SAMPLE PAPER-(unsolved)

PHYSICS (Theory)

Class – XII

Time allowed: 3 hours Maximum Marks: 70

General Instructions:

a) All the questions are compulsory.

b) There are **26** questions in total.

c) Questions **1** to **5** are very short answer type questions and carry **one** mark each.

d) Questions **6** to **10** carry **two** marks each.

e) Questions **11** to **22** carry **three** marks each.

f) Questions **23** is value based question carry four marks.

g) Questions **24** to **26** carry **five** marks each.

h) There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all three questions in five marks each. You have to attempt only one of the choices in such questions.

i) Use of calculators is **not** permitted. However, you may use log tables if necessary.

j) You may use the following values of physical constants wherever necessary:

1. How are X-rays produced?
2. Define the SI unit for electrical capacity.
3. Write the mathematical form of the law which is a statement of the fact that magnetic monopoles do not exist.
4. Write any two characteristics of nuclear forces.
5. Draw a graph showing the V-I characteristics for a solar cell.
6. a) Define stopping potential.

   b) How does stopping potential depend on i) Intensity of incident radiation ii) Frequency of incident radiation?
7. Consider two identical capacitors X and Y of capacity Z each. Both are initially uncharged. The capacitor X is charged by a battery of potential difference V. The energy in it is U. The capacitor X is disconnected from the battery a) The capacitor X is

connected across the capacitor Y. After steady state is attained,determine the new p.d in terms of V across the capacitor X and the energy in terms of U stored in it.

b) The capacitor X is connected in series with the capacitor Y. After steady state is attained, determine the new potential difference in terms of V across the capacitor X and the energy in terms of U stored in it.

8. What is the principle of working of transformer? Describe. Does a transformer violate the principle of energy conservation? Explain. Can a transformer be used to step up d.c? Explain.
9. Determine the electrostatic potential energy of the system of charges shown in the diagram below.

Or

State the principle of working of moving coil galvanometer. Write two reasons why a galvanometer cannot be used as such to measure the current in a given circuit.

10. Define: mean life of a radioactive sample. The half-life of a radioactive sample is 3 hours. If at t = 0, you start with 240g of the sample, what mass will remain undecayed after 12 hours?
11. Define: Magnifying power for a compound microscope for the case when the final image is at the near point for the normal eye. A compound microscope uses an objective lens of focal length 4 cm and an eye piece of focal length 10 cm. an object is placed 6 cm from the objective. Calculate the magnifying power for this situation. Also, determine the length of the microscope.

Or

Draw a labelled diagram to show the image formation in a refracting type astronomical telescope.

12. Two heating elements of resistance R1 and R2 when operated at a constant supply of voltage V, consume power P1 and P2 respectively. Deduce the expression for the power of the combination when they are in-turn connected in a) series and b) parallel across another source of voltage V. Your results must be in terms of P1 and P2 only.
13. State de Broglie's hypothesis. Write the expression for the de Broglie wave. State Bohr's postulate on angular momentum of a revolving electron and use the same to show that the nth Bohr orbit has an integral number of de Broglie waves.
14. A motor car is fitted with a convex mirror of focal length 20 cm. Another car is 10 m away from this car.

    a) Calculate the position of the 2nd car as seen in the rear view mirror of the 1st car.

    b) If the 2nd car is overtaking the 1st car at a relative speed of 20 m/s, then how fast will the image move and in what direction?
15. The input resistance of a common emitter amplifier is 2kΩ and ac current gain is 20. If the load resistor used is 5KΩ, then calculate a) the voltage gain of the amplifier and b) the transconductance of the transistor used.
16. Light of wavelength 5 x 10-7 m is diffracted by an aperture of width 2 x 10-3 m. Upto what distance travelled by the diffracted beam the ray optics is valid?
17. Consider the logic circuit given below. Name the logic gates labelled as X, Y and Z. Write the Boolean expression for the output A in the most simplified form. Write the truth table for the logic operation carried by the gate circuit.
18. State the factors that illustrate the need for modulation. What are the three types of modulation? Define frequency modulation. Why the value of 'modulation index' is kept less than 1?
19. A parallel plate capacitor is being charged by a time varying current. Explain how ampere's circuital law is generalized to incorporate the effect due to displacement current.
20. In the circuit, if the point Y is at zero potential, use Kirchoff's laws to determine the potential at X. Determine the values of R1 and R2.
21. The figure shows two signals having frequencies 20 MHz and 50 MHz. Write the frequencies of the signals X and Y. Which signal is preferred for long range transmission? Explain.

22. A beam of light of wavelength 400nm is incident normally on a right angled prism as shown. It is observed that the light just grazes along the surface AC after falling on it. Given that the refractive index of the material of the prism varies with the wavelength as per the relation m =1.2 + *b* /l 2 . Calculate the value of 'b' and the refractive index of the prism material for a wavelength l = 5000A°

    [Given q = *Sin*-1(0.625)].

23. Shiva complained of a severe stomach pain and started crying. His father consoled him and took him to a gastroenterologist. The doctor advised for an endoscopy. Shiva was afraid. However, his father explained the need for the test and further explained that a tube containing a fine glass fibre would be inserted through the food pipe and light through this pipe would allow the doctor to examine the inside of the stomach. The test was done and Shiva felt fine after taking medicine for two days.

    a) What are the conditions for the light to travel along the pipe?

    b) What is the working principle of the glass fibre in the endoscope?

    c) What values of father impress you?

24. Draw a labelled diagram of a moving coil galvanometer. State its principle. Derive an expression for the current sensitivity of a moving coil galvanometer. Two moving coil meters M1 and M2 have the following particulars:

    R1 = 20Ω, N1 = 15, A1 = 1.8 x 10-3 m2, B1 = 0.25 T, R2 = 14Ω, N2 = 42, A2 = 3.6 x 10-3 m2, B2 = 0.50 T

    The torsion constants are identical for the two meters.

    a) Determine the ratio of current sensitivity of M1 to that of M2.

    b) Determine the ratio of voltage sensitivity of M1 to that of M2.

25. State the importance of coherent sources in the phenomenon of interference. Can interference be observed with two independent sources? Justify your answer. In YDSE, obtain the conditions for constructive and destructive interference. How does the fringe width change when the entire apparatus is immersed in water? Draw the graphs showing the variation of intensity on the screen in Young's double slit and Faunhofer's single slit experiments.

Or

a) Two slits 1mm apart are illuminated with a light of wavelength 500 nm. What would be the width of each slit to obtain 10 maxima of double slit pattern within the central maxima of the single slit pattern?

b) The velocity of a certain monochromatic light in a given transparent medium is 2.25 x 108m/s. What is the critical angle of incidence and the polarizing angle for this medium?

26. State the principle of AC generator. Draw a labelled diagram of an AC generator. What is the source of energy production in this device? An AC generator consist of a coil of 500 turns and area 0.4 m2 rotating at an angular speed of 60 rads-1 in a uniform magnetic field B = 0.50 T between two fixed pole pieces. The resistance of the circuit including that of the coil is 500Ω.

a) What is the flux through the coil when the current is zero? What is the flux when the current is maximum?

b) What is the maximum current drawn from the generator?

c) Would the generator work if the coils were stationary and instead, the pole pieces were rotated together with the same speed as earlier?

Or

A 100/μF capacitor in series with a 100Ω resistance is connected to a 200 V – 50 Hz supply.

a) Determine the average power dissipated per cycle of the AC.

b) Determine the current amplitude in the circuit.

c) Determine the time lag between the current maximum and the voltage maximum.

d) Determine the impedance of the circuit.