**Sample Paper – 2013
Class – XII
Subject –PHYSICS**

TIME: 3 hrs MAX. MARKS: 70

**INSTRUCTIONS:**

* The question paper consists of 4 pages.
* Diagrams/graphs are to be drawn only with a PENCIL.
* The paper consists of 30 questions with following marks distribution:
* Questions 1 to 8 of 1 mark each.
* Questions 9 to 18 of 2 marks each.
* Questions 19 to 27 of 3 marks each.
* Questions 28 to 30 of 5 marks each.

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Q.1: What are the dimensions of magnetic flux? What is the flux associated with a plane coil

 of area $→$ , having N turns in a uniform magnetic field $→$ ? (1)

Q.2: One billion electrons pass from A to B in a conductor in 1 milli second. What is the direction and

 magnitude of current? (1)

Q.3: A rectangular current loop is in an arbitrary orientation in an external uniform magnetic field. Is

 any work required to rotate the loop about an axis perpendicular to its plane? Explain. (1)

Q.4: Explain the term ‘minority carrier injection’ under forward bias in a p-n junction diode. (1)

Q.5: Write the equation for an alpha decay if the parent nucleus is AXZ and the daughter nucleus is Y.

 Also mention the expression for disintegration energy (Q – value) for an α – decay. (1)

Q.6: A convex mirror of focal length f produces an image half of the size of the object. What is the

 distance of the object from the mirror? (1)

Q.7: Draw geometrical shape of a wave front emerging through an equilateral prism. (1)

Q.8: What is the effect on the following on inserting a dielectric in a parallel plate capacitor:

 (a) Capacitance (b) Charge on the plates of the capacitor

Q.9: For an amplitude modulated wave, the maximum amplitude is found to be 10 V while the

 minimum amplitude is found to be 2 V. Determine the modulation index µ. (2)

Q.10: (a) Distinguish between resistance, reactance and impedance for an AC circuit. (1)

 (b) What do we mean by the term phasors? Draw a phasor diagram for an AC circuit with a

 capacitor. (1)

Q.11: What is the magnetic moment of an electron (charge = e) orbiting in a circular orbit of radius R

 with a speed V? (2)

Q.12: The electric field vector is given by $→$ = ax1/2 $\hat{i}.$ Calculate

 (a) flux of $→$ through a cube bounded by surfaces x=p, x=2p, y=0, y=p, z=0 and z=p.

 (b) the charge within the cube. (1 + 1)

Q.13: A fish in an aquarium approaches the left wall at a rate of 3 m/s and observes a fly approaching

 it at 8 m/s. If the refractive index of water is 4/3, find the actual velocity of the fly. (2)

## Q.14: The width of one of the two slits in a Young’s Double Slit Experiment is double of the other.

##  Assuming that the amplitude of the light coming from a slit is proportional to the slit width, find

##  the ratio of the maximum to minimum intensity in the interference pattern. (2)

## Q.15: Give two differences between a photo diode and a LED. Also, sketch a I – V characteristics of a

##  photodiode for different intensities. (2)

## Q.16: The radius of the innermost electron orbit of a hydrogen atom is 5.3 × 10-11 m. What is the

##  radius of the n = 3 orbit? (2)

## Q.17: Draw a well labelled diagram to show Earth’s magnetic field and angles associated with it. (2)

## Q.18: Calculate the current flowing in the following circuit and the heat loss across 2.2 kΩ resistor in

##  10 seconds. (2)

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Q.19: Two capacitors are filled half with dielectrics of dielectric constants k1 and k2 in a manner shown in the figure: (assuming plate area A and distance b/w the plates D)

k1

k1

k2

 If the net capacitance in the two cases is same, find the relation between k1 and k2. (3)

Q.20: Draw a labelled diagram of the experimental set up used to study the photoelectric effect.

 Establish Einstein’s photoelectric equation from his theory of photoelectric effect. (3)

Q.21: From a truth table for output Q in the given circuit:



Q.22: In a Young’s Double Slit Experiment conducted with white light (4000 Å - 7000 Å), consider two

 points P1 and P2 on the screen at y1 = 0.2 mm and y2 = 1.6 mm respectively. Determine the

 wavelengths which form maxima at these points. (3)

Q.23: (a) Does every charge give out electromagnetic waves? Explain very briefly. (1)

 (b) The magnetic field in a plane EM wave is given by

 By = 2 × 10 -7 sin (0.5 × 103 z + 1.5 × 1011 t) T.

1. What is the frequency of the wave? (1)
2. Write an expression for the electric field. (1)

Q.24: Draw a circuit diagram for a potentiometer circuit used to find internal resistance of a cell

 and deduce the expression for internal resistance in terms of the balancing lengths. (3)

Q.25: (a) The coefficient of mutual induction of the two coils is 0.5 H. If the current is increased from 2

 to 3 A in 0.1 seconds in one of them, then find the induced EMF in the second coil. (1)

 (b) Give two advantages of eddy currents in electrical appliances. (2)

Q.26: (a) Give two advantages of the presence of a soft iron core in a moving coil galvanometer. (1)

 (b) How can you turn a galvanometer into a voltmeter? Give the necessary equation. (1)

 (c) A galvanometer having a coil resistance 100 Ω gives a full scale deflection when a current of

 1 mA is passed through it. What is the value of the resistance which can convert this

 galvanometer into a meter giving full scale deflection for a potential difference of 10 V? (1)

Q.27: Block diagram of a receiver is shown. Identify X, Y and Z. State their functions. (3)

Receiving Antenna

Received Signal

Output

Z

Y

X

Amplifier

Q.28: (a) A prism can produce minimum deviation ƍ in a light beam. If three such prisms are

 combined, what will be minimum deviation produced in this beam? (1)

 (b) Show that if the angle of the prism is twice the critical angle of glass, there will be no

 emergent ray. (2)

 (c) A ray enters a glass sphere of R.I. n = $\sqrt{3}$ at an angle of incidence 600 and is reflected and

 refracted at the farther surface of the sphere. Calculate the angle between the reflected and

 refracted ray at this surface. (2)

Q.29: (a) Draw the graph for the following once it passes through a half wave rectifier. Draw the

 corresponding detailed circuit. On what principle does it work? (1 + 1.5 + 0.5)

 ![[Maple Plot]]()

 (b) What is the difference between diffusion current and drift current? (1)

 (c) Define dynamic resistance for a diode. (1)

Q.30: (a) Dipole is placed parallel to the electric field. If W is the work done in rotating the dipole 60o

 then what is the work done in rotating it by 180o? (1)

 (b) Derive electric field for point P at a distance of r from a spherical conductor of radius R with R < r. (2)

 (c) Derive the electric field at a point r from the midpoint of a dipole having dipole moment $\vec{p}$ and charge q. (3)

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