KENDRIYA VIDYALAYA SANGATHAN (AHMEDABAD REGION)

CLASS: XII **SUBJECT: PHYSICS** **SESSION: 2023-24**

CHAPTER: Electromagnetic Waves

WORKSHEET : Level-1

Q 1. Name the part of the electromagnetic spectrum of wavelength 10^{-2} m and mention its one application.

Ans.

Q 2. What is meant by displacement current.In which situation there is a displacement current but no conduction current ?

Ans.

Q 3. What are electromagnetic waves ? Are these waves transverse or longitudinal ?

Ans.

Q 4. Arrange the following electromagnetic waves in order of increasing frequency :
Γ-rays, microwaves, infrared rays and Ultraviolet rays

Ans.

Q 5. Identify the electromagnetic waves whose wavelength vary as and also write one use for each.
(i) 10^{-12} m< λ < 10^{-8} m (ii) 10^{-4} m< λ < 10^{-6} m

Ans.

Q 6 Electromagnetic waves with wavelengths-
(i) λ_1 are used to treat muscular strain
(ii) λ_2 are used by a F.M. radio station for broadcasting
(iii) λ_3 are used to detect fractures in bones

(iv) λ_4 are absorbed by ozone layer of the atmosphere
Identify the name and part of electromagnetic spectrum to which these radiations belong. Arrange these wavelengths in order of magnitude.

Ans.

Q 7 How does the resolving power of a microscope change when
(i) the diameter/aperture of the objective lens is decreased,
(ii) the wavelength of the incident light is increased ?
(iii) refractive index of the medium between the object and the objective lens increases

Ans.

Q 8 Using Young's double slit experiment obtain the expression for fringe width for monochromatic light.

Ans.

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CLASS: XII **SUBJECT: PHYSICS** **SESSION: 2023-24**

CHAPTER: RAY-OPTICS

WORKSHEET : Level-1

Q 1. An optical material has critical angle of 45^0 for yellow light. Find its refractive index?

Ans.

Q 2. Draw a schematic diagram of a reflecting telescope.

Ans.

Q 3. State the conditions for the phenomenon of total internal reflection to occur.

Ans. (i)

(ii)

Q 4. The radii of curvature of the faces of a double convex lens are 10 cm and 15 cm. If the focal length if the lens is 12 cm find the refractive index of the material of lens.

Ans.

Q 5. Draw a labelled ray diagram for the formation of image by a refractive telescope in normal adjustment.

Ans.

Q 6 Derive the lens makers formula.

Ans.

Q 7 Draw a ray diagram of compound microscope. Write the expression for its magnifying power.

Ans.

Q 8 A convex lens made up of refractive index n_1 is kept in a medium of refractive index n_2. Parallel rays of light are incident on the lens. Complete the path of rays of light emerging from the convex lens if

(1) $n_1 > n_2$ (2) $n_1 = n_2$ (3) $n_1 < n_2$

Ans.

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CLASS: XII **SUBJECT: PHYSICS** **SESSION: 2023-24**

CHAPTER: SEMICONDUCTOR DEVICES

WORKSHEET : Level-1

Q 1. What do you mean by doping?

Ans.

Q 2. What do you mean by hole in a circuit? Write its two characteristics?

Ans.

Q 3. Distinguish between 'intrinsic' and 'extrinsic' semiconductors.

Ans.

Q 4. What is p-n junction ? Explain briefly, with the help of suitable diagram, how a p-n junction is formed.

Ans.

Q 5. What is meant by forward biasing of a p-n junction ? Draw the circuit diagram of a forward biasing of a p-n junction.

Ans.

Q 6 Draw a labeled circuit diagram of a junction diode as a full wave rectifier. Explain its underlying principle and working. Depict the input and output wave forms.

Ans.

Q 7 Distinguish between a conductor, an insulator and a semiconductor on the basis of energy band diagrams.

Ans.

Q 8 Describe briefly, with the help of a diagram, the role of the two important

processes involved in the formation of a *p*-*n* junction.

Ans.

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CLASS: XII **SUBJECT: PHYSICS** **SESSION: 2023-24**

CHAPTER: WAVE-OPTICS

WORKSHEET : Level-1

Q 1. What is the relation of a wave front with a ray of light ?

Ans.

Q 2. Give the necessary conditions for (i) Constructive Interference (ii) Destructive Interference of light waves.

Ans.

Q 3. Define Diffraction of light. What must be size of obstacle or aperture for diffraction?

Ans.

Q 4. Sketch the reflected wavefront emerging from a (i) concave mirror (ii) convex mirror, if plane wavefront is incident normally on it.

Ans.

Q 5. State two differences between interference and diffraction patterns.

Ans.

Q 6 Using Huygen's construction draw a figure showing the propagation of a plane wavefront reflecting at a plane surface. Show that the angle of incidence is equal to the angle of reflection.

Ans.

Q 7 How does the resolving power of a microscope change when
(i) the diameter/aperture of the objective lens is decreased,
(ii) the wavelength of the incident light is increased ?
(iii) refractive index of the medium between the object and the objective lens increases

Ans.

Q 8 Using Young's double slit experiment obtain the expression for fringe width for monochromatic light.

Ans.

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CLASS: XII **SUBJECT: PHYSICS** **SESSION: 2023-24**

Chapter- 10 (WAVE OPTICS)

WORKSHEET: Level-2

1. The ratio of the widths of two slits in Young's double slit experiment is 4 : 1. Evaluate the ratio of intensities at maxima and minima in the interference pattern.

Ans.

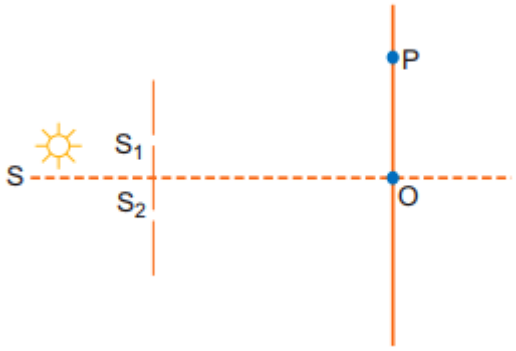
2. In Young's double slit experiment, the slits are separated by 0.5mm and screen is placed 1.0 m away from the slit. It is found that the 5^{th} bright fringe is at a distance of 4.13 mm from the 2^{nd} dark fringe. Find the wavelength of light use.

Ans.

3. A beam of light consisting of two wavelengths, 800 nm and 600 nm, is used to obtain the interference fringes in a Young's double slit experiment on a screen is placed 1.4 m away. If two slits are separated by 0.28 mm, Calculate the least distance from the central bright maximum where the bright fringes of the two wavelengths coincide.

Ans.

4. The figure shows a modified Young's double slit experimental set-up. Here $SS2 - SS1 = \lambda/4$.
(*a*) Write the condition for constructive interference.
(*b*) Obtain an expression for the fringe width.



Ans.

5. Define the resolving power of a microscope. How is this affected when
(*i*) the wavelength of illuminating radiations is decreased, and
(*ii*) the diameter of the objective lens is decreased? Justify your answer.

Ans.

6. A parallel beam of light of wavelength 600 nm is incident normally on a slit of width 'a'. If the distance between the slit and the screen is 0.8 m and the distance of 2nd order maximum from the centre of the screen is 1.5 mm,

calculate the width of the slit.

Ans.

7. Use Huygens' principle to show how a plane wavefront propagates from a denser to rarer medium. Hence, verify Snell's law of refraction.

Ans.

8. Two wavelengths of sodium light 590 nm and 596 nm are used, in turn, to study the diffraction
taking place at a single slit of aperture 2×10^{-4} m. The distance between the slit

and the screen
is 1.5 m. Calculate the separation between the positions of the first maxima of the diffraction
pattern obtained in the two cases.

Ans.

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CLASS: XII **SUBJECT: PHYSICS** **SESSION: 2023-24**

Chapter- EM Wave

WORKSHEET : Level-2

1. The charge on a parallel plate capacitor varies as $q = q_0 \cos 2\pi nvt$. The plates are very large and close together (area = A, separation = d). Neglecting the edge effects, find the displacement current through the capacitor.

Ans.

2. Electromagnetic waves with wavelengths-
   (i) λ_1 are used to treat muscular strain
   (ii) λ_2 are used by a F.M. radio station for broadcasting
   (iii) λ_3 are used to detect fractures in bones
   (iv) λ_4 are absorbed by ozone layer of the atmosphere

Ans.

3. Write the generalized expression for the Ampere's circuital law in terms of the conduction current and the displacement current. Mention the situation when there is:
   (i) only conduction current and no displacement current.
   (ii) only displacement current and no conduction current

Ans.

4. A capacitor, made of two parallel plates each of plate area A and separation d, is being charged by an external ac source. Show that the displacement current inside the capacitor is the same as the current charging the capacitor .

Ans.

5. Write the expression for the generalized form of Ampere's circuital law. Discuss its significance and describe briefly how the concept of displacement current is explained through charging/discharging of a capacitor in an electric circuit.

Ans.

6. The oscillating electric field of an electromagnetic wave is given by:

$$E_y = 30 \sin \{2x10^{11}t + 300\pi x\} \text{ V/m}$$

(a) What is the direction of propagation?

(b) Obtain the value of oscillating magnetic field of an electromagnetic wave.

(c)Obtain the value of the frequency of the electromagnetic wave.

Ans.

7. In a plane e.m. wave, the electric field oscillates sinusoidal at a frequency of $2.0X10^{10}Hz$ and amplitude $48Vm^{-1}$.
(a) What is the wavelength of wave?
(b) What is the amplitude the oscillating magnetic field?
(c) Show that the average energy density of the electric field equals the average energy density of the magnetic field(B).

Ans.

8. (i) An electromagnetic wave is travelling in a medium, with a velocity $v = v_i$. Draw a sketch showing the propagation of the electromagnetic wave, indicating the direction of the oscillating electric and magnetic fields.
(ii) How are the magnitudes of the electric and magnetic fields related to velocity of the electromagnetic wave?

Ans.

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CLASS: XII **SUBJECT: PHYSICS** **SESSION: 2023-24**

Chapter- RAY OPTICS AND OPTICAL INSTRUMENTS

WORKSHEET : Level-2

1. Why parabolic mirrors are used in search light ?

Ans.

2. In a telescope the focal length of the objective and the eye piece are 60cm and 5cm respectively. What is (a) Its magnification power (b) Tube length ?

Ans.

3. Three immiscible liquids of densities d1 > d2 > d3 and refractive indices μ1 > μ2 > μ3 are pot in a beaker. The height of each liquid column is h/3. A dot is made at the bottom of the beaker. For near normal vision, find the apparent depth of the dot.

Ans.

4. How does the angle of minimum deviation of a glass prism of refractive index 1.5 change, if it is immersed in a liquid of refractive index 1.3?

Ans.

5. A small illuminated bulb is at the bottom of a tank, containing a liquid of refractive index upto a height H. Find the expression for the diameter of an opaque disc, floating symmetrically on the liquid surface in order to cut-off the light from the bulb.

Ans.

6. A biconvex lens of glass of refractive index 1.5 having focal length 20 cm is placed in a medium of refractive index 1.65. Find its focal length. What should be the value of the refractive index of the medium in which the lens should be placed so that it acts as a plane sheet of glass?

Ans.

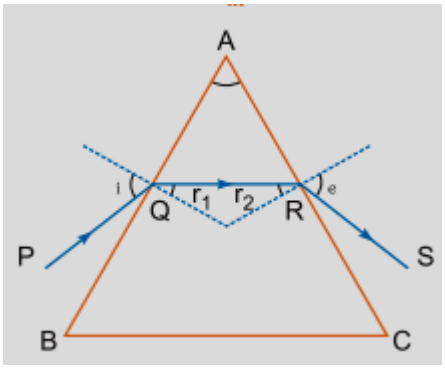
7. A symmetric biconvex lens of radius of curvature R and made of glass of refractive index 1.5, is placed on a layer of liquid placed on top of a plane mirror as shown in the figure. An optical needle with its tip on the principal axis of the lens is moved along the axis until its real, inverted image coincides with the needle itself. The distance of the needle from the lens is measured to be x. On removing the liquid layer and repeating the experiment, the distance is found to be y. Obtain the expression for the refractive index of the liquid in terms of x and y.

Ans.

8. Figure shows a ray of light passing through a prism. If the refracted ray *QR* is parallel to the base *BC*, show that

(*i*) $r1 = r2 = A/2$,

(*ii*) angle of minimum deviation, $Dm = 2i - A$.



Ans.

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Chapter- SEMICONDUCTOR DEVICES

WORKSHEET : Level-2

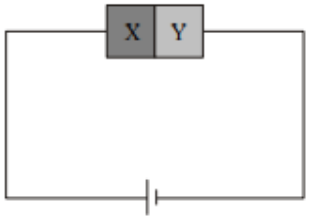
1. If a full wave rectifier circuit is operating from 50 Hz mains, what will be the fundamental frequency in the ripples ?

Ans.

2. n_e and v_d be the number of electrons and drift velocity in a semiconductor. When the temperature is increased, how these quantities change ?

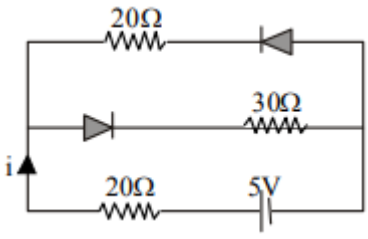
Ans.

3. A semiconductor X is made by doping a germanium crystal with arsenic (Z = 33). A second semiconductor Y is made by doping germanium with indium (Z = 49). The two are joined end to end and connected to a battery as shown. Is the diode forward biased or reverse biased and why?



Ans.

4. Calculate the current in the circuit :

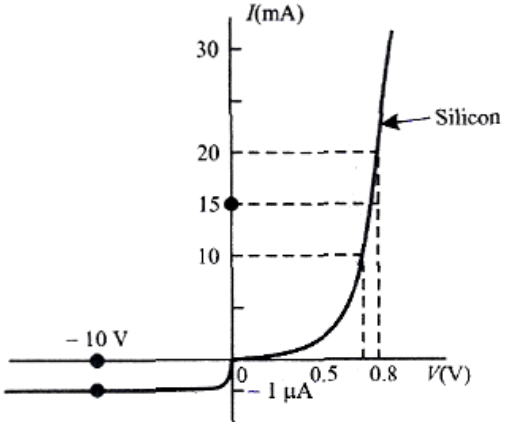


Ans.

5. The number of silicon atoms per m3 is $5 \times 10^{28.}$ This is doped simultaneously with 5×10^{22} atoms per m^3 of Arsenic and 5×10^{20} per m^3 atoms of Indium. Calculate the number of electrons and holes. Given that $n_i = 1.5 \times 10^{16}$ per m^3 . Is the material n-type or p-type?

Ans.

6. The V-I characteristic of a silicon diode is shown in figure below. Calculate the resistance of the diode at $(a)\, I_D = 15mA \text{ and } (b)\, V_D = -10V$

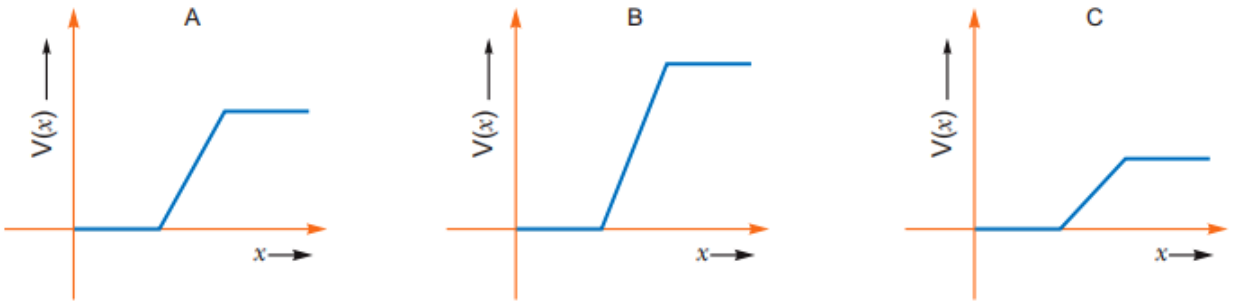


Ans.

7. A student wants to use two *p*-*n* junction diodes to convert alternating current into direct current. Draw the labelled circuit diagram she would use and explain how it works.

Ans.

8. The graph of potential barrier versus width of depletion region for an unbiased diode is shown in *A*. In comparison to *A*, graphs *B* and *C* are



obtained after biasing the diode in different ways. Identify the type of biasing in *B* and *C* and justify your answer.

Ans.