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PRE-BOARD - TERM II EXAMINATION 2021-2022

CLASS XII

SUBJECT – PHYSICS (O42) THEORY

TIME – 90 MIN **MM-35**

GENERAL INSTRUCTION

1.There are 12 questions in all. All questions are compulsory.

2. This question paper has three sections: Section A, Section B and Section C.

3. 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.

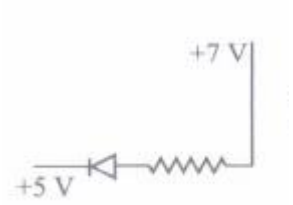
4. There is no overall choice. However, an internal choice has been provided in one question of two marks and two questions of three marks. You have to attempt only one of the choices in such questions.

5. You may use log tables if necessary but use of calculator is not allowed.

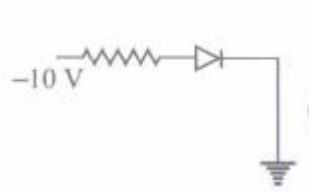
SECTION A

Q.1 (a) Draw energy band diagram of an N-type and P-type semiconductor at T>o^0 K ,mark the doner and acceptor energy levels with their energies.

(b) In the following circuit which one of the two diodes if forward bias and which is reverse bias :-



(i)



(ii)

Q.2 (a) Explain the process of nuclear Fission and nuclear Fusion by using the plot of binding energy per nucleon (BE/A) versus the mass number A.

(b) Calculate the Energy released in Mev in the Fusion Reaction

$_1H^2 + {}_1H^3 \_\_\_\_\_ {}_2He^4 + n$

M($_1H^2$) = 2.014102 a.m.u m($_1H^3$) = 3.0160494 a.m.u

m($_2$ He ^{4}) = 4.002603 a.m.u

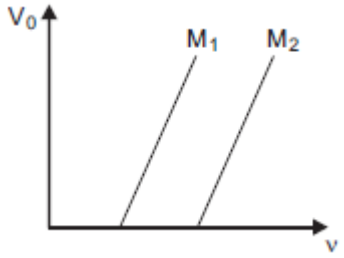
m(n) = 1.0086654 a.m.u 1 a.m.u = 931.5 Mev/c^2

OR

Figure shows variation of stopping potential (Vo) with the frequency (v) for two photo sensitive material M_1 and M_2 ,with the help of fig. explain following:-

(1) Why is the slope same for both lines?

(2) For which material will the emitted electron have grater K.E for the incident radiation of the same frequency justify your answer.



Q.3 How is Photo Diode is fabricated . Briefly explain its working .Draw its V-I characteristic for two different intensities of illumination.

SECTION B

Q.4 Using Bohr's postulate obtain the expression for total energy of the electron in stationary orbit of hydrogen atom and also draw the energy level diagram for hydrogen atom.

Q.5 With the help of a circuit diagram explain how two P-N junction diode along with a centered tapped transformer can be used as a full wave rectifier. Draw its input and output waveforms.

Q.6 The ground state energy of H_2 atom is -13.6 eV . If an electron makes a transition from an energy level -1.51 eV to -3.4 eV , calculate the wavelength of the spectral line emitted and name the series of hydrogen spectrum to which it belongs.

Q.7 (1) What will happen to stopping potential, if the intensity of radiation is doubled?

(2) Two beams, one of red light and the other of blue light of same intensity are incident on a metallic surface to emit photo electrons. Which one of the two beams emit electron of greater kinetic energy?

(3) Two metals A & B have work function 2eV and 4eV respectively. Which metal has lower threshold wave length for photoelectric effect?

(4) A proton and an electron have same kinetic energy. Which one has smaller de-Broglie wavelength and why?

Q.8 (a) In a single slit diffraction experiment, a slit of width 'd' is illuminated by red light of wavelength 650 nm. For what value of 'd' will

(i) the first minimum fall at an angle of diffraction of 30°, and

(ii) the first maximum fall at an angle of diffraction of 30°?.

(b) In a single slit diffraction experiment, light of wavelength 'a' illuminates a slit of width and the diffraction pattern is observed on a screen

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.

Q.9 (a) Draw a labelled ray diagram to obtain the real image formed by an Astronomical Telescope in normal adjustment position . Define its magnification power.

(b) An astronomical telescope has an angular magnification of magnitude 5 for distant objects. The separation between the objective and eye piece is 36 cm and final image is formed at infinity calculate the focal length of the objective and eye piece.

(c) Why is aperture of the objective preferred to be large.

OR

(a) Draw a ray diagram for formation of image of a point object by a thin double convex lens having radii curvature R1 and R2 . Hence derive lens maker's formula for a double convex lens .

(b) An equiconvex lens of refractive index μ1, focal length 'f' and radius of curvature 'R' is immersed in a liquid of refractive index μ2. For $\mu_2 < \mu_1$,and $\mu_2 < \mu_1$ draw the ray diagrams in two cases when a beam of light coming parallel to the principal axis is incident on the lens.

Q.10. (a) Light from a point source in air falls on a convex spherical glass surface of refractive index 1.5 and radius of curvature 20 cm .The distance of light source from the glass surface is 100 cm. AT what position is the image formed ?

(b) How does the power of a convex lens vary, if the incident red light is replaced by violetlight?

Q.11. (a) Two independent monochromatic sources of light cannot produce a sustained interference pattern.

(b) Laser light of wavelength 630 nm incident on a pair of slits produces an interference pattern in which the bright fringes are separated by 7.2 mm. Calculate the wavelength of another source of laser light that produces interference fringes separated by 8.1 mm using the same pair of slits.

(c) The ratio of intensities of maxima and minima in an interference pattern is found to be 25: 9. Calculate the ratio of light intensities of the sources producing this pattern

OR

(a) Arrange the following Electromagnetic wave in order of increasing frequency.

Microwave, Infrared , Ultra Violet , Radio wave ,and Y- ray

(b) Name the following constituent radiation of Electromagnetic Spectrum which--

(i) Are used for Study crystal structure of solid.

(ii) are used in Satellite Communication / in Radar and Geostationary Satellite.

(iii) Haze photography

(iv) has its wavelength range 390 nm to 770 nm

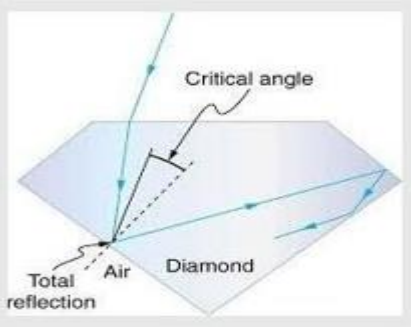
(C) In a plane electromagnetic wave the electric field oscillates sinusoidally at a frequency of $2* 10^{10}$ Hz and amplitude is 48 v . ($c= 3*10^{8}$ m/s)

(i) what is the wavelength of the wave?

(ii) what is the amplitude of oscillating magnetic field.

SECTION C

Q.12 Sparking Brilliance of Diamond:



The total internal reflection of the light is used in polishing diamonds to create a sparking brilliance. By polishing the diamond with specific cuts, it is adjusted the most of the light rays approaching the surface are incident with an angle of incidence more than critical angle. Hence, they suffer multiple reflections and ultimately come out of diamond from the top. Thisgives the diamond a sparking brilliance.

1. **Light cannot easily escape a diamond without multiple internal reflections. This is because:**
   (a) Its critical angle with reference to air is too large.
   (b) Its critical angle with reference to air is too small.
   (c) The diamond is transparent.

(d) Rays always enter at angle greater than critical angle.

2. The critical angle for a diamond is 24.4^0. Then its refractive index is-

(a) 2.42
(b) 0.413
(c) 1
(d) 1.413

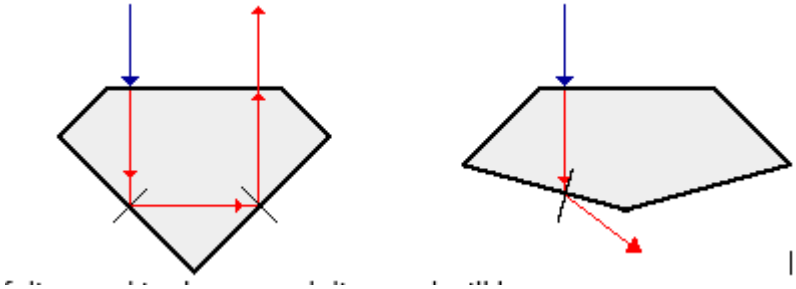
3. The basic reason for the extraordinary sparkle of suitably cut diamond is that :

(a) It has low refractive index
(b) It has high transparency
(c) It has high refractive index
(d) It is very hard

4. A diamond is immersed in a liquid with a refractive index greaterthan water. Then the critical angle for total internal reflection will :

(a) will depend on the nature of the liquid
(b) decrease
(c) remains the same
(d) increase

5. The following diagram shows same diamond cut in two differentshapes.



The brilliance of diamond in the second diamond will be:

(a) less than the first
(b) greater than first
(c) same as first
(d) will depend on the intensity of light.
