Mock Board Exam

STD: XII | **SUBJECT: Physics** | **ASSESSMENT: Mock Test**
Maximum marks : 35 | **16/3/2022 11:00 - 16/3/2022 22:30** | **Time Limit : 120 Minutes**

General Instructions:
(i) There are 14 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.
vi) A students has to answer a question either by typing it out, in the space provided, or writing down each answer on paper, and uploading a picture of it using the upload option.
vii) A student is advised to write the answers in a clear, legible handwriting using a blue/black ball point pen before uploading it.

Section A

6 Marks
6 Marks

1 Write the dimensions of $\frac{1}{\sqrt{\mu_0\ \varepsilon_0}}$, where μ_0 and ε_0 are magnetic permeability and electrical permittivity of free space. **1 M**

2 In which direction, the plane electromagnetic wave will propagate, if its component fields are $\vec{E}\ and\ \vec{B}$ **1 M**

3 Write the two advantages of LED. With which biasing, is the operation of LEDs favourable? Draw the symbol of LED. **2 M**

OR

A p-n junction photodiode is made of semiconductor material with band gap 2 eV. What is the minimum frequency of radiation that can be absorbed by the material? **2 M**

4 The frequency (ν) of incident light is greater than the threshold frequency (ν_0) in a photocell. How will stopping potential vary if frequency is increased, keeping another factor constant? **2 M**

Section B

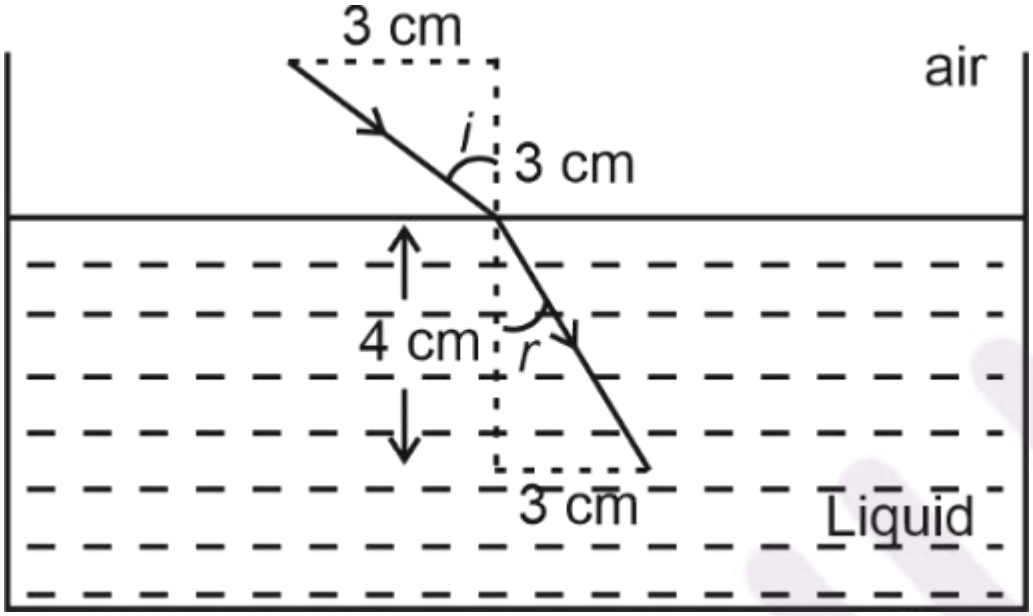
24 Marks
24 Marks

5 Derive the lens maker's formula for thin lenses. **3 M**

6 (a) What is the width of the central maxima in a single slit diffraction pattern? **3 M**

(b) Find the width of the central diffraction maximum of a slit of width 0.20 mm as seen on a screen 2.00 m away from the slit. The wavelength of light used is 630 nm.

7 A ray of light enters a liquid and bends towards the normal as shown in the figure. Calculate the speed of light in liquid. **1.5 M**



8 (i) What is the critical angle of a medium whose refractive index is $\sqrt{2}$? **1.5 M**
(ii) Write the expression of minimum deviation for thin prisms.

9 In Young's double slit experiment, light of wavelength $500\ nm$ is used. The second bright band on the screen is formed at a distance of $1\ cm$ from the centre line. If the screen is at distance $2\ m$ from the slits plane, then calculate the separation between slits. **3 M**

10 a). Draw the ray diagram of an astronomical telescope for an image at a near point **3 M**
b). Focal lengths of the objective and eyepiece of a telescope are 60 cm and 5 cm respectively. Calculate the magnifying power for
(i)Normal adjustment and
(ii)Image at near point

OR

With the help of a ray diagram, illustrate the formation of the final image of an object in a compound microscope. Write the expression of its magnifying power. **3 M**

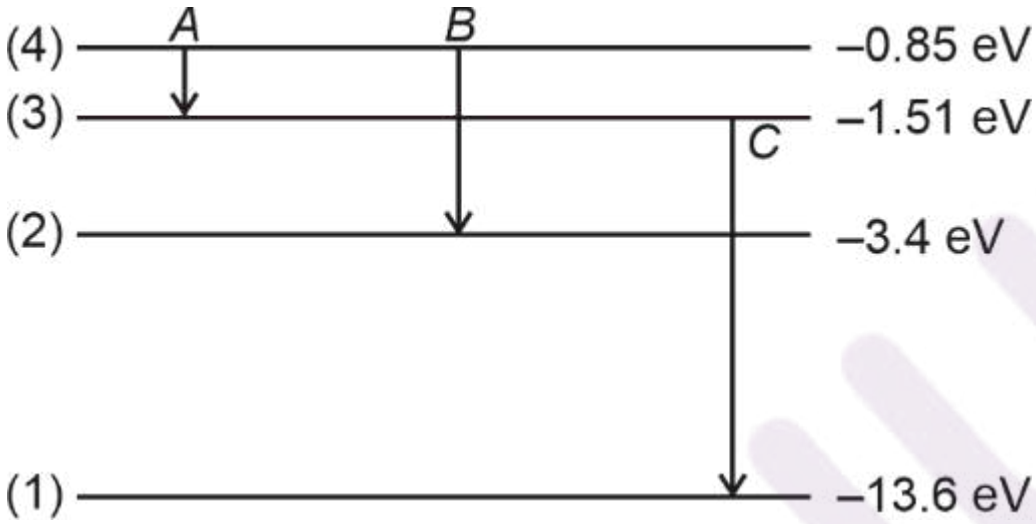
11 What do you mean by ionisation energy? Find the value of potential energy and ionisation energy for an electron in the first orbit of a hydrogen atom. **3 M**

12 Calculate the energy released when three alpha particles $\left({}_2He^4\right)$ fuse to form a carbon nucleus $\left({}_6C^{12}\right)$ **3 M**
Given $m\left({}_eHe^4\right) = 4.002603$ amu.

13 What are Bohr's three postulates? **3 M**

OR

The energy level of the hydrogen atom is as shown in the figure. **3 M**



Electronic transitions are shown by an arrow. Which transition will result in the emission of a photon of maximum wavelength? Find the value of the wavelength of the photon corresponding to transition A and C.

Section C

5 Marks

5 Marks

14 A material can be classified as conductor, semiconductor and insulator. Semiconductors have conductivity and resistivity in between the conductor and insulator. Semiconductors and insulators have negative temperature coefficient of resistance. Semiconductors have forbidden energy gaps (Eg < 3 eV). The conductivity of semiconductor material can be increased by increasing temperature or by adding impurity, called as doping. When a pentavalent dopant is added to Si or Ge, then the semiconductor becomes of n-type and when Si or Ge is doped by the trivalent atom, then the semiconductor becomes of the p-type. All types of semiconductors are electrically neutral.

From the given information, answer the following questions

a Which among the following has a positive temperature or coefficient of resistance? **1 M**

(i)Conductor (ii)Semiconductor

(iii)Insulator(iv)Both (ii) and (iii)

b Which among the following can be the band gap of a semiconductor? **1 M**

(i) $1.4\ \mathrm{eV}$ (ii) $5\ \mathrm{eV}$

(iii)$13.6\ \mathrm{eV}$ (iv) $6.2\ \mathrm{eV}$

c If Si is doped with phosphorus, then semiconductor is of **1 M**

(i) $p-$ type (ii) $n-$ type

(iii)Both (i) and (ii) (iv)Neither (i) nor (ii)

d If Si is doped with trivalent atoms, then in semiconductor (n_e and n_h are electron and hole concentrations) **1 M**

e If N_a and N_b are acceptor and donor concentrations respectively, in a semiconductor and n_e and n_h are electron and hole concentrations, then **1 M**
(i) $n_e + n_h = N_a + N_d$ (ii) $N_a + n_h = N_a + n_e$
(iii) $n_e + N_a = N_d + n_h$ (iv) $N_a + N_d = n_h - n_e$