CBSE SAMPLE QUESTION PAPER-2
CLASS XII
PHYSICS THEORY (SOLUTION)
TERM II
SESSION 2021 – 22

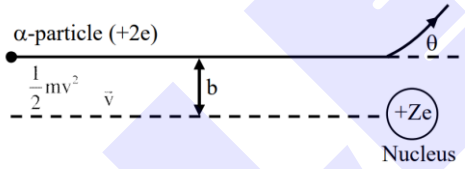
SECTION-A

1. No change in KE because the kinetic energy of the emitted electrons does not depend upon the intensity of the incident radiation. **[1]**

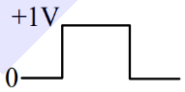
As, KE = $h\upsilon - W_0$, the maximum kinetic energy of emitted electrons decrease on increasing the work function of the metal. **[1]**

OR

The impact parameter (b) is the perpendicular distance of the initial velocity vector of the α-particle from the center of the nucleus – **[2]**



2. The n-side of the diode is earthed, it is at zero potential. So the diode conducts current when input level is +1V and does not conduct when the input level is –1V. As the diode is ideal, the output across it will be either 0 or +1V. **[2]**



3. During the positive half cycle of input a.c. (when the diode gets forward biased), the capacitor charges itself to the peak value of the supply voltage. Therefore, the voltage across the capacitor is – $V = V_0 = \sqrt{2}V_{rms} = \sqrt{2} \times 220 = 311.08\,V$ **[2]**

SECTION-B

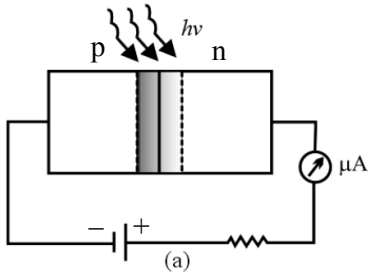
4. (i) Bohr's model is applicable to simplest atoms like hydrogen with Z = 1. It fails for other Elements. **[1]**

(ii) This theory does not explain the fine structure of spectral lines in the hydrogen atom. **[1]**

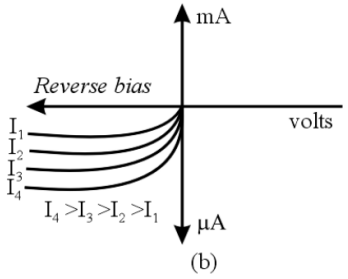
(iii) It could not explain the difference in the intensities of emitted radiations. **[1]**

5.

(a)



(a) An illuminated photodiode under reverse bias,



(b) *I-V* characteristics of a photodiode for different illumination intensity $I_4 > I_3 > I_2 > I_1$.

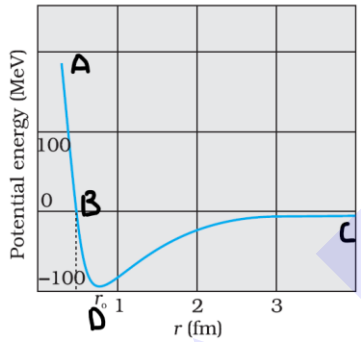
[1+1]

(b) Difference between light emitting diode and photodiode :

Light Emitting Diode (LED)	Photodiode
1. It is forward biased. 2. Recombination of electrons and holes takes place at the junction and emits e.m. radiation.	It is reverse biased. Energy (hν) is supplied by light to take an electron from valence band to conduction band.

[½ + ½]

6.



Force is attractive in the region DC , for the separation greater than r_0. **[½]**

Force is strongly repulsive in the region ABD , for the separation lesser than r_0. **[½]**

Two characteristics of nuclear force :-

1. Nuclear force is much stronger than the coulomb force . **[½]**

2. The nuclear force between neutron-neutron, proton-neutron and proton-proton is approximately the same. The nuclear force does not depend on the electric charge. **[½]**

7. The width of central maximum is given by $\beta_0 = \frac{2\lambda D}{a}$ so -

(i) Since $\beta_0 \propto \frac{1}{a}$, therefore, as the slit width is decreased, the width of the central maximum will increase. **[1]**

(ii) Since $\beta_0 \propto D$, therefore, as the distance between the slit and the screen is increased, the width of the central maximum will also increase. **[1]**

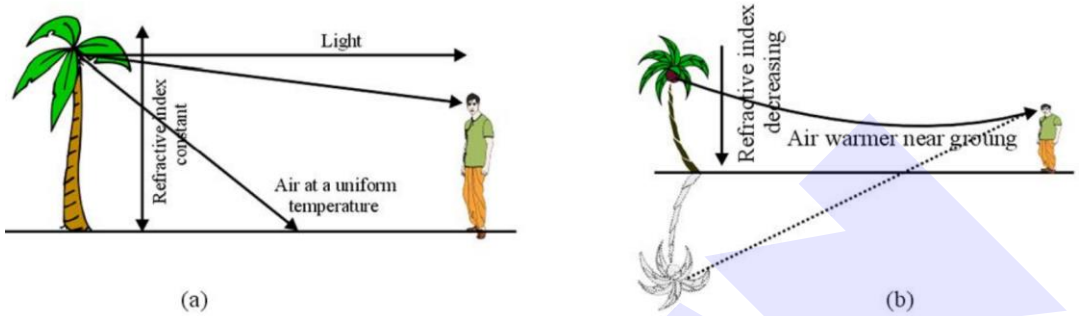
(iii) Since $\beta_0 \propto \lambda$, therefore, as the light of smaller wavelength is used, the width of the central maximum will decrease. **[1]**

8. The two conditions :

(i) Light ray must move from a denser to a rarer medium.

(ii) Angle of incidence must be greater than critical angle. **[1]**

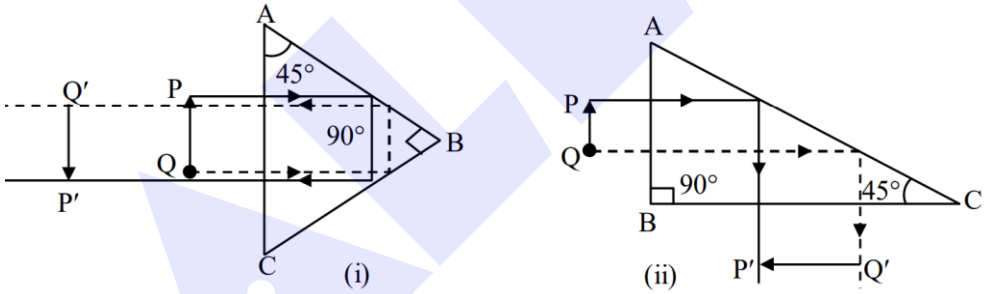
Mirage : A realistic image of an object that is either totally imaginary or that appears to be in a location other than the true one. In hot areas, the layers of air near the earth surface becomes hotter as compared to the layers above. As a result the upper layers of air become denser. When rays from a tree like object passes from denser to rarer medium, it suffers total internal reflection. An observer notices an mirage of the object being formed as if there is water around.



OR

(a) Splitting of white light into its constituent colors on passing through a medium is called dispersion of light and the medium causing dispersion is called the dispersive medium. Dispersion of light is due to the fact that velocity of light of different wavelengths is different in a dispersive medium. Light get dispersed because different wavelength get deviated by different amount.

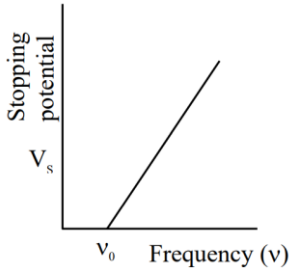
(b)



[1+1]

9. **Threshold Frequency :-** It is the minimum frequency, required by the photons so that they can just emit the photoelectrons from the metal surface. **[1]**

Stopping Potential :- It is the minimum value of negative potential applied between emitter and collector for which no photoelectron reaches to collector is called stopping potential. **[1]**



10. (a) $\sin^{-1}(4/5)$, using $i_c = \sin^{-1}(\frac{1}{n})$, $n = \frac{5/3}{4/3} = \frac{5}{4}$ **[1]**

(b) $\frac{\delta_1}{\delta_2} = \frac{5}{2}$, using $\delta = A(n-1)$, here $n_1 = 3/2$, and $n_2 = \frac{3/2}{5/4} = \frac{6}{5}$ **[1]**

(c) 4 cm, 12 cm . As $f_o + f_e = 16$, and $\frac{f_0}{f_e} = 3$ **[1]**

11. (a) When an em wave interacts with an electron [as in photoelectric effect] the electron get disturbed and also get ejected from metal surface, it is because of energy and momentum imparted by em waves.. **[1]**

(b) Our atmosphere is opaque for X- ray , so for X- ray astronomy we have to use space station. **[1]**

(c) The average temperature will be lower due to absence of green house effect. **[1]**

OR

(a) It is the phenomena of redistribution of light energy on account of superposition of light waves coming from the two coherent source of light. The point, at which intensity of light is maximum, is called constructive interference, while the point, at which intensity of light is minimum, is called destructive interference. **[½]**

Coherent sources : Two sources of light waves which emit the light waves of same frequency, same wavelength and zero phase difference or constant phase difference are called coherent sources of light. **[½]**

(b) Condition for sustained Interference **[1]**

1. Two sources of light should emit light continuously.
2. The light wave should be of same wavelength.
3. The waves should be of same amplitude.
4. The two waves must be in same phase or bear a constant phase difference.

(c) Condition for maximum intensity at a point :

Phase difference, $\phi = 2n\pi$ or path difference $x = n\lambda$, where n = 0, 1, 2, 3……. **[½]**

& Condition for minimum intensity at a point :

Phase difference $\phi = (2n + 1)\pi$ or path difference $x = (2n + 1)\frac{\lambda}{2}$

where n = 0, 1, 2,3……. **[½]**

SECTION-C

12. (i) (1), (ii) (3), (iii) (1), (iv) (1), (v) (4)