Maharaja Agrasen Model School, PitamPura

SAMPLE QUESTION PAPER, Physics

MAX.MARKS- 70 TIME- 3 HOURS

General Instructions:

(i) All questions are compulsory.

(ii) Question numbers 1 to 5 are very short answer type questions, carrying one mark each.

(iii) Question numbers 6 to 10 are short answer type questions, carrying two marks each.

(iv) Question numbers 11 to 22 are also short answer type questions, carrying three marks each.

(v) Question number 23 is value based question, carrying 4 marks.

(vi) Question numbers 24 to 26 are long answer type questions, carrying five marks each.

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

(viii) You may use the following values of physical constants wherever necessary

1. What is the work done in moving a test charge 'q' through a distance of 1 cm along the equatorial axis of an electric dipole?

(ii) Cannot form closed loops?

2.How does the self-inductance of an air core coil change, when (i) the number Of turns in the coils is decreased & (ii) an iron rod is introduced in the coil.

3. Give two characteristics of electromagnetic waves.

4. Which among X-rays, sound waves and radio waves can be polarized?

5.What is total internal reflection? Under what condition does it take place.

6.Two capacitors of capacitances 3μF and 6μF are charged to potentials of 2V and 5V respectively. These two charged capacitors are connected in series. Find the potential across each of the two capacitors now?

7. Length of a given conductor is increased to 3 times by stretching it. What is its effect on drift velocity and resistivity?

(Assume potential difference across the conductor is kept constant).

8. What is potential gradient? Write its unit also. Write its expression in terms of Specific resistance of the wire.

(OR)

Draw the graphs showing variation of resistivity with temperature for metals and silicon.

9. State Biot –Savart's law. Using it, write the expression for the magnetic field at thecentre of the circular current carrying coil of radius 'a'.

10. A circular copper disc, 10cm in radius rotates at 20π rad/s about an axis Through its center and perpendicular to the disc. A uniform magnetic field of 0.2 T acts perpendicular to the plane of the disc.

(i) Calculate the potential difference developed between the axis of the disc and the rim.

(ii) What is the induced current if the resistance of the disc is 2 ohm.

11. The threshold frequency for a certain metal is 3.3 x 1014 Hz. If light of frequency 8.2 x 1014 Hz is incident on the surface of the metal. Find (i) work function (ii) maximum K.E of photoelectron ejected,(iii) threshold frequency.

12. (i) If the base region of a transistor is made large as compared to the usual transistor, how does it affect (a) collector current (b) current gain?(ii)Write the biasing conditions for a transistor.

13. A set of 4 cells each of emf 2V and internal resistance 1 ohm are connected across an external load of 10 ohms with 2 rows, 2 cells in each branch.

Calculate the current in each branch and the potential difference across 10Ω.

14. What is the force on a wire of length 2 cm placed inside a solenoid near its centre (a) making an angle of 60ºwith the axis (b) parallel to the axis

(c) perpendicular to the axis? The wire carries a current of 1A and the magneticfield inside the solenoid is 0.4T

15. Compare the any three properties of ferro, para and dia magnetic substances.

16. A 100V,50Hz source is connected to a series combination of an inductance of

100mH and resistance 20 ohms. Calculate the magnitude and phase of current.

(Or)

A 25μF capacitor,0.1H inductor and 25 ohms resistor are connected in series withan ac source whose emf is given by E = 310 Sin (314t)

Calculate (a) frequency of the ac power supply? (b) Impedance.

(c)Peak current in the circuit.

17. Explain various series of spectral lines Hydrogen atom and draw energy level diagram.

18. Using the data given below, state which of the two given lenses will you prefer to construct the best possible

(i) Telescope (ii) Microscope. Also indicate which of the selected lenses is to be used as objective and as eyepiece in each case.

Lens	Power(P)	Aparture(A)
L1	6D	1 cm
L2	3 D	8 cm
L3	10 D	1 cm

19.A star converts all its hydrogen to helium achieving 100% helium composition. It then converts helium to carbon via the reaction

$2He^4 + 2He^4 + 2He^4 \longrightarrow 6C^{12} + 7.27\ MeV$

The mass of the star is 5 x 1012kg and it generates energy at the rate of 5x1030 W.

Calculate (i) Total number of nuclear reactions, (ii) Total energy released

And (iii) How long will it take to convert all the helium to carbon at this rate.

20. Explain the following (a) ground wave communication (b) Sky wave communication and (c) space wave communication.

21. Define polarization of light .State and prove Brewster's law.

22. What is the power dissipated in the pure inductor circuit & derive the equation for energy stored in an inductor?.

23. In the famous conversation, Rakesh Sharma, the first Indian Astronaut in space, was asked by the then Prime Minister Indira Gandhi as to how India lookedfrom space. To which he replied 'Sare Jahan Se Achcha' (better than the whole world).Answer the following questions based on above passage:

a. Which scientific mode of communication enabled The Prime Minister to speak to the Astronaut?

b. Name the scientific values displayed in this anecdote.

c. Which values are being reflected in the reply given by the astronaut?

24. Write the principle of a capacitor? Deduce the expression for the capacitance of a PPC and hence derive the expression for the energy stored in a capacitor.

(Or)

a) State Gauss's theorem in electrostatics.
b) Obtain expression for electric field at a point which is at a perpendicular distance 'r' from a plane infinite sheet of charge with uniform charge density.

25. a)State Huygen's principle.

b)Describe the single slit diffraction experiment and obtain the expression for fringe width.

(Or)

a) Derive the relation between the focal length of a convex lens in terms of the radii of curvature of the two surfaces and refractive index of its material. Write the sign conventions and two assumptions used in the derivation of the relation.

b) A convex lens of focal length 40 cm and a concave lens of focal length -25 cm are kept in contact with each other. What is the value of power of this combination?

26.a) With the help of a labeled diagram, explain how n-p-n transistor is used as an amplifier in CE configuration. Explain how the input and output in this case areout of phase.

b)A transistor operated in CE configuration at Vc=2V such that change in

base current from 100μA to 200 μA produces change in the collector current from9mA to 16.5mA.Calculate the current gain.

OR

a) Explain the working of n-p-n transistor as an oscillator with the help of a labeled diagram.

b) Sketch the output waveform for the inputs A and B obtained from NAND gate.