CBSE SAMPLE QUESTION PAPER-1
CLASS XII
PHYSICS THEORY (SOLUTION)
TERM II
SESSION 2021 – 22

SECTION-A

1. The order of energy gap in a semiconductor is 1eV . **[1]**

The ratio of the number of holes and the number of conduction electrons in an intrinsic semiconductor is 1 : 1 . **[1]**

2. Nuclear density is independent to the mass number therefore ratio of nuclear densities is 1 : 1. **[1]**

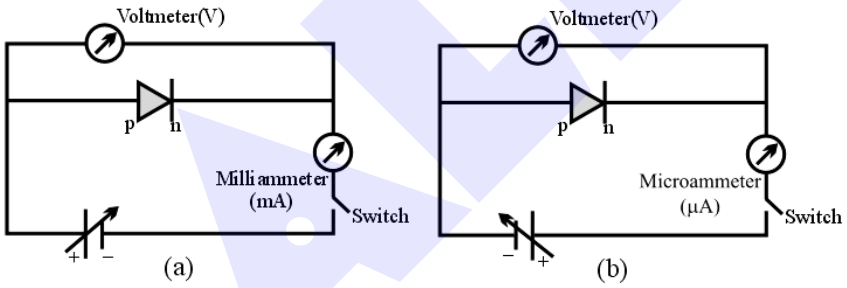
Daughter nucleus would have a higher binding energy/nucleon. **[1]**

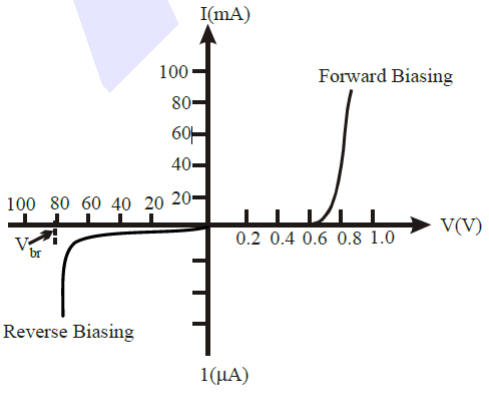
OR

$E_1 = -3.4 - (-13.6) = 10.2$ eV and $E_2 = 0 - (-3.4) = 3.4$ eV **[1]**

Ratio $\frac{E_1}{E_2} = \frac{10.2}{3.4} = 3:1$ **[1]**

3. **[1+1 = 2]**





(c)

SECTION-B

4. According to the Bohr's theory, the stationary orbits are those for which the angular.

Momentum is some integral multiple of $h/2\pi$ (Bohr's quantization condition). **[1]**

That is $L = nh/2\pi$, where n is an integer called a quantum number. **[1]**

K.E. of the electron = – total energy of the electron = $-(-3.4eV) = 3.4eV$ **[1]**

P.E. of electron = 2(total energy of electron) = $2x(-3.4) = -6.8eV$ **[1]**

5. A solar cell works on photo-voltaic action , i.e it converts light directly into electric energy. The generation of emf by a solar cell, when light falls on, it is due to the following three basic processes : generation, separation and collection- **[1]**

(i) generation of e-h pairs due to light (with $h\nu > E_g$) close to the junction.

(ii) separation of electrons and holes due to electric field of the depletion region electrons are swept to n-side and holes to p-side.

(iii) the electrons reaching the n-side are collected by the front contact and holes reaching p-side are collected by the back contact. Thus p-side becomes positive and n-side becomes negative giving rise to photo voltage. **[2]**

6. Energy, $E = 10^{-3} \times (3 \times 10^8)^2$ J or, $E = 10^{-3} \times 9 \times 10^{16} = 9 \times 10^{13}$ J **[1]**

Thus, if one gram of matter is converted to energy, there is a release of enormous amount of energy. **[1]**

(i) Since X and Y have the same atomic numbers so, they are the isotopes of the same element viz Li.

(ii) ${}^{7}_{3}X$ is more stable than ${}^{4}_{3}Y$, this is due to the fact that number of neutrons is more in ${}^{7}_{3}X$ as compared to that in ${}^{4}_{3}Y$, therefore, attractive force between the nucleons is greater in ${}^{7}_{3}X$

[1]

7. (a) A wavefront is defined as a surface of constant phase. **[½]**

Corresponding to a beam of parallel rays of light, the wavefront is plane in shape. **[½]**

No, the speed of light is dependent of the color (wavelength) of the light. The violet color travels slower than the red light in a glass prism. **[½]**

(b) We know, $\beta = \frac{\lambda D}{d}$ **[½]**

(i) When the two sources are close to each other (d quite small), sufficiently wide fringes are formed. In case the two sources are infinitely close to each other, general illumination will take place. **[½]**

(ii) When the two sources are moved far apart (d very large), the fringe width will be very small and they will not be separately visible. **[½]**

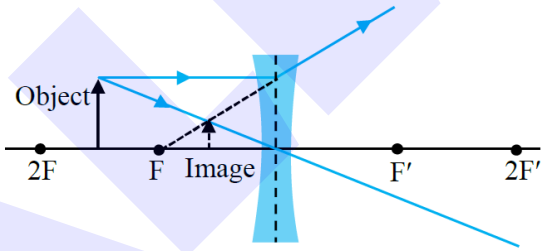
8. The focal length of the lens in air is given by $\frac{1}{f} = (n-1)[\frac{1}{R_1} - \frac{1}{R_2}]$ ...(i)

If n' is refractive index of the material of the lens w.r.t. liquid, then focal length of the lens,

when placed in liquid is given by $\frac{1}{f'} = (n'-1)[\frac{1}{R_1} - \frac{1}{R_2}]$ ...(ii)

From equation (i) and (ii), we have $\frac{f'}{f} = \frac{n-1}{n'-1}$.

Since n' < n, f ' > f i.e. focal length of the lens will increase on immersing it in liquid. -2 image formation by concave lens.



The image is always virtual, erect and diminished.

OR

(i) For constructing a telescope the objective lens should have large aperture.

Hence lens 2 will be preferred as objective.

The eye piece should have small focal length.

So lens 3 will be preferred as the eye piece **[1½]**

(ii) For constructing a microscope both the objective and eye piece should have short focal lengths and the focal length of the objective should be shorter than the focal length of eye piece. Therefore lens 3 will be used as objective and lens 1 should be used as an eye piece. **[1½]**

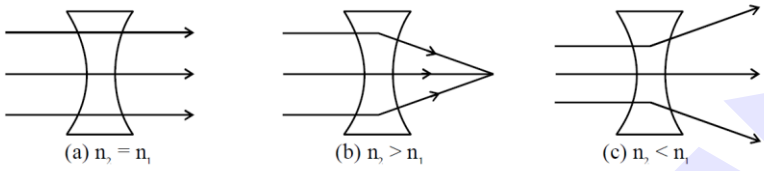
9. (a) (i) As the intensity of incident light increases, the number of photoelectrons emitted per second and therefore the photoelectric current will increase.

(ii) As the stopping potential is independent of the intensity of incident light therefore it remains unchanged. **[1]**

(b) Work function of a metal is the minimum amount of energy required to draw an electron From the metal surface without giving any velocity to it. **[1]**

According to Einstein photoelectric equation, $E_{kmax} = h\upsilon - w_0$ **[1]**

For a given frequency of incident radiation, the metal having lower work function has more K.E of emitted photoelectrons. **[1]**

10.  **[3]**

(a) $n_2 = n_1$ (b) $n_2 > n_1$ (c) $n_2 < n_1$

11. (a) Ultra-violet rays are used in Lasik Laser, for eye surgery. **[1]**

(b) Infra-red rays capable of penetrating layers of dust. **[1]**

(c) X- rays. 10^{-10} m. **[1]**

OR

(a) Reflection and refraction arise through interaction of incident light with the atomic constituents of matter. Atoms may be viewed as oscillators, which take up the frequency of the external agency (light) causing forced oscillations. The frequency of light emitted by a charged oscillator equals its frequency of oscillation. Thus, the frequency of scattered light equals the frequency of incident light. **[1]**

(b) No, energy carried by a wave depends on the amplitude of the wave, not on the speed of wave propagation. **[1]**

(c) $\beta = \frac{D\lambda}{d}$ .....(i) and $\beta' = \frac{D\lambda'}{d}$

Taking ratio , we get $\frac{\beta'}{\beta} = \frac{\lambda'}{\lambda} = \frac{400}{600} = \frac{2}{3}$, now $n'\beta' = n\beta$ **[1]**

So $n' = n' = n \times \frac{\beta}{\beta'} = 12 \times \frac{3}{2} = 18$

SECTION-C

CASE STUDY

12. (i) (2), (ii) (3), (iii) (3), (iv) (1) , (v) (1)