SHIKSHA CLASSES

Subject : Science -I **Answer Paper** **Total Marks : 20**

Class : X **7. Lenses**

Q.1: A) Choose the correct alternative : 2

1) A small aperture in iris which controls intensity of light is called ------.

Ans. : c) Pupil

2) The lens which is thin at centre and thick at edges is ------.

Ans. : b) Cancave lens

B) Solve the following questions : (Any One) 1

1) Find the odd man out

Medical equipment, torch, scanner, spectograth

Ans. : Spectograph.

2) Complete the analogy.

Convex lens : Converging lens : : Cancave lens : ------

Ans. : Convex lens : Converging lens : : Cancave lens : **Diverging lens.**

3) Write true or false.

The power of lens depends on its focal length

Ans. : True

Q.2: A) Give scientific reason. (Any One) 2

1) A concave lens is used to correct myopia.

Ans. : i) In myopia the person can see nearby objects clearly but cannot see the distant object.

ii) The image of the object at distance is formed in front of retina.

iii) concave lenses are diverging lenses when the rays of light are incident on the eye this lens diverge the rays and these diverged rays can be converged by the lens in the eye to form image on the retina.

iv) Hence concave lenses are used to correct myopia.

2) In old age bifocal lens is necessary for some person.

Ans. : i) The ciliary muscles near the lenses lose their ability to change the focal length of the lens. Due to this the focussing power of lens decreases with age.

ii) This effect is called presbyopia. Sometimes people suffer from both myopia and hyper metropia.

iii) To correct these defects a bifocal lens is used.

B) Solve the following question. (Any Two) 4

1) Explain the terms a) Centre of curvature b) Optical centre

Ans. : **a) Centre of curvature :** The centers of spheres whose parts form surfaces of the lenses are called centres of curvatures of the lenses.

b) Optical centre : The point inside a lens on the principal axis, through which light rays pass without changing their path is called the optical centre.

2) What is lens formula?

Ans. : The formula showing the relation between distance of the object (u), the distance of the image (v) & the focal length (f) is called the lens formula.

$$\frac{1}{v}-\frac{1}{u}=\frac{1}{f}$$

3) What is persistance of vision? Why one can sense color only in bright light?

Ans. : **Persistance of vision :**

The image formed on retina remains imprinted for $\frac{1}{6}$th of a second after the object is removed.

This sensation on retina persist for a while. This is called persistence of vision.

i) The retina is made up of many light sensitive cells. These cells are in shape like rod and cone. The rod cells respond to intensity of light while conial cells responds to colors.

ii) Brain processes all the information received and we see actual image of the object.

iii) Rod cells respond to faint light but conical cells do not. Thus one can see colors in bright light only.

4) A concave lens of focal length 12 cm and convex lens of focal length 20 cm are kept in contact with each other. Find the focal length of their combination and its power.

Ans. : f_1 (concave lens) $= -12$cm

f_2 (convex lens) $= 20$cm

f (combination) $= ?$

$$\frac{1}{f}=\frac{1}{f_1}+\frac{1}{f_2}$$

$$=\frac{1}{-12}+\frac{1}{20}$$

$$=\frac{-5+3}{60}$$

$$=\frac{-2}{60}$$

$$=\frac{-1}{30}$$

$f = -30cm$

$\therefore$ focal length of combination $= -30cm$

$f = 30cm = -0.3m$

$$\therefore P = \frac{1}{f(m)} = -\frac{1}{0.3}$$

$P = -3.33$ D.

Q.3: Solve the following questions. (Any Two) **6**

1) At which position will you keep an object in front of a convex lens so as to get a real image of the same size as the object? Draw a figure.

Ans. : At $2F_1$, Position if we keep the object in front of a convex lens we will get the real image of same size as that of the object.

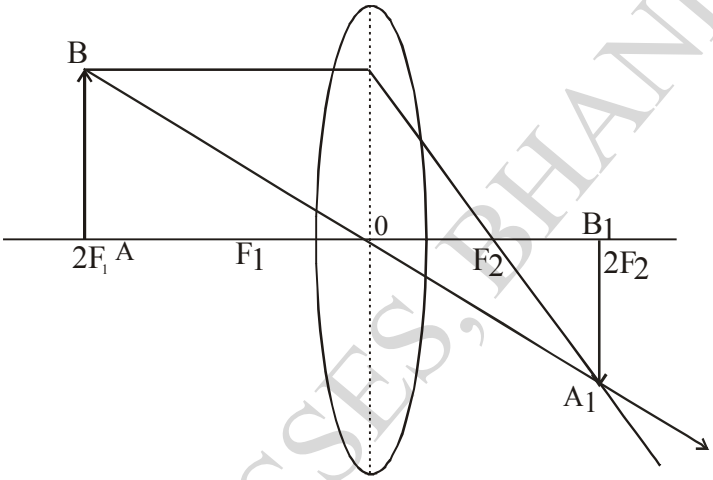


Fig. Real image formed by a convex lens

2) What is the Cartesian sign convention used for lens?

Ans. : i) The object is always placed on the left of the lens. All distances parallel to the principal axis are measured from the optical centre (O).

ii) The distance measured to the right of O are taken to be positive while those measured to the left are taken to be negative.

iii) Distances perpendicular to the principal axis & above it are taken to be positive.

iv) Distances perpendicular to the principal axis & below it are taken to be negative.

v) The focal length of a convex lens is positive while that of a concave lens is negative.

3) At what distance from a convex lens of focal length 2.5 m should a boy stand so that this image is half of his height?

Ans. : Given :

$M = \frac{1}{2}$, $f = 2.5m$ $\qquad\qquad$ $u = ?$

$$M = \frac{v}{u} \qquad \frac{1}{2} = \frac{v}{u}$$

$$v = \frac{u}{2} \qquad \frac{1}{v} = \frac{2}{u}$$

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

for convex lens u is $-$ ve

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{-u} \qquad \frac{1}{f} = \frac{1}{v} + \frac{1}{u}$$

$$\frac{1}{f} = \frac{2}{v} + \frac{1}{u}$$

$$\frac{1}{f} = \frac{3}{u}$$

$$u = 3f$$

$$= 3 \times 2.5 = 7.5\text{m}$$

A boy should stand at a distance of 7.5m.

4) What is the function of iris and the muscles connected to the lens in the human eye?

Ans. : Function of iris :

i) Iris is responsible for controlling the diameter and size of pupil.

ii) Pupil controls the amount of light entering the retina.

Function of ciliary muscle :

i) Ciliary muscle is a circular muscles that contracts or relaxes to enable the lens to change the shape for focussing.

ii) When we see distant objects the lens become flat because the ciliary muscles relax and focal length of lens increases.

iii) When we see nearby objects the lens become rounded because the ciliary muscles tightens and the focal length of the lens decreases.

Q. 4: Solve the following question. (Any One) 5

1) Distinguish between

a) Farsightedness & Nearsightedness

b) Concave lens & Convex lens.

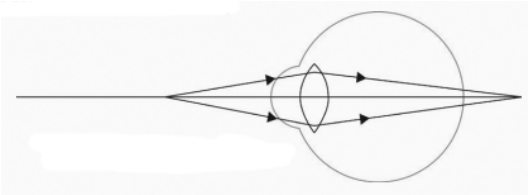
Ans. :

Farsightedness	Nearsightedness
1) The human eye can see distant objects clearly but can't see nearby objects distinctly.	1) The human eye can see nearly objects clearly but the distant objects appear indistinct.
2) Image forms behind the retina.	2) Image forms in front of the retina.
3) It is corrected by convex lens.	3) It is corrected by concave lens.

b)

Concave lens	Convex lens.
1) A lens having both surface inwards is a concave lens.	1) A lens having both spherical surfaces bulging outward is a convex lenses.
2) It is thicker at the edges than the middle.	2) It is thicker in the middle than the edges.
3) It is a diverging lens.	3) It is a converging lens.
4) Focal length is negtive.	4) Focal length is positive.

2) Given below is diagram showing a defect of human eye. study it and answer the following question.



i) Name and define the defect shown in fig.

ii) Give two possible reason for this defect of eye in human being.

iii) Name the type of lens used to correct the defect

iv) Draw a well labelled diagram to show how the defect is rectified by using the lens.

Ans. : i) The defect shown in the figure is hyper metropia.

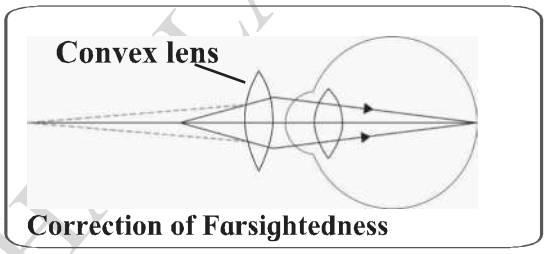
Hyper metropia : The defect in which the human eye can see distant object clearly but cannot see nearby object distantly is called as hypermetropia.

ii) a) Curvature of the cornea and the eye lens decreases so the converging power of lens becomes less.

b) Due to flattening of eye ball the distance between lens and retina decreases.

iii) It is corrected using convex lens of suitable focal length.

iv)



****