Physics_XII | Sample Mock Paper Class 12th SA2(Paper_2)

Name : ..... **Date : 04-03-2022**

Time : 120 Mins **M.M. : 35**

General Instructions:

1. Question 1 to 3 Short answer type (SA1) questions of 2 Mark each.
2. Question 4 to 11 Short answer type (SA2) questions of 3 Mark each.
3. Question 12 Long answer type (LA) questions of 5 Mark each.

Q1	Can we take one slab of *p*-type semiconductor and physically join it to another *n*-type semiconductor to get *p-n* junction?	2
Q2	A light of wavelength 6, 000 Å in air, enters a medium with refractive index 1.5. What will be frequency and wavelength of light in the medium?	2
Q3	In accordance with the Bohr's model, find the quantum number that characterises the Earth's revolution around the Sun in an orbit of radius 1.5×10^{11} m with orbital speed 3×10^4 m/s. (Mass of Earth = 6.0×10^{24} kg.)	2
Q4	In an intrinsic semiconductor the energy gap E_g is 1.2 eV. Its hole mobility is much smaller than electron mobility and independent of temperature. What is the ratio between conductivity at 600 K and that at 300 K? Assume that the temperature dependence of intrinsic carrier concentration n_i is given by $$n_i = n_0 \exp\left[-\frac{E_g}{2k_BT}\right]$$ where n_0 is a constant.	3
Q5	How is wavefront defined? Using Huygen's construction draw a figure showing the propagation of a plane wave refracting at a plane surface separating two media. Hence, verify Snell's law of refraction.	3
Q6	Sketch a graph between frequency of incident radiations and stopping potential for a given photosensitive material. What information can be obtained from the value of the intercept on the potential axis?	3

Q7 If the nucleons of a nucleus are separated far apart from each other, the sum of masses of all these nucleus is larger than the mass of the nucleus. Where does this mass difference come from? 3

Calculate the energy released, if ^{238}U nucleus emits an α-particle.

Given,

Atomic mass of ^{238}U = 238.0508 u Atomic mass of ^{234}U = 234.04363 u

Atomic mass of α-particle = 4.00260 u and 1 u = 931 MeV

Q8 Assume that the de-Broglie wave associated with an electron can form a standing wave between the atoms arranged in a one dimensional array with nodes at each of the atomic sites. It is found that one such standing wave is formed, if the distance *d* between the atoms of the array is 2 Å. A similar standing wave is again formed, if the distance *d* is increased to 2.5 Å, but not for any intermediate value of *d*. Find the energy of the electrons in eV and the least value of *d* for which the standing wave of the type described above can form. 3

Q9 How is a Zener diode fabricated so as to make it a special purpose semiconductor diode? Draw the circuit diagram of a Zener diode as a voltage regulator and explain its working. 3

Q10 The total energy of an electron in the first excited state of the hydrogen atom is about –3.4 eV. 3

(a) What is the kinetic energy of the electron in this state?

(b) What is the potential energy of the electron in this state?

(c) Which of the answers above would change if the choice of the zero of potential energy is changed?

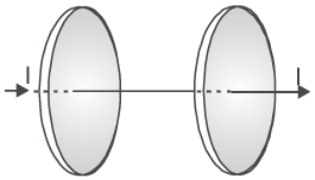
Q11 Figure shows a capacitor made of two circular plates, each of radius *R* = 12 cm, separated by *d* = 5.0 mm. The capacitor is being charged by an external source (not shown in figure). 3

The charging current *I* is constant and equal to 0.15 A.

(a) Calculate the capacitance the rate of charge of potential difference between the plates.

(b) Obtain the displacement current across the plates.

(c) Is the Kirchhoff's rule valid at each plate of the capacitor?



Q12 How is the working of a telescope different from that of a microscope? 5

The focal lengths of the objective and eyepiece of a microscope are 1.25 cm and 5 cm respectively. Find the position of the object relative to the objective in order to obtain an angular magnification of 30 in normal adjustment.