SAMPLE PAPER – 2008
CLASS – XII
SUBJECT – PHYSICS
(Three Hours)

Candidates are allowed additional 15 minutes for only reading the paper.They must not start writing during this time.
Answer all questions in Part 1 and six questions in Part 2 choosing two questions each from Section A,Section B and Section C
All working including rough work should be done on the same sheet as and adjacent to the rest of the answer.The intended marks for each question or parts of question are given in brackets [ ]
Material to be supplied: Mathematical tables including trigonometric tables
A list of useful physical constants is given at the end of the paper.

Part I
(Compulsory)

Answer all the questions briefly and to the point

Question 1 [20]

a) What is the work done by the electric field of the nucleus of an atom on a 'complete' circular orbit in which an electron is revolving.What will be the work done if the orbit was elliptical
b) Define mutual inductance
c) A transformer converts a voltage of 12V to 240 V.Calculate the turns ratio
d) State Ampere's Circuital Law
e) Can a sphere of radius 1cm hold a charge of 1C.Explain
f) When we touch the wires connected to capacitors of capacitance 2μF and 0.2μF both at same potential we get a more intense shock from the wire connected to the 0.2μF capacitor.Why?
g) A potential difference of 10V is applied across a 6m long wire.Calculate potential gradient
h) An inductor of inductance 10mH is connected to an a.c. of frequency 50 Hz.Calculate inductive reactance
i) What is Seebeck effect?
j) What will happen to the drift velocity of electrons in a conductor if:
   i) its length is increased
   ii) its temperature is increased
k) A cell of internal resistance 0.5 Ω is being charged by a p.d. of 15V and by passing a current of 1A.Calculate the emf of the cell
l) What is depletion layer in a p-n junction diode
m) Explain the occurrence of characteristic curves in the spectrum of X-rays
n) Calculate the de-Broglie wavelength of a photon having mass 3.3×10^{-25} kg and moving with a velocity of 10^4 m/s
o) Calculate the angular width of the central maximum in single slit fraunhoffer diffraction pattern when a light of wavelength of 5890 nm is used. The width of the slit is 0.02 m
p) Give two applications of remote sensing
q) Define luminous intensity .State its SI unit

r) When a ring is placed on the projecting core of an electromagnet and circuit is closed the ring moves up.Why?
s) What is the source of sun's energy
t) State radioactive decay law

Part II
(Answer six questions choosing two questions each from Section A,SectionB and Section C)

Section A
(Answer any two questions)

Question 2

a) Two balls of density 1.6 kg/m^3 is hung by two strings from a point.The angle between the strings at equilibrium is 30^0 . The whole system is now immersed in a liquid of density 0.8 kg/m^3.The angle between the strings remain equal.Calculate the dielectric constant of the liquid .(Assume masses of strings to be negligible)
[4]
b) Deduce Coulomb's Law from Gauss' Theorem
[3]
c) An electric dipole of dipole moment p=2ql is placed in an electric field of intensity E at an Angle θ.Deduce the expression for the torque experienced by it
[2]

Question 3

a) To reduce the value of current flowing through a galvanometer 25 times what value of shunt should be connected.The resistance of the galvanometer is 1000Ω.
[2]
b) Using Biot-Savart's Law deduce the expression for the magnetic field at a point due to an infinitely long conductor
[4]
c) Give three points of difference between dia para and ferro magnetic substances
[3]

Question 4

a) Two circulars loops of radius 3 cm and 15 cm are kept apart coaxially at a distance of 20cm A current of 2A flows through the smaller loop.Calculate the flux linked with the bigger loop

and the mutual inductances between the coils
[3]

b) A circuit draws a power of 550W from a 220V-50Hz a.c. source.The power factor of the circuit is 0.8.The current lags behind voltage.Show that a capacitor of capacitance $\frac{1}{42\pi} \times 10^{-6} F$ is to be connected so as to bring the power factor to unity
[3]

c) Show that the resonant frequency of an LCR ac circuit is $\frac{1}{2\pi\sqrt{LC}}$
[3]

Section B
(Answer any two questions)

Question 5

a) Using Huygen's theory prove the laws of refraction of light [4]
b) In Young's Double Slit Experiment the fringe width was found to be 2.5mm when a light of 6000 angstrom is used.What will be the fringe width when the apparatus is immersed in water of refractive index 1.33 [4]

Question 6

a) Write four differences between interference and diffraction [2]
b) A light ray is incident on a glass surface at polarizing angle.If angle of refraction is 32^0 Calculate angle of polarization and refractive index. [2]
c) Deduce the expression for achromatic combination of lenses.State some essential features of achromatic doublet [4]

Question 7

a) Draw a neat labeled diagram of compound microscope and deduce the expression for its Magnifying power [4]
b) An object and a screen are kept at a distance D apart .In between a convex lens of focal length f is
Placed.The real image is formed when the lens is displaced by a distance x.
Show that $f = \frac{D^2 - x^2}{4D}$ [3]
c) The focal length of a convex lens in air is 15 cm.What will be its focal length under water μ_{water}=1.33, μ_{glass}=1.5 [1]

Section C
(Answer any two questions)

Question 8

a) In a cathode ray tube an electron is accelerated from rest through a potential difference of 1000 V
The length of the plates is 2cm and the distance between the plates is 0.5mm.If the deflection Of the electron is 0.25cm.Calculate the potential difference between the two plates [3]
b) Write down the main differences between Compton effect and photoelectric effect [2]
c) When a metallic plate is illuminated alternately by lights of wavelength 3000 angstroms and 6000Angstroms.The maximum velocity of the photoelectrons emitted is in the ratio 3:1.Calculate
The work function of the metal and the maximum velocities of the emitted photoelectrons [3]

Question 9

a) Atomic masses can be determined precisely by mass spectrography.The atomic mass of [4]
$^4He_2$ Molecule measured by this technique is 4.0026u (1u=1.66 X 10^{-27} kg)
i) Compare the given mass of the molecule with the sum of the masses of its components
Which one is greater and by how much?(m_p=1.0073 u ,m_e=0.00055u , m_n=1.0087 u)
ii)Calculate the binding energy in joules and MeV
iii) Calculate binding energy per nucleon
b) Represent graphically the binding energy per nucleon and the atomic masses of elements Write down three major observations from this graph [3]
c) In a nuclear reactor state the function of i) Moderator ii) Control Rod [1]

Question 10

a) Draw a labeled diagram for the use of p-n-p transistor as an amplifier.Explain how there Is a reversal of phase in the current entering and leaving [3]
b) Draw and explain the V-I characteristics of p-n junction diode under reverse bias [3]
c) The output of OR gate is connected to NOT gate.Draw the resultant gate and the truth Table for it [2]

PHYSICAL CONSTANTS

Electron Charge (e) $=1.6 \times 10^{-19}$ C
Unified Atomic mass (u) $= 1.66 \times 10^{-27}$ kg
Planck's Constant (h) $= 6.6 \times 10^{-34}$ J s

Electron Volt (eV) = 1.6×10^{-19} J

Speed of em waves in vacuum(c) = 3×10^{8} m/s

Rydberg Constant (R) = 1.097×10^{7} m^{-1}

Permittivity of free space ($\square_0$) = 8.85×10^{-12} F/m

$\frac{1}{4\pi\varepsilon_0}$ = 9.0×10^{9} N m^2 C^{-2}

Permeability of free space (μ_0) = $4\pi \times 10^{-7}$ T.m.A^{-1}

π = 3.14