SAMPLE QUESTION PAPER

BLUE PRINT

Time : 2 Hours **Max. Marks :** 35

S. No.		Chapter	Section-A (2 marks)	Section-B (3 marks)	Section-C (5 marks)	Total
8.	Unit-V	Electromagnetic Waves	–	1(3)	–	5(17)
9.	Unit-VI	Ray Optics and Optical Instruments	1(2)	1(3)#	1(5)	
10.		Wave Optics	–	2(6)	–	
11.	Unit-VII	Dual Nature of Radiation and Matter	1(2)#	1(3)	–	4(11)
12.	Unit-VIII	Atoms	–	1(3)*	–	
13.		Nuclei	–	1(3)	–	
14.	Unit-IX	Semiconductor Electronics : Materials, Devices and Simple Circuits	2(4)	1(3)	–	3(7)
		Total Questions	**3(6)**	**8(24)**	**1(5)**	**12(35)**

*It is a choice based questions.
#Out of the two or more questions only one question is choice based.

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General Instructions :

(i) There are 12 questions in all. All questions are compulsory.

(ii) This question paper has three sections: Section A, Section B and Section C.

(iii) Section A contains three questions of two marks each, Section B contains eight questions of three marks each, Section C contains one case study-based question of five marks.

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

(v) You may use log tables if necessary but use of calculator is not allowed.

SECTION - A

1. Draw a plot showing the variation of resistivity of a (i) conductor and (ii) semiconductor, with the increase in temperature.

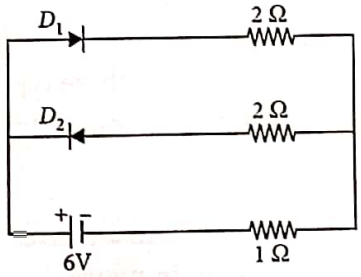
2. (a) Define the terms, (i) threshold frequency and (ii) stopping potential in photoelectric effect.

   (b) Plot a graph of photocurrent versus anode potential for a radiation of frequency υ and intensities I_1 and I_2 ($I_1 < I_2$).

   OR

   Calculate the energy of a photon of wavelength 390 nm.

3. Assuming that the two diodes D_1 and D_2 used in the electric circuit shown in the figure are ideal, find out the value of the current flowing through 1 Ω resistor.



SECTION - B

4. State clearly how a microwave oven works to heat up a food item containing water molecules.

   Why are microwaves found useful for the radar systems in aircraft navigation?

5. Draw a plot of potential energy of a pair of nucleons as a function of their separation. Write two important conclusions which you can draw regarding the nature of nuclear forces.

6. Derive the expression for the intensity at a point of the interference pattern in Young's double slit experiment.

7. (a) In a single slit diffraction experiment, the width of the slit is made double the original width. How does this affect the size and intensity of the central diffraction band? Explain.

(b) When a tiny circular obstacle is placed in the path of light from a distant source, a bright spot in seen at the centre of the obstacle. Explain why.

8. (i) Define magnifying power of a telescope. Write its expression and what are its limitations.

(ii) A small telescope has an objective lens of focal length 150 cm and an eye piece of focal length 5 cm. If this telescope is used to view a 100 m high tower 3 km away, find the height of the final image when it is formed 25 cm away from the eye piece.

OR

(a) Draw a ray diagram for the formation of image by a compound microscope.

(b) You are given the following three lenses. Which two lenses will you use as an eyepiece and as an objective to construct a compound microscope?

Lenses	Power(D)	Aperture (cm)
L_1	3	8
L_2	6	1
L_3	10	1

9. Draw the circuit diagram of a half wave rectifier and explain its working.

10. Two particles A and B of same mass have their de Broglie wavelengths in the ratio $\lambda_A : \lambda_B = k : 1$. Their potential energies $U_A : U_B = 1 : k^2$. Find the ratio of total energies A and B.

11. Define ionization energy. How would the ionization energy change when electron in hydrogen atom is replaced by a particle of mass 200 times that of the electron but having the same charge?

OR

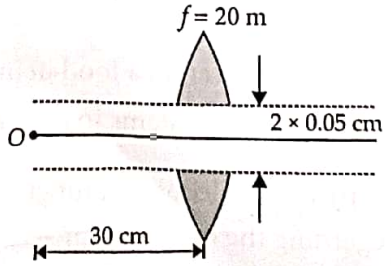
The ground state energy of hydrogen atom is –13.6 eV. If an electron makes a transition from an energy level – 0.85 eV to –3.4 eV, calculate the wavelength of the spectral line emitted. To which series of hydrogen spectrum does this wavelength belong?

SECTION - C

12. CASE STUDY : REFRACTION THROUGH LENS

A convex or converging lens is thicker at the centre than at the edges. It converges a parallel beam of light on refraction through it. It has a real focus. Convex lens is of three types : (i) Double convex lens (ii) Plano-convex lens (iii) Concavo-convex lens. Concave lens is thinner at the centre than at the edges. It diverges a parallel beam of light on refraction through it. It has a virtual focus.

(i) A point object O is placed at a distance of 0.3 m from a convex lens (focal length 0.2 m) cut into two halves each of which is displaced by 0.0005 m as shown in figure.



What will be the location of the image?

(a) 30 cm right of lens
(b) 60 cm right of lens
(c) 70 cm left of lens
(d) 40 cm left of lens

(ii) Two thin lenses are in contact and the focal length of the combination is 80 cm. If the focal length of one lens is 20 cm, the focal length of the other would be

(a) –26.7 cm (b) 60 cm (c) 80 cm (d) 20 cm

(iii) A spherical air bubble is embedded in a piece of glass. For a ray of light passing through the bubble, it behaves like a

(a) converging lens (b) diverging lens
(c) plano-converging lens (d) plano-diverging lens

(iv) Lens used in magnifying glass is

(a) concave lens (b) convex lens (c) both (a) and (b) (d) none of the above

(v) The magnification of an image by a convex lens is positive only when the object is placed

(a) at its focus F (b) between F and $2F$
(c) at $2F$ (d) between F and optical centre