Human Eye and Colourful World

1 Mark Questions

1. When a person is myopic, he/ she can clearly see
(a) both nearby and far off objects
(b) Only nearby objects
(c) only far off objects
(d) Neither nearby nor far off objects
Ans. (b) Only nearby objects

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2. The defect of myopia can be corrected by using
(a) Concave lens
(b) Convex lens
(c) Either concave or convex
(d) A complicated combination of lenses.
Ans. (a) Concave lens

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3. The colour that is scattered the least by the tiny particles and the atoms/ molecules of the atmosphere is
(a) Violet
(b) Green
(c) yellow
(d) Red
Ans. (d) Red

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4. Which of the following phenomenon 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
(d) Reflection of light from the earth
Ans. (b) Scattering of light

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5. The focal length of the eye lens increases when eye muscles.
(a) are relaxed and lens becomes thinner
(b) contract and lens becomes thicker
(c) are relaxed and lens becomes thicker
(d) Contract and lens becomes thinner.
Ans. (a) are relaxed and lens becomes thinner

6. Define power of accommodation?
Ans. The ability of the eye lens to adjust its focal length is called power of accommodation.

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7. Which part of the human eye provides most of the refraction for the light rays entering the eye?
Ans. Cornea and Aqueous humour

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8. What happens to the image distance in the eye when we increase the distance of an object from the eye?
Ans. It remains the same

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9. What happens to the pupil of the eye when the light is very bright?
Ans. Size of the pupil becomes small.

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10. Which part of the human eye conveys the electrical signals generated by the light sensitive cells of the retina, on the brain?
Ans. Optic nerves

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11. The human eye can focus objects at different distances by adjusting the focal length of the eye lens. This is due to
(a) Presbyopia
(b) Accommodation
(c) Near-sightedness
(d) Far-sightedness
Ans. (b) Accommodation

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12. The human eye forms the image of an object at its
(a) Cornea
(b) Iris
(c) Pupil
(d) Retina
Ans. (d) Retina

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13. The least distance of distinct vision for an eye lens is caused by the action of the
(a) 25 m
(b) 2.5 cm
(c) 25 cm

(d) 2.5 m
Ans. (c) 25 cm

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14. The change in focal length of an eye lens is caused by the action of the
(a) Pupil
(b) Retina
(c) Cilliary muscles
(d) Iris
Ans. (c) Cilliary muscles

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15. What would have been the colour of the sky if there had not been any atmosphere around the earth?
Ans. black.

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16. For dispersion of light through a prism which colour has maximum deviation?
Ans. violet

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17. What is the least distance of distinct vision of a normal human eye?
Ans. 25cm.

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18. Name the muscle responsible for bringing change in the focal length of the eye lens?
Ans. Ciliary muscle.

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19. Name one defect of vision which cannot be corrected by any type of spectacle lenses?
Ans. Cataract.

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20. State one effect produced by the scattering of light by the atmosphere?
Ans. Tyndall effect.

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21. What is the nature of image formed on the retina of the eye?
Ans. Real and inverted.

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22. What type of lens is used for correcting hypermetropia?
Ans. Convex lens.

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23. Who was the first person to obtain the spectrum of sunlight?
Ans. Sir Isaac Newton.

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24. As light rays pass from air into glass prism, are they refracted towards or away from the normal?
Ans. Towards the normal.

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25. Which color has largest wavelength?
Ans. Red color. Ant

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26. Which defect of vision can be rectified using a concave lens?
Ans. Myopia.

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27. What phenomenon causes twinkling of star on a clear night?
Ans. Atmospheric refraction.

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28. What is meant by scattering of light?
Ans. Change of direction of light on striking a scattered.

2 Mark Questions

1. The far point of a myopic person is 80 cm in front of the eye. What is the nature and power of the lens required to correct the problem.

Ans. $f = -80cm = -0.8m$

$$P = \frac{1}{-0.8} = -1.25D$$

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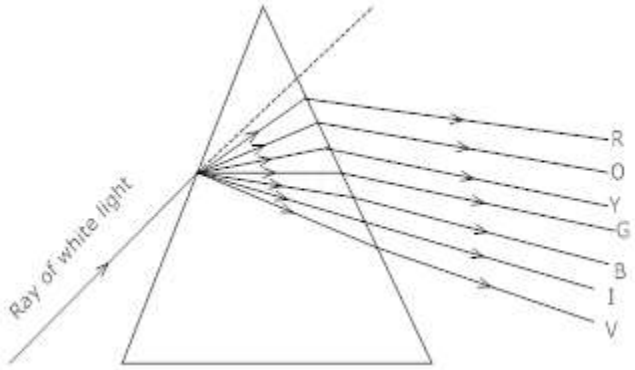
2. Draw a diagram to show the dispersion of white light by a glass prism.
Ans.



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3. Name the phenomenon responsible for the observed twinkling of stars. Will this twinkling be observed by an observer on the moon.
Ans. Atmospheric refraction is responsible for twinkling of stars.

The observer on the moon will not observe twinkling of stars as moon has no atmosphere.

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4. Name the part of the eye that
(a) determines the colour of a person's eye
(b) Controls the amount of light entering the eye
Ans. (a) Cones cell present in retina
(b) Iris

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5. What is the role of the ciliary muscles?
Ans. The ciliary muscles holds the eye lens in its position and when the muscles contract and relax it changes the shape of the eye lens which is turn increases or decreases the focal length of the eye lens

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6. Which convex lens is called as converging lens?
Ans. A convex lens is called as a converging lens because it focuses all the parallel beam of light at its focus.

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7. State the role of eye lens in the human eye?
Ans. If focuses the light says entering the eye to form a real and inverted image of the object on the retina.

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8. What is meant by power of accommodation of eye?
Ans. The ability of the eye lens to adjust its focal length, so as to clearly focus rays coming from distant as well as near objects on the retina, is called the power of accommodation of the eye.

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9. A person with a myopic eye cannot see objects beyond 1.2 m distinctly. What should be the corrective lens used to restore proper vision?
Ans. A person with a myopic eye should use a concave lens of focal length 1.2 m so as to restore proper vision.

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10. What is the far point and near point of the human eye with normal vision?
Ans. For a human eye with normal vision the far point is at infinity and the near point is at 25 cm from the eye.

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11. A student has difficulty reading the blackboard while sitting in the last row. What could be the defect the child is suffering from? How can it be corrected?
Ans. The student is suffering from myopia or short sightedness. The defect can be corrected by the use of concave lens of suitable power.

12. The far point of a myopic person is 80 cm in front of the eye. What is the nature and power of the lens required to correct the problem?
Ans. To correct the myopia the person concerned should use concave lens of focal length (f) = -80 cm = -0.80 m Power of lens (P) = 1/f(m) = 1/-0.80 = 100/-80 = -1.25 D.

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13. Why is a normal eye not able to see clearly the objects placed closer than 25 cm?
Ans. Due to limit of power of accommodation, the focal length of the eye lens cannot be decreased below certain minimum limit. So, a normal eye cannot see clearly the objects placed closer than minimum distance, called near point of the eye.

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14. What happen to the image distance in the eye when we increase the distance of an object from the eye?
Ans. The image is formed on the retina even on increasing the distance of an object from the eye. In fact, the eye lens becomes thinner and its focal length increases as the object is moved away from the eye and consequently image is formed on the retina.

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15. Why does the Sun appear reddish early in the morning?
Ans. In early morning, the Sun is situated near horizon. Light from the Sun passes through thicker layers of air and covers a larger distance in earth's atmosphere before reaching our eyes. While passing through atmosphere blue light is mostly scattered away and the Sun appear reddish.

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16. A person wears eye glass of focal length 70 cm what is the far point of the person?
Ans. l/f=l/v-l/u
V=?
F=-70 cm
$u = -\infty$
$1/-70 = l/v - 1/-\infty$
1/v=1/-70 v=-70 cm

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17. If your eye glasses have focal length 60 cm what is your nor point?
Ans. l/f=l/v-l/u
1/60=l/v+1/25
v=-43 cm.

18. Why do we observe random wavering or flicking of the objects near a fire or on a very hot day?
Ans. Area above the fire is hot, and its density and hence refractive index changes frequently. Therefore, apparent image of the object also changes.

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19. Why are we not able to see the things clearly when we come out of a darkroom?
Ans. When we are in dark, pupil size is bigger. As we come out of dark room, its size needs to Become smaller. For that time-interval person is unable to see.

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20. What is the function of optic nerve in human eye?
Ans. Optic nerve carries the image formed on the retina to the brain in the form of electrical signals.

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21. Why do different colours deviate though different angles on passing through a prism?
Ans. This is because different colours travel through glass with different speeds and glass has different refractive index for different colours.

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22. Name the defect of vision in person
a. Whose near point is more than 25 cm away'?
b. Whose far point is less than infinity.
Ans. a. Hypermetropia
b. Myopia

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23. What is a spectrum?
Ans. The band of seven colours obtained by dispersion of white light is called spectrum.

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24. Why does clear sky look blue?
Ans. The sky appears blue because the tiny particles held in the atmosphere scatter lights of shorter wavelength like blue light…. this light is received by our eye and the sky appears blu… in the absence of atmosphere , scattering does not take place and the sky appears dark….

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25. Can visible light be scattered by atoms/molecules in earth's atmosphere?
Ans. Yes, as size of molecules/atoms i much less then wavelength of light

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26. Why does the s y appear ac moue to an astronaut?

Ans. The upper atmosphere does not have particle or dust etc. as a result there is no scattering of light and hence the sky appear dark instead of blue to an astronaut.

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27. What is the basic cause of atmospheric refraction?
Ans. The basic cause of refraction is variation in optical density of different layers of earth's atmosphere. The sun passes through earth's atmosphere.

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28. What is range of vision?
Ans. Range of vision of a normal human eye is between it's near point and far point is, from 25 cm to infinity.

3 Mark Questions

1. (a) What is hypermetropia?
(b) What are the two causes of this defect of vision?
Ans. (a) Hypermetropia is the defect in which a person can see distant objects clearly but cannot see the nearby objects.
(b) The two possible causes of this defect are
(i) Increase is the focal length of the eye lens
(ii) Eye ball gets shortened

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2. (a) What is scattering of light?
(b) Astronauts observe the sky as dark instead of blue why?
Ans. (a) The re-scattering of light by the scatterers present is the atmosphere in different directions after being absorbed by them is called scattering.
(b) The blue of sky is due to scattering of blue colour by the earth's atmosphere. For the astronaut there would be no such scattering effect. Hence the sky appears dark to the astronaut.

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3. A person is known to use a lens of power
(i) -5.5 D for his distant vision
(ii) +1.5 D for his near vision
Calculate the focal length of the lens used for correcting his
(a) Distant vision and (b) Near vision problems.
Ans. (i) For distant vision

$$f = \frac{1}{-5.5} m = \frac{-100}{5.5} cm$$

$$f = -18.2cm$$

(ii) For near vision

$$f = \frac{1}{1.5m} = \frac{2}{3}m = \frac{200}{3}cm.$$

$$f = 66.7cm.$$

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4. What is presbyopia? State the causes of this defect? How is presbyopia of a person corrected?
Ans. Presbyopia is the defect of human eye in which a person is unable to see the nearby as well as far off objects clearly.
Causes:
(1) Decrease is the power of accommodation of the eye due to ageing
(2) Weakening of the ciliary muscles It can be corrected by using a bifocal lens (upper half concave and the lower half convex)

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5. The rainbow is a natural spectrum appearing in the sky after a rain shower
(a) Is it correct to say that a rainbow is always formed in a direction opposite to sun?
(b) Can it be seen on a sunny day?
(c) Arrange the sequence in correct sequential order Refraction, Internal Reflection, Refraction & Dispersion
Ans. (a) Yes
(b) No, we cannot observe a rain bow on a sunny day when we look at the sky through a waterfall
or fountain with the sun behind us.
(c) Refraction and dispersion, internal reflection, Refraction.

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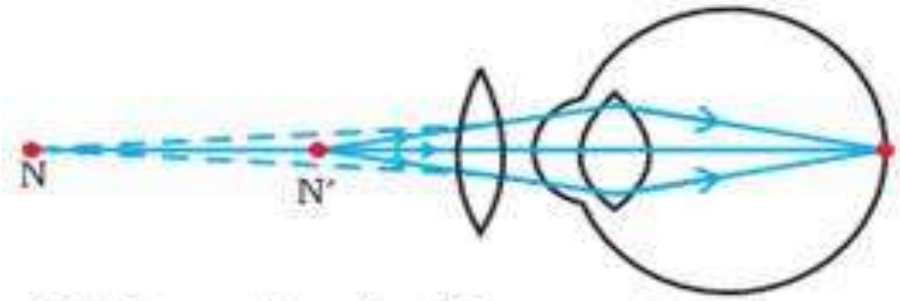
6. (a) Write two causes of hypermetropia?
(b) Show diagram to show the correctness of hypermetropia?
Ans. (a) Causes of hypermetropia
(1) Increase in the focal length of the eye lens
(2) Decrease in the size of the eye ball.
(b)



(c) Correction for Hypermetropic eye

7. A reporter records the following observations of an astronaut from his space ship.
(a) The length of the day is same as observed on the earth.
(b) Sky appears black in colour.
(c) The star appears to twinkle while the planets do not do so as they do on the earth.
Justify each statement
Ans. (a) It is incorrect as length of the day in space would be about four minutes shorter than that on the earth.
(b) It is correct because in space we cannot observe scattering of light because of absence of atmosphere.
(c) It is incorrect because twinkling of stars is due to atmospheric refraction but in space we do not have atmosphere and atmospheric particles.

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8. A person needs a lens of power -5.5 dioptre for correcting his distinct vision. For correcting his near vision he needs a lens +1.5 dioptre. What is the focal length of the lens required for correcting (i) distinct vision, and (ii) near vision?
Ans. (i) Power of lens needed for correction distant vision of the person (P) = -5.5 D
Focal length of lens required for correcting distant vision (f)
= 1/P = 1/-5.5 m = 0.18 m = 18 cm.
(ii) For correcting near vision the power of lens required (P) = +1.5 D
Focal length of lens required for correcting near vision (f)
= 1/P = 1/1.5 m = 0.67 m = 66.7 cm.

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9. Why do stars twinkle?
Ans. Stars twinkle due to atmospheric refraction of starlight. As the stars are very away they behave as almost point sources of light. As on account of atmospheric refraction, the path of rays of light coming from the star goes on varying slightly, the apparent position of the star fluctuates and the amount of light entering the eye flickers, so sometimes the star appear brighter and at some other time, fainter. Thus the stars twinkle.

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10. Explain why the planets do not twinkle.
Ans. Planets are much closer to the earth and are seen as extended source. So, a planet may be considered as a collection of a large number of point-sized light sources. Although light coming from individual point-sized sources flickers but the total amount of light entering our eye from all the individual point-sized sources

average out to be constant. Thereby, planets appear equally brighter and there is no twinkling of planets.

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11. Why does the sky appear dark instead of blue to astronaut?
Ans. Blue colour of the sky is on account of scattering of light of shorter wavelength by particles in the atmosphere of earth. If the earth had no atmosphere, there would not have been any scattering and sky would have looked dark. When astronaut in his spacecraft goes above the atmosphere of earth, sky appears dark to him because there is no scattering of light.

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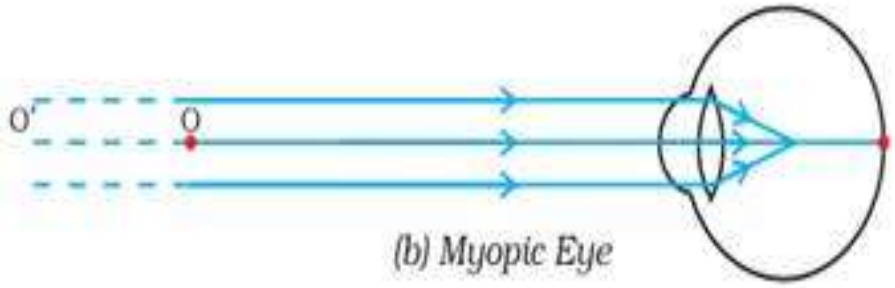
12. A certain person has minimum distance of distinct vision of 150cm . He wishes to read at a distance of 25cm. What focal length glass should he use? What is the nature of eye defect?
Ans. -U=-25 cm V=-l5O cm.
1/f= 1
1/f=1/ – 1/(-25)
f=3Ocm.
f being +ve, lense used is convex lens.
Hypermetropic

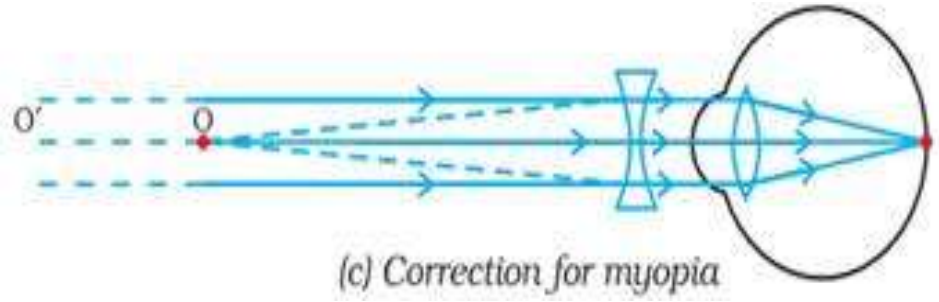
5 Mark Questions

1. A 14 year old student is not able to see clearly the questions written of the black board placed at a distance of 5 m from him.
(a) Name the defect of vision he is suffering from?
(b) Draw the diagram to show this defect?
(c) Name the type of lens used to correct this defect?
(d) Name two possible cause of this defect.
(e) Draw the diagram to show how this defect can be corrected.
Ans. (a) The student is suffering from myopia.
(b)



(b) Myopic Eye

(c) Concave lens
(d) (i) Decrease in the focal length of the eye lens
(ii) Eye ball gets elongated.
(e)



(c) Correction for myopia

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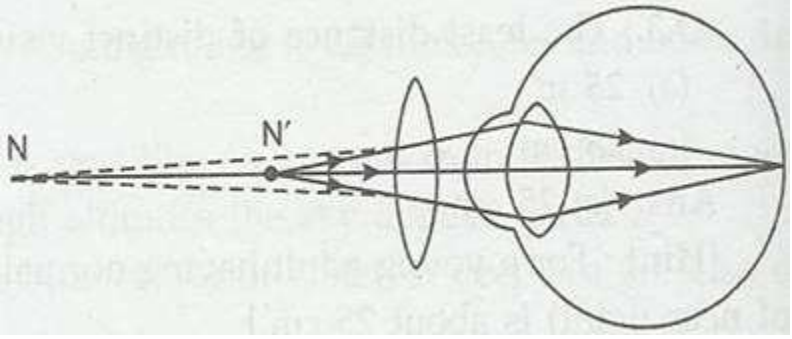
2. Make a diagram to show how hypermetropia is corrected. The near point of a hypermetropic eye is 1 m. What is the power of the lens required to correct this defect? Assume that near point of the normal eye is 25 cm.
Ans. Diagram representing the correction of hypermetropia is a follows:



Near point of defective eye is 1 m and that of normal eye is 25 cm.
Here, u = -25 cm, v = -1m = 100 cm.
Using lens formula
$1/f = 1/v - 1/u$
$1/f = 1/-100 + 1/25 = 3/100$
f = 100/3 cm = 1/3m.
P = 1/f(m) = 1/0.33 = +3.0 D.