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	–	2(6)#	–	
10.		Wave Optics	–	1(3)#	1(5)	
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.

Subject Code : 042

SQP-8

PHYSICS

Time : 2 Hours *Max. Marks : 35*

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.

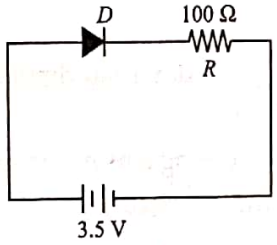
(iii) Section A contains three questions of two marks each, Section B contains eight questions of three marks each, Section C contains one case study-based question of five marks.

(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.

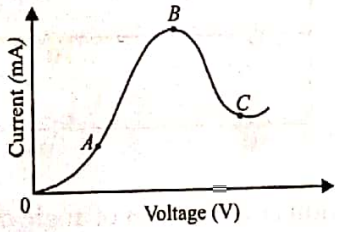
SECTION - A

1. In the given figure, a diode D is connected to an external resistance $R = 100\ \Omega$ and an emf of 3.5 V. If the barrier potential developed across the diode is 0.5 V, what is the current in the circuit?



2. (a) Why cannot we use Si and Ge in fabrication of visible LEDs?

(b) The graph shown in the figure represents a plot of current versus voltage for a given semiconductor. Identify the region, if any, over which the semiconductor has a negative resistance.



3. Two monochromatic radiations of frequencies υ_1 and $\upsilon_2 (\upsilon_1 > \upsilon_2)$ and having the same intensity are in turn, incident on a photosensitive surface to cause photoelectric emission. Explain, giving reason, in which case (i) more number of electrons will be emitted and (ii) maximum kinetic energy of the emitted photoelectrons will be more.

OR

Write three basic properties of photons which are used to obtain Einstein's photoelectric equation. Use this equation to draw a plot of maximum kinetic energy of the electrons emitted versus the frequency of incident radiation.

SECTION - B

4. A hydrogen atom initially in the ground state absorbs a photon which excites it to the $n = 4$ level. Estimate the frequency of the photon.

5. (a) A plane electromagnetic wave travels in vacuum along z-direction. What can you say about the direction of electric and magnetic field vectors?
   (b) Gamma rays and radio waves travel with the same velocity in free space. Distinguish between them in terms of their origin and the main application.

6. Distinguish between the phenomena of nuclear fission and fusion.

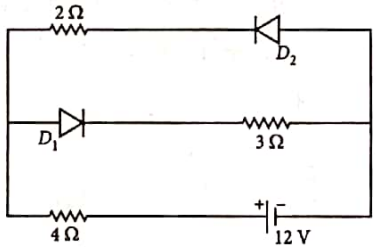
7. In a single slit diffraction experiment, light of wavelength λ illuminates the slit of width 'a' and the diffraction pattern is observed on a screen.
   (a) Show the intensity distribution in the pattern with the angular position θ.
   (b) How are the intensity and angular width of central maxima affected when
      (i) width of slit is increased, and
      (ii) separation between slit and screen is decreased?

OR

   (a) The ratio of the widths of two slits in Young's double slit experiment is 4 : 1. Evaluate the ratio of intensities at maxima and minima in the interference pattern.
   (b) Does the appearance of bright and dark fringes in the interference pattern violate, in any way, conservation of energy? Explain.

8. A convex lens made up of glass of refractive index 1.5 is dipped, in turn, in (i) a medium of refractive index 1.65, (ii) a medium of refractive index 1.33.
   (a) Will it behave as a converging or a diverging lens in the two cases?
   (b) How will its focal length change in the two media?

9. The circuit has two oppositely connected ideal diodes in parallel. What is the current flowing in the circuit?

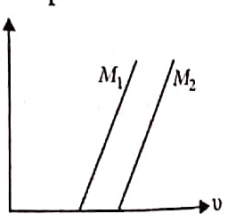


10. (a) Plot a graph for angle of deviation as a function of angle of incidence for a triangular prism.
    (b) Derive the relation for the refractive index of the prism in terms of the angle of minimum deviation and angle of prism.

OR

Explain briefly how the phenomenon of total internal reflection is used in fibre optics.

11. Figure shows a plot of stopping potential (V_0) with frequency (υ) of incident radiation for two photosensitive material M_1 and M_2. Explain
    (i) why the slope of both the lines is same
    (ii) for which material emitted electrons have greater kinetic energy for the same frequency of incident radiation.

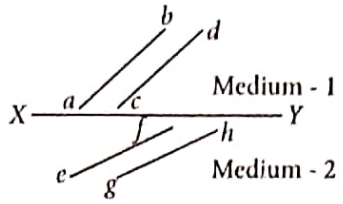


SECTION - C

12. CASE STUDY : WAVEFRONT

Wavefront is a locus of points which vibrate in same phase. A ray of light is perpendicular to the wavefront. According to Huygens principle, each point of the wavefront is the source of a secondary disturbance and the wavelets connecting from these points spread out in all directions with the speed of wave.

The figure shows a surface XY separating two transparent media, medium-1 and medium-2. The lines ab and cd represent wavefronts of a light wave travelling in medium- 1 and incident on XY. The lines ef and gh represent wavefronts of the light wave in medium-2 after refraction.



(i) Light travels as a

(a) parallel beam in each medium

(b) convergent beam in each medium

(c) divergent beam in each medium

(d) divergent beam in one medium and convergent beam in the other medium.

(ii) The phases of the light wave at c, d, e and f are ϕ_c, ϕ_d, ϕ_e and ϕ_f respectively. It is given that $\phi_c \neq \phi_f$

(a) ϕ_c cannot be equal to ϕ_d (b) ϕ_d can be equal to ϕ_e

(c) $(\phi_d - \phi_f)$is equal to $(\phi_c - \phi_e)$ (d) $(\phi_d - \phi_c)$ is not equal to $(\phi_f - \phi_e)$.

(iii) Wavefront is the locus of all points, where the particles of the medium vibrate with the same

(a) phase (b) amplitude (c) frequency (d) period

(iv) A point source that emits waves uniformly in all directions, produces wavefronts that are

(a) spherical (b) elliptical (c) cylindrical (d) planar

(v) What are the types of wavefronts ?

(a) Spherical (b) Cylindrical (c) Plane (d) All of these