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ASCENT COACHING & SPOKEN ENGLISH POINT
cinema chowk PATORY (SAMASTIPUR)

LIGHT(Reflection,Refraction) &Human Eye and colourful world | CLASS-X Time-3hrs | S.A-II (Physics) F.M=90

SECTION-A

Q1: In which type of lens linear magnification is always less then one? **1mark**
Answer: Concave Lens always has linear magnification less than one, because it always gives diminished images.

Q2: : Which mirror has a wider field of view?
Answer: convex mirrors have wilder field view, that's why these are used as rear view-mirrors in vehicles **1mark**

Q3.) What is the range of vision for a normal human eye? **1mark**
Answer: The range of vision for a normal human eye is 25 cm to infinity

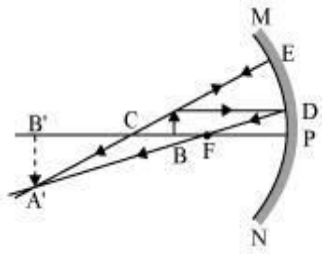
***Q4*. Why is red colour usually used in danger signals?** **2marks**
Answer: Red-coloured light scatters the least as it has the longest wavelength among the visible range of light. The use of red colour in danger signals allows them to be clearly visible, even from a distance

***Q5*: Why does sky appear dark to an astronaut?** **2marks**
Answer: There are no dust particles in the upper atmosphere of the earth and in the space because of which no scattering of light takes place. Therefore sky appears black (instead of blue) to an astronaut

***Q6.* When a bright object is placed 10 cm away from a concave mirror, its real image is formed at a distance 40cm from the mirror. What is the focal length of the mirror?** **2marks**
Answer: u = - 10 cm, v = - 40 cm, f = ?
i.e $f = \frac{uv}{u+v} = \frac{400}{-50} = -8cm \ (ans)$

Q7.): A concave mirror produces three times magnified real image of an object placed at 10 cm in front of it. Where is the image located? **2marks**
Answer: Given mirror = concave mirror
Distance of the object from mirror = - u = - 10 cm
Distance of the image from the concave mirror = v?
Magnification (m) = -3
m = -v/u
⇒ -3 = -v/-10 cm
⇒ v = -3 × 10 = **-30 cm**
Thus image is formed 30 cm from pole in front of the concave mirror (-ve sign tells that image formed is on the same side of the object).

***Q8.* Which type of mirror is used in the headlights of a car? Why is it used for this purpose? An object is placed between the centre of curvature and focus of a concave mirror. Draw a simple ray diagram for the formation of image.** **3 marks**
Answer: In a car headlight, a concave mirror is used. When a light-emitting object is placed at the focus of a concave mirror, all of the rays—after reflection from the mirror—become parallel to the principal axis. The headlights of a vehicle are made up of concave mirrors so as to obtain powerful parallel beams of light.



Q9. **) A small object is placed in front of a convex lens of 10 cm focal length, such that a virtual image is formed at a distance of 25 cm. Find its magnification.** **3 marks**

Object distance, $u = ?$ cm
Image distnace, $v = -25$ cm
Focal length, $f = 10$ cm
On putting these values in the lens formula, we get

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

$$\frac{1}{10} = \frac{1}{-25} - \frac{1}{u}$$

$$\frac{1}{u} = -\frac{1}{25} - \frac{1}{10}$$

$$\frac{1}{u} = \frac{-10-25}{250}$$

$$u = \frac{250}{35} = -7.14 \text{ cm}$$

Thus, the object is placed at a distance of 7.14 cm from the convex lens. The negative sign shows that the object is placed on the left hand side of the convex lens.

Magnification, $m = \frac{v}{u}$

Image distance, $v = -25$ cm

Object distance, $u = -7.14$ cm

$$m = \frac{-25}{-7.14} = 3.5$$

The plus sign shows that the image is formed above the principal axis. Therefore, the image is virtual and erect.

Q10. **When an object is placed at a distance of 60 cm from a convex mirror, the magnification produced is 1/2. Where should the object be placed to get a magnification of 1/3?** **3 marks**

Answer:

Case I: Given u = -60cm, $m = \frac{1}{2}$, v = ? and f = ?

$$m = \frac{1}{2} = \frac{-v}{u} \Rightarrow \frac{-v}{-60} = \frac{1}{2}$$

$$\Rightarrow v = 30cm$$

Applying mirror formula

$$\frac{1}{f} = \frac{1}{30} - \frac{1}{60}$$

$$\Rightarrow f = 60cm$$

Case II: u = ?, v = ? and $m = \frac{1}{3} = \frac{-v}{u}$

$$\Rightarrow v = \frac{-u}{3}$$

Using mirror formula

$$\frac{1}{60} = \frac{1}{-u/3} + \frac{1}{u} = \frac{-3}{u} + \frac{1}{u}$$

$$\frac{1}{60} = \frac{-2}{u} \Rightarrow \mathbf{u = -120cm}$$

Q11. **The far point for a myopic person is 75 cm in front of the eye. What is the type and power of the lens required to correct this defect? 3 marks**

Answer:The defect is called myopia, and it can be corrected by using concave lens. In this case:

Object distance, $u = \infty$

Image distance, $v = -75$ cm

Focal length, $f = ?$

On putting these values in the lens formula, we get

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

$$\frac{1}{-75} - \frac{1}{\infty} = \frac{1}{f}$$

$$\frac{1}{-75} - 0 = \frac{1}{f}$$

$$\therefore f = -75 \text{ cm} = -0.75 \text{ m}$$

$$\text{Power, } P = \frac{1}{f \text{ (in metres)}}$$

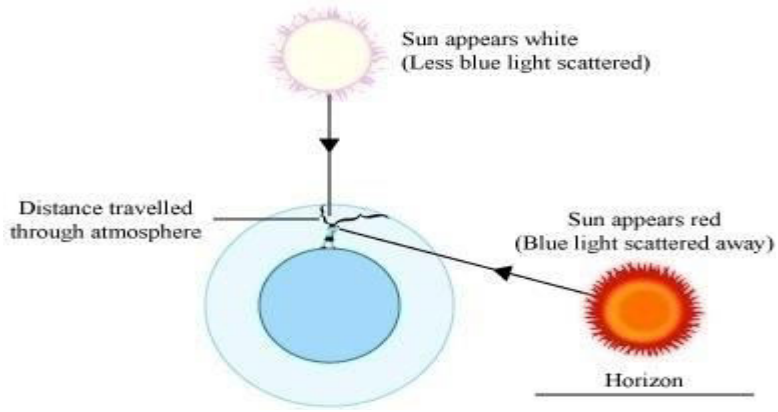
$$= \frac{1}{-0.75} = -1.33 \text{ D}$$

Therefore, the power of the required concave lens is -1.33 D.

Q12:**Explain why we cannot see objects clearly when we enter a cinema hall from a brightly lit room. 3 marks**
Answer: The iris adjusts the size of the pupil according to the intensity of light received by our eyes. As the intensity of light is great outside a cinema hall, the pupil becomes small. This limits the amount of light entering the eye. The intensity of light inside a cinema hall is low. So, the pupil needs to expand and become big to allow more light to enter the eye. As the pupil takes some time to dilate, we cannot see the objects clearly for the first few seconds.

The eye lens then becomes thicker. Consequently, the focal length of the eye lens decreases. This enables us to see nearby objects clearly.This ability of the eye lens to adjust its focal length is called accommodation.

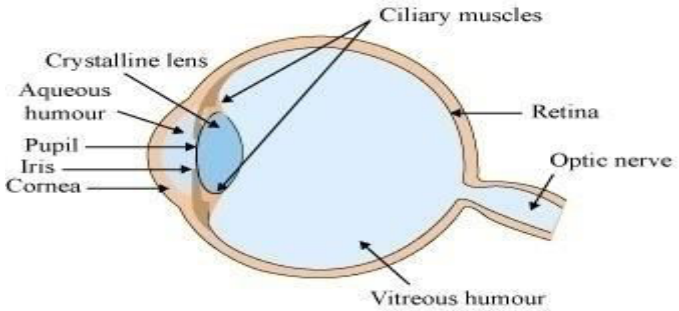
Q13 ***Give reasons for the following*****.** **3 marks**
(i) Sky appears blue for an observer on the earth.
(ii) Sun appears white at noon.
Answer:-**(i)** Red-coloured light has the longest wavelength, and blue-coloured light has the shortest wavelength. As the colour of scattered light also depends on the size of the suspended particles, a minute particle will scatter blue light, while a relatively larger-sized particle will scatter red light.
The sizes of the molecules of air and other particles present in the atmosphere are smaller than the wavelengths of visible light. Thus, these particles scatter light of shorter wavelength (i.e., blue) more effectively than light of longer wavelength (i.e., red). As sunlight passes through the atmosphere, fine particles present in the atmosphere scatter blue light more effectively than red. The scattered blue light makes the sky appear blue to our eyes.
(ii) At noon, as the sun is directly overhead, the light coming from the sun travels a relatively shorter distance through the atmosphere to reach us. Only a small portion of blue light is scattered in the atmosphere. This is why the sun appears to be white.



Scattering of light

Q14.) Explain Tyndall effect. Give three examples. **3 marks**
Answer:-Tyndall effect is named after the British physicist, John Tyndall (1820-1893). He discovered that the path of a beam of light becomes visible when it is passed through a heterogeneous mixture. It happens due to the scattering of light by the particles suspended in the medium. This phenomenon of scattering of light by the particles in the medium is called Tyndalleffect. This effect becomes more pronounced as the number of suspended particles in the medium increases. In our daily life, we observe this effect in the following situations.
A beam of sunlight becomes visible when it enters a closed, dusty room through a small crevice. The tiny dust particles in the room scatter the beam of light; therefore, we can see the beam of light.
We can see the light from the headlights of a car on foggy days.

Q15. Draw a labelled diagram of the human eye showing its important parts. **3 marks**
Answer



Q.16. Rhea and Harnoor were at the dining table having their dinner. An argument broke out between them about convex and concave mirror as to which mirror forms an inverted image. Without wasting time Rhea took Harnoor look into the depressed surface of the spoon and then the bulging surface. The images formed

in the two cases were different. In the first case the image formed was inverted while in the second case it was erect. Then she explained to Harnoor about the two surfaces acting as mirrors and also which formed an inverted image. This at once stopped the argument.

(a) Which of the two mirrors forms an inverted image; concave or convex? (b) What are the values shown by Rhea and Harnoor? (c) Give one use of a concave mirror. 3 marks

Ans:- (a) A concave mirror forms an inverted image. (b) **Rhea:** Concern for her brother to for having correct knowledge. **Harnoor:** Ability to learn and understand, respect for elders. (c) Used as a shaving mirror.

Q.17. A person with a defective eye vision is unable to see the objects nearer than 1.5 m. He wants to read books at a distance of 30 cm. Find the nature, focal length and power of the lens he needs in his spectacles.

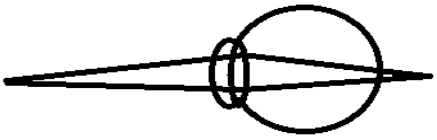
3 marks

Ans: The defect is Hypermetropia . For him u= - 30cm, v= -1.5 m= - 150cm. Therefore, focal length of corrective lens to be used by him is $f = \frac{uv}{u - v} = 37.5$ **0r alternate ,**

$f = \frac{xd}{x - d}$ *Where 'x' is the distance of near point of defective eye, d' is distance of near point of normal eye:*

$f = \frac{150\ X\ 30}{150 - 30} = 37.5\ cm$ The +ve sign shows that the lens needed is a convex lens of focal length 37.5, hence power, $P = \frac{1}{f} = \frac{100}{37.5} = 2.67\ D$

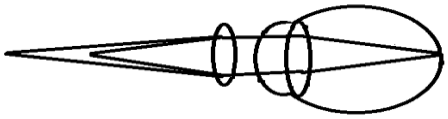
Q.18 Study the diagram given below and answer the questions that follow it: 3 marks



(a) Which defect of vision is represented here?

(b) Draw ray diagram to show the correction of this defect by the use of a suitable lens.

Ans: (a):- Hypermetropia or far sightedness; this is because the nearby objects are not focused the retina.

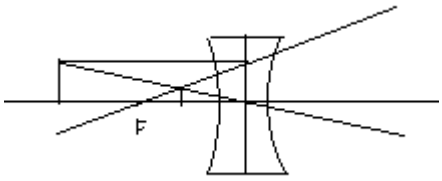


(b):

Q19. A concave lens of focal length 15 cm forms an image 10 cm from the lens. How far is the object placed from the lens? Draw the Ray diagram. 3 marks

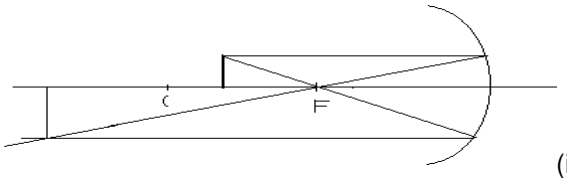
Ans: Given f= -15cm, v= - 10 cm, u= ?

$\frac{1}{v}-\frac{1}{u}=\frac{1}{f} \Rightarrow \frac{1}{u}=\frac{1}{v}-\frac{1}{f}=\frac{1}{-10}-\frac{1}{-15} \; therefore \; u=\frac{15X10}{10-15}=-30cm$ The object is placed at a distance of 30cm from the lens.The ray diagram is as shown below:

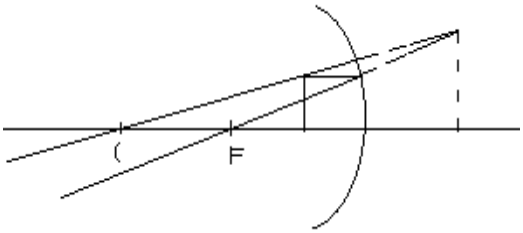


Q20. Draw ray diagrams to show the formation of image of an object by a concave mirror, when it is placed (i) between its centre of curvature C and focus F (ii) between pole P of mirror and its focus F. Write its nature and position. **5 marks**

Ans: (i) The ray diagram is as shown. The image is formed beyond C. It is real, inverted and larger than the object.



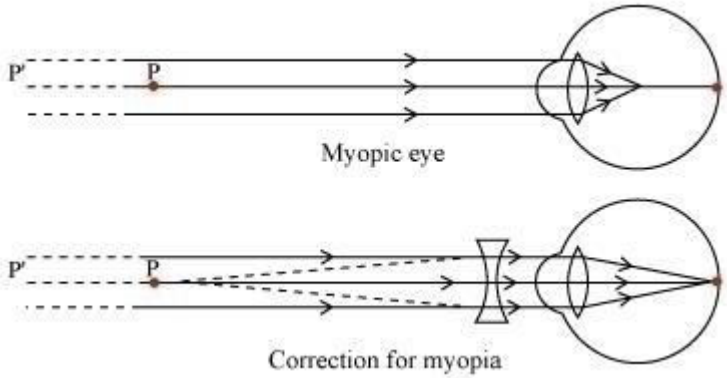
(ii) The ray diagram is as shown. The image is formed behind the mirror. It is virtual, erect and highly magnified.



Q21. Explain short sightedness and how it can be rectified. Draw simple ray diagrams for the same. **5 marks**

Answer: Myopia is **near sightedness**. A person with myopia can see nearby objects clearly, but is unable to see distant objects distinctly. The person sees clearly up to a distance of only a few metres, depending upon the extent of the defect. In myopia, the image of a distant object is formed in front of, and not at, the retina. This defect is caused by the excessive curvature of the eye lens or elongation of the eyeball.

A **concave lens** of suitable power is used for correcting this defect. The lens brings the image onto the retina.



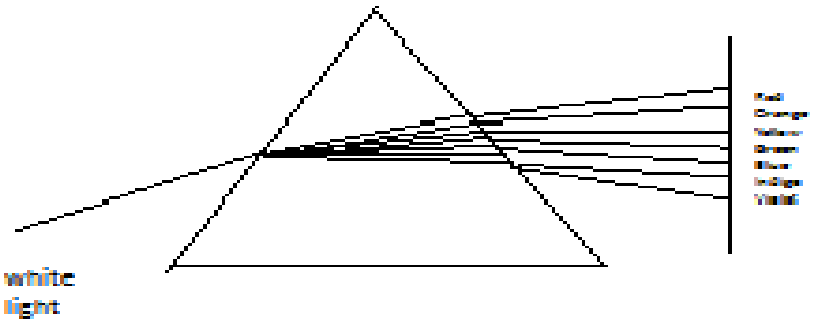
Myopia or short sightedness and its corrective measure

Q22. (a) What is dispersion of white light? What is the cause of such dispersion? Draw a ray diagram, to show the dispersion of white light by a glass prism.

(b) A glass prism is able to produce a spectrum when white light passes through it but a glass slab does not produce any spectrum. Explain why it is so. **5 marks**

Ans: Dispersion:- The splitting of white light into its constituent seven colours is called dispersion of light.

Cause:- Ordinary white light is a superposition of waves of wavelengths extending throughout the visible spectrum.The speed of light in vacuum is same for all wavelengths, but the speed in a material substance is different for different wavelengths. As a result, different colours are deviated by different angles when they pass through a prism. This is called dispersion of light



. In a prism the refraction of light takes place at the two slant surfaces. The dispersion of white light occurs at the first surface of prism where its constituent colours are deviated through different angles. At the second surface, these split colours suffer only refraction and they get further separated. But in a rectangular glass block the refraction of light takes place at two parallel surfaces. At the first surface, although the white light splits into its constituents colours on refraction, but these split colours on suffering refraction at the second surface emerge out in form of a parallel beam, which give an impression of white light.

Q23. (a) Name the type of mirror used in the following:- (i) Headlight of a car. (ii) Rear view mirror of a vehicle. Support your answer with reason.

(b) When an object is placed at a distance of 60 cm from a diverging spherical mirror, the magnification produced is 0.5. Where should the object be placed to get a magnification of $\frac{1}{3}$? **5 marks**

Ans: (i) Concave mirror:- When the source of light is at the focus of concave mirror, it converts the diverging beam from source to a parallel beam of light which is directed towards the front of vehicle and is able to reach to an appreciable distance without much loss of intensity.

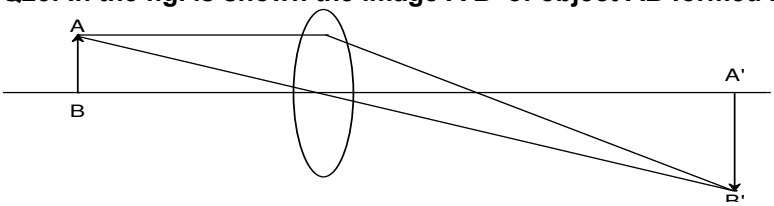
(ii) Convex mirror:- Because of its wider field of view and its capacity to form virtual, erect and diminished image.
(b) Here, u= -60 cm, m=0.5 according to magnification formula,
m= $\frac{-v}{u}, v = 30cm$ *also, according to mirror formula,* $\frac{1}{u}+\frac{1}{v}=\frac{1}{f}$ *on calculation,* $f = +60cm$ again, for magnification $\frac{1}{3}$ u=?, m= $\frac{-v}{u}, v = \frac{-u}{3}$ using mirror formula $\frac{1}{u}+\frac{1}{v}=\frac{1}{f}$ *on calculation* $u = -120cm$

Q24.(a) **Define power of lens. Write its SI units. (b) You are provided with two convex lenses of focal length 15cm and 25 cm respectively. Which of the two is of larger power ? Give reason for your answer.**
(c) A 20 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 10 cm. The distance of the object from the lens is 15 cm. Find the nature, position and size of the image. Also find its magnification.

Ans:- The ability of a lens to converge or diverge light rays is called the power of lens. **P** $= \frac{1}{focal\ length}, dioptre$
(b) Lens of focal length 15 cm because power is inverse of focal length.
(c) $\frac{1}{v}-\frac{1}{u}=\frac{1}{f}, \quad \frac{1}{v}=\frac{1}{-15}+\frac{1}{10}=\frac{1}{30}$ **, image** is real and inverted magnification = $\frac{h^i}{h_o}=\frac{v}{u}=\frac{30}{-15}, m = -2$

SECTION-B (1 x 18 = 18)

Q25: In the fig. is shown the image A'B' of object AB formed by a convex lens. The position of the object is:



(**a)** at 2f (b) beyond 2f (c) between f and 2f (d) at f

Q26: A real inverted magnified image of an object is formed by a convex lens. To obtain a virtual magnified image of the same object:
(a) lens should be moved away from the object (b) object should be moved away from the lens
(c) object should be moved towards the lens (d) none of these

Q27: A convex lens of power 5D is combined with a concave lens of power 4D, the focal length of the combination is:
(a) 20 cm (b) 25 cm (c) 100 cm (d) 11.1 cm

Q28: For no refraction at the interface of two mediums the angle of incidence should be
(a) 30^0 (b) 45^0 (c) 60^0 (d) 90^0

Q29: Magnification produced by a rear view mirror fitted in vehicles
(a) is less than one (b) is more than one (c) is equal to one

(d) can be more or less than one depending upon the position.

Q30: Magnification produced by a mirror is +1.5. The mirror is
(a) Concave (b) Convex (c) May be concave or convex (d) None

Q31: A student obtained a sharp image of the grill of a window on a screen using a convex lens. For better results, the teacher suggested focussing of a distant tree instead of the grill. In what direction should the lens be moved for this purpose?
(a) Away from the screen (b) Very far away from the screen (c) Behind the screen (d) Towards the screen

Q32. The clear sky appears blue because
(a) blue light gets absorbed in the atmosphere (b) ultraviolet radiation are absorbed in the atmosphere (c) violet and blue lights get scattered more than all other colours by the atmosphere (d) light of all other colours is scattered more than the violet and blue colour lights by the atmosphere

Q33. The intensity of light of light entering the eye is controlled by
(a) pupil (b) ciliary muscles (c) vitreous humour (d) retina

Q34. Electric nerve pulses from retina to brain are conveyed by
(a) ciliary muscles (b) optic nerve (c) aqueous humour (d) pupil

Q35. Twinkling of stars is due to
(a) reflection (b) atmospheric refraction (c) dispersion (d) scattering

Q36. Ciliary muscles can change the focal length of eye lens. This phenomenon is responsible for
(a) accommodation (b) persistence of vision (c) astigmatism (d) colour blindness

Q37. Which of the following phenomena contributes significantly to the reddish appearance of the sun at sunrise or sunset?

(a) Dispersion of light (b) Scattering of light (c) Total internal reflection of light (d) Reflection of light from the earth

Q38. In optical fibres, the principle used is

(a) scattering (b) reflection (c) refraction (d) total internal reflection

Q39. Light travels slowest in

(a) vacuum (b) air (c) glass (d) diamond

.**Q40. You are given water, mustard oil, glycerine and kerosene. In which of these media a ray of light incident obliquely at same angle would bend the most?**

(a) Kerosene (b) Water (c) Mustard oil (d) Glycerine

Q41. While trying to identify convex lens from a group of glass pieces lying on a table, Asha found that there is lens that always forms a virtual and diminished image. The kind of this lens is:

(a) Plane convex lens (b) Double concave lens (d) Double convex lens (d) Plane glass sheet

Q42. A convex lens forms a virtual and magnified image of an object, the position of the object must be :

(a) just beyond f (b) between focus and optical centre (c) between f and 2f of the lens (d) can't say anything with certainty