r_2.

a) Draw the incident and refracted ray at the minimum deviation.

b) What do you mean by critical angle of prism? If the refractive index of above prism is 1.5, find 'C'.

c) Find the angle of incidence in order that emergent ray may just graze the other side

[1+2+1]

9) a) Which of the following phenomenon can't be explained by wave theory of light?

i) Reflection ii) Refraction iii) Interference iv) Photoelectric effect

b). In Young's experiment, the distance between slit and screen (D) = 1m, the separation of slits (d) =1mm, wavelength of light (λ) = 600 nm. Calculate the fringe width (β)

c) If the experiment is done in water (n=4/3) without changing the setup, what change will be observed in fringe width? Why**?** **[1+2+2]**

10) Electromagnetic spectrum consists of γ rays, X-rays, UV, Visible, IR, Microwaves and Radiowaves

a) What is the phase difference between electric and magnetic field vectors in EM wave?

b) Which constituent radiation of the spectrum is mainly involved in

i) Greenhouse effect ii) Radar system iii) Distant photography during foggy condition

iv) Treatment of cancer **[1+2]**

. **11)** The resolving power of electron microscope is more than ordinary microscopes. Why?

a) Which property of electrons is used in the construction of electron microscope?

b) Obtain expression of wavelength of De-Broglie waves associated with electrons accelerated through a potential of V volts. **[1+2]**

12) Classify the following statements into true or false and justify

a) Radioactivity of a sample depends on the temperature of sample.

b) Rate of disintegration at any instant depends on the original number of atoms present initially

[1+1]

13) 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]**

14) a)The lightly doped region of a transistor is known as ……

b) Current amplification factor for CB, CE and CC transistor configuration are α, β and γ. Show that $\beta = \alpha / 1 - \alpha$.

c) A transistor is having two PN Junctions. Is it possible to produce transistor action by fusing two PN junction diodes? Justify your answer **[1+2+2]**

15) a) 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= 6.4×10^6 m) **[2+2]**