Higher Secondary Examination, 2008
Physics (New Syllabus)
(English version)
Group-A

1. Give answer to the following questions either in one word or in one sentence (alternatives are to be noted):

$$1 \times 10 = 10$$

(a) What is the condition for destructive interference of two monochromatic coherent beams of light?

1

OR, Fill in the blanks:

For a source of sound approaching a stationary observer, the frequency of sound source ----------.

(b) At the ends of an organ pipe open at both ends, what do we get always — nodes or antinodes?

1

(c) What is the net electric force on an electric dipole placed in a uniform electric field? 1

(d) Fill in the blank: 1 e.s.u. of potential = --------- volts.

1

OR, State whether the statement is true of false:

"The direction of electrostatic field intensity at a point on the surface of a charged conductor is along the tangent drawn on the surface at that point."

(e) The north pole of a magnet is brought near a static conductor charged negatively. Will the pole experience any force?

1

OR, Will a moving charge experience any force in a magnetic field?

(f) Write down the name of the physical quantity whose unit is joule (coulomb)

1.

(g) What kind of charge is the majority carrier in a p-type semiconductor?

1

(h) What is threshold frequency in photo electric effect?

1

OR, What is the rest mass of a photon?

(i) Write down Bohr's quantum condition for the angular momentum of the electron in the hydrogen atom.
  1

(j) What type of impurity is required to prepare an n-type semiconductor? 1

Group – B

2. Answer the following questions (alternatives are to be noted):
  2x7=14

(a) State the principle of conservation of angular momentum for a mechanical system.
  2

OR, why does a ballet dancer extend her hands in order to reduce her spinning motion?
  2

(b) What are intensive variables for a thermodynamic system? Name two intensive variables for a gas in equilibrium kept in a container.
        1+1

OR, what is Brownian motion? Does the r.m.s velocity of Brownian particles increase or decrease with rise in temperature?
      1+1

(c) Define electric energy and electric power. State their units.   2

OR, What do you understand by the statement that the Curie temperature of Nickel is 360°C?

(d) Give the definition of the temperature of inversion of a thermocouple with the help of a graph.
      2+2

(e) Two bodies of capacitance C_1, and C_2, carry equal charge Q. Find the common potential of the bodies if they are connected by a conducting wire.
        2

(f) Why does the conductivity of a pure semi-conductor increase with rise in temperature?

(g) Show the logic symbol and the truth table of an AND gate.
2+2

OR, Show with the help of a diagram the construction of a n-p-n transistor.
      2

Group - C

3. Answer the following questions (alternatives are to be noted):   4x11=44

(a) What is moment of inertia? Write down its unit.
A solid sphere of mass 1 kg and radius 10 cm is rotating uniformly about a diameter with angular velocity %: radians/sec. Using standard formulae calculate its kinetic energy.
         1+1+2

OR, Why does a cyclist during motion along a circular path lean towards the centre of the path? Establish the relationship between the speed of the cyclist, radius of curvature and the angle through which the cyclist leans with respect to the vertical direction.
         1+3

(b) State Newton's law of gravitation. Obtain the expression for the variation of the acceleration due to gravity with the altitude from the surface of the earth. 1+3

OR, What is a geo-stationary satellite?
An artificial satellite revolves around the earth along a circular orbit of radius r. If T be the time period of revolution, show that $T^2 \propto r^3$.   1+3

(c) Why are there two specific heats of gases? Show that the specific heat of a gas at constant pressure (C_P) is greater than that at constant volume (C_v).
         2+2

OR, The density of a monoatomic gas remaining constant, at what temperature will the r.m.s. speed of the molecules of the gas, which is initially at 100°C, fall to 1/3 rd of its original value?4

(d) 10 liters of water is dropped from a height of 250 meters. How much heat (in calories) will be generated when the water reaches the bottom? Assuming all the heat remains contained in the mass of water, what will be the rise in temperature of water? (Give J=4.18 joules/calorie) 4

(e) Write down the expression for the velocity of sound waves in a gas, taking account of Laplace's correction. Calculate the velocity of sound in air at N.T.P. (give C_p/C_v =1.4, Density of air at N.T.P. = 0.001293 gm/c.c, Density C v of mercury = 13.6 gm/c.c. and g = 981 cm/sec3).   1+3

OR, Write down the laws of transverse vibration of a stretched string. What is the change in frequency of the string if its tension is double, keeping its linear density and length unchanged?
                 3+1

(f) What are standing waves? Show by mathematical analysis how standing waves are formed in a closed medium by superposition of two waves of same frequency and

amplitude but moving in opposite directions.
                        1+3

(g) Define electrostatic potential. Obtain an expression for the potential at a distance r from a point charge q in free space. What change in potential is observed if the charge is placed in a medium of dielectric constant k?
                        1+2+1

 OR, What is electric dipole moment? Find out the field intensity at a point which is located at a distance r from the mid-point of an electric dipole and which lies on the axis of the dipole.
                1+3

 (h) State Coulom's law of electrostatics. Two particles A and B having charge 8×10^6 coulomb and -2×10^6 coulomb respectively are held fixed with a separation of 20 cms. Where should a third charged particle be placed so that it does not experience any electric force?   1+3

OR, Define capacitance of a capacitor. A potential difference of 20 volts is applied across a parallel combination of three identical capacitors. If the total charge in the combination be 30 coulombs, determine the capacitance of each capacitor. What will be the charge of the series combination of these three capacitors with the same potential difference?
                1+2+1

(i) The thermo e.m.f. of a copper-constantan thermocouple is E. It is found that the relation $E = at + 1/2 bt^2$ is approximately obeyed when the temperature of the hot junction is t^oC (the temperature of the cold junction is 0°C). Here E is in µ V, t in °C and a= 41 µV $(^0C)^{-1}$, b=0.041 µV $(^0C)^{-2}$. Determine the temperature of the hot junction if the magnitude of the thermo e.m.f. is 5.5 mV.   4

OR, State Ampere's circuital law. Use the law to find the magnetic field intensity inside a long solenoid. 1+3

 (j) What are the elements of terrestrial magnetism at a particular place? Give the definition for each.
1+3

OR, A closed circular coil of average radius 10 cm and 100 turns is placed normal to a uniform magnetic field of intensity 100 oersted. Determine the amount of charge flowing through the coil if it is turned through 180° about one if its diameters, give that the resistance of the coil is 2Ω.   4

(k) Distinguish between a metal and an insulator with the help of an energy band diagram.   4

OR, What is the photoelectric effect? State its laws. Write down Einstein's photoelectric equation.

1+2+1

Group - D

4. Answer" the following questions (alternatives are to be noted):
    6x2=12

(a) What do you understand by 'neutral point' in a magnetic field? A 6 cm long bar magnet is kept on the ground vertically on its north pole. If the neutral point is observed 8 cm away from the north pole on the ground, then what is the magnetic moment of the bar magnet? (H=0.36CGS)   2+4

OR, Obtain an expression for the force per unit length between two long parallel wires separated by a distance d and carrying currents i_1, and i_2 respectively in the same direction. Give the definition of 1 ampere of current from that expression.

A solenoid having 7 turns per cm carries a current of 2.5 amps. What is the magnetic intensity inside the solenoid?
    3+1+2

(b) State Huygens 'Principle for the propagation of light and using it derive the law of refraction of light. A progressive wave is described by the relation:

 $y = a \sin\pi[x/15-t/6]$ where a is the amplitude (in cm). Determine (i) the wavelength and (ii) the velocity of it, give that x is measured in cm and t in seconds.
4+2

OR, What is meant by interference of light? State two essential criteria for its observation. A double slit of separation 0.5 mm is illuminated by light of the blue cadmium line ($\lambda = 4800A^0$). How far behind the slits must one place a screen to obtain fringes of width 1 mm? (You may use the relevant formulae).
    1+4