Ray Optics And Optical Instruments

Que 1: A compound microscope consists of an objective lens of focal length 2 cm and an eyepiece of focal length 6.25 cm separated by a distance of 15 cm. How far from the objective should an object be placed in order to obtain the final image at *Marks :(4)*

(a) least distance of distinct vision

(b) infinity

Ans: (a) v_e = -25cm

$$\frac{1}{u_e}=\frac{1}{v_e}-\frac{1}{f_e}=\frac{1}{-25}-\frac{1}{6.25}, \qquad \therefore \quad u_e=5cm$$

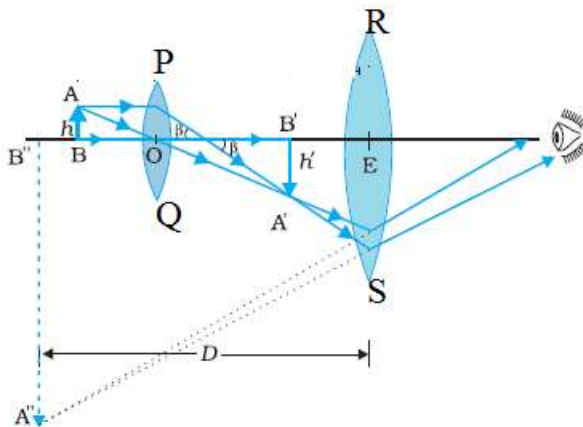Length of the tube, $L=|v_o|+|u_e|$

$$\therefore \quad v_o=15-5=10$$

$$\frac{1}{u_o}=\frac{1}{v_0}-\frac{1}{f_o}=\frac{1}{10}-\frac{1}{2}, \qquad u_o=-2.5cm$$

(b)

$$\therefore \quad v_o=15-f_e=15-6.25=8.75$$

$$\frac{1}{u_o}=\frac{1}{v_0}-\frac{1}{f_o}=\frac{1}{8.75}-\frac{1}{2}, \qquad u_o=-2.59cm$$

Que 2: The given figure shows a compound microscope with two lenses PQ and RS

(a) Identify Objective and eyepiece in the microscope

(b) A compound microscope has a magnification of 30. The focal length of its eyepiece is 5 cm. assuming the final image to be formed at the least distance of distinct vision, calculate the magnification produced by the objective.

(c) What is the length of a compound microscope in normal adjustment.
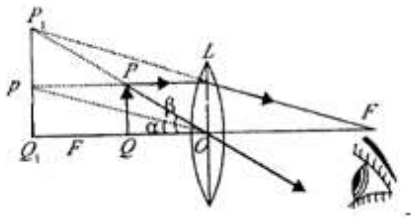*Marks :(4)*

Ans:

(a) Objective-PQ, eyepiece-RS

(b)Magnification , $M = m_o \times m_e$

$$m_e = 1 + \frac{D}{f_e} = 1 + \frac{25}{5} = 6$$

$$m_o = \frac{m_e}{M} = \frac{30}{6} = 5$$

(c)The length of a compound microscope in normal adjustment is $v_o + f_e$

Que 3: The given figure shows a simple microscope   *Marks :(5)*

(a) Identify the object distance and image distance

(b)Derive an equation for magnifying power of the simple microscope.

Ans: (a) Object distance-OQ, image distance-OQ$_1$

(b) Magnifying power or magnification is given by

$$magnification, \ m = \frac{\text{linear size of the image formed at the least distance of distinct vision}}{\text{linear size of the object}}$$

$$\therefore \qquad m = \frac{v}{u} = \frac{D}{u}$$

From the lens formula $\dfrac{1}{v} - \dfrac{1}{u} = \dfrac{1}{f}$

$$\frac{1}{-D} - \frac{1}{-u} = \frac{1}{f} \qquad \text{or-} 1 + \frac{D}{u} = \frac{1}{f}$$

$$m = 1 + \frac{D}{f}$$

Que 4: Blue colour of the sky is due to………………

A transparent container containing water is illuminated by narrow beams of red and green lights. Which colour will be more intense in the solution. Why?
*Marks :(3)*

Ans:

1. Scattering

2. Green. Green light is more scattered than red light since green light has shorter wavelength than red light.

Que 5: A light ray us incident on the face AB of an equilateral prism as shown.
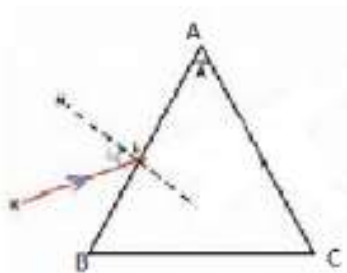
1. **A light ray incident on one face of the above equilateral prism ABC having refractive index 1.5 emerges by grazing through the face AC. Find the angle of incidence on the face AC.**

2. **Draw the path of the ray when it is coming out through the face AC.**

3. **Write down the expression for the refractive index of the material of the prism in terms of angle of minimum deviation.**   *Marks :(3)*

Ans: a)
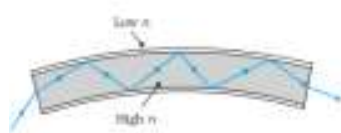

b)
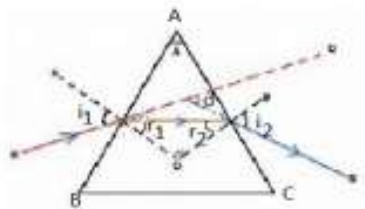
$$\frac{n_2}{n_1} = \frac{sin(\frac{A+D}{2})}{sin(\frac{A}{2})}$$

c) When the light ray is grazing through the second face the angle of refraction at the second face is 90°and angle of incidence at the second face is critical angle.

Que 6: The figure shows the propagation of light through an optical fibre.

1. Name the principle guiding the propagation of light through an optical fibre.
2. Write the necessary conditions for the above phenomenon.
3. Diamond has refractive index 2.42.Calculate the critical angle for diamond. If the diamond crystal is placed in a liquid of refractive index 1.3 what will be the critical angle?   *Marks :(3)*

Ans:

1. Total internal reflection.

2. i) Light travels from an optically denser medium to a rarer medium. ii) The angle of incidence in the denser medium is greater than critical angle.

3.

$$\frac{1}{2.42} = \frac{\sin i_c}{\sin 90}$$

$$\sin i_c = \frac{1}{2.42} = 0.4132$$

$$i_c = \sin^{-1}(0.4132) = 24.4$$

If placed in liquid of refractive index 1.3

$$\frac{1.3}{2.42} = \frac{\sin i_c}{\sin 90}$$

$$\sin i_c = \frac{1.3}{2.42} = 0.5372$$

$$i_c = \sin^{-1}(0.5372) = 36.1$$

Que 7: Certain prisms are designed to bend light by 90^0 and by 180^0.

(a) These prisms make use of the phenomenon called ………….. ………………

(b) Two rays of light — red and blue — are incident on the face AB of a right angled prism ABC. The refractive indices of the material of the prism for red and blue wavelengths are 1.39 and 1.47 respectively. Trace the path of the rays through the prism *Marks :(5)*
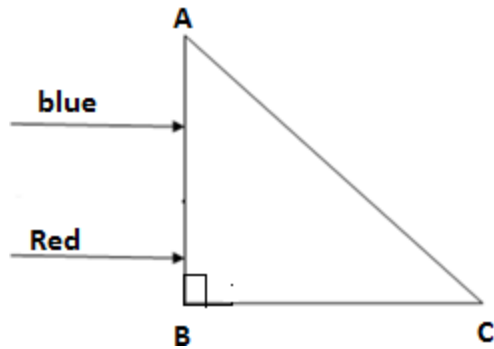
Ans:

(a) Total internal reflection

Critical angle for blue light

$$i_{c(b)} = \sin^{-1}\left(\frac{1}{1.47}\right) = 42.8^0$$

$$i_{c(r)} = \sin^{-1}\left(\frac{1}{1.39}\right) = 46^0$$

Que 8: You are given two mirrors labeled A and B. When you look at them keeping it close to your face a magnified image is seen in mirror A and a diminished image is seen in the mirror B.

1. Identify the mirrors A and B

2. Draw the ray diagram in which the mirror forms magnified erect image.

3. Let the focal length of the mirror you used in the above question is 20 cm. At what distance an object must be placed in front of the mirror so that an image magnified three times is formed on a screen? *Marks :(5)*
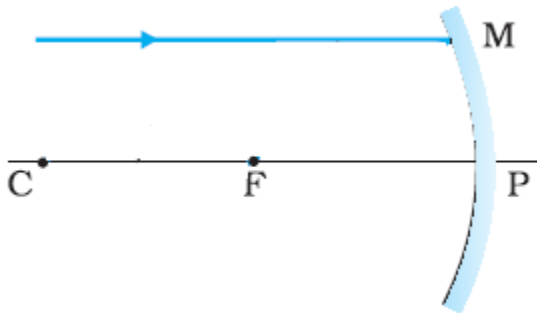
Ans: 1. A - Concave mirror

B – Convex Mirror

2.
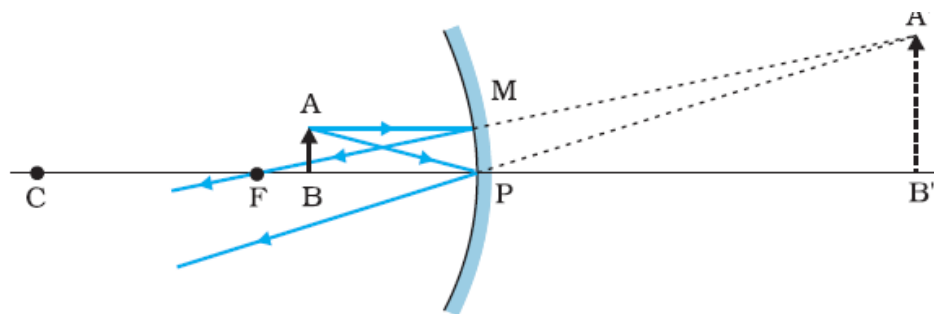
3. $f = -20\,cm\; m = -3$

$$\frac{-v}{u} = -3\; v = 3u,\quad \frac{1}{f} = \frac{1}{v} + \frac{1}{u} = \frac{1}{3u} + \frac{1}{u} = \frac{4}{3u},\quad \frac{1}{-20} = \frac{4}{3u}\; u = \frac{-20 \times 4}{3} = -26.67\,cm$$

Que 9: A ray of light parallel to the principal axis of a spherical mirror falls at a point M as shown in

1. Identify the type of the mirror used in the diagram.

2. If focal length of the mirror is 10 cm, what is the distance CF in the figure?

3. Complete the ray diagram and mark the angle of incidence and angle of reflection

4. If the mirror is immersed in water its focal length will be (i) less than 10 cm (ii) 10 cm (iii) greater than 10 cm (iv) 20 cm   *Marks :(5)*

Ans: 1. Concave mirror

2. 10 cm

3.
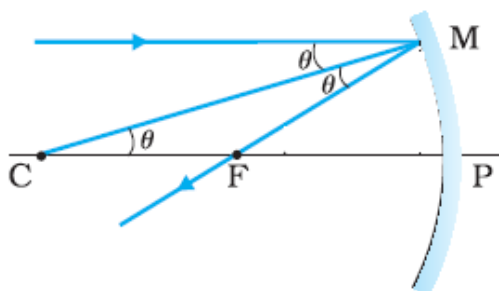
4.10 cm

Que 10: Fill in the blanks in three columns   *Marks :(3)*

I	II	III
Refractive index n= 1.5	Critical angle, θ = ...	Polarising angle P = ...
Photoelectric Equation $KE = h\upsilon - h\upsilon_0$	Graph between incident frequency along x axis and KE on Y axis is a	Slope of the graph gives........................
Magnetic Susceptibility $\chi_m = 0.2$	Relative pemeability $\mu_r = ...$	Substance is .... in nature

Ans:

I	II	III
Relative index n = 1.5	Critical angle θ = 42°	Polarising angle: P = 57°
$KE = h\upsilon - h\upsilon_0$	Graph between incident frequency along x axis and KE along Y axis is a straight line	Slope of the graph gives planks constant
Susceptibility $\chi_m = 0.2$	Relative permeability $\mu r = 1.2$	Substance is paramagnetic in nature

Que 11: A concave mirror is held in water. What should be the change in the focal length of the mirror? *Marks :(1)*

Ans: No change. The focal length of a concave mirror does not depend on the nature of the medium.

Que 12: Two concave mirrors have the same focal length but the aperture of one is larger than that of the other. Which mirror forms the sharper image and why? *Marks :(2)*

Ans: The concave mirror with smaller aperture forms the sharper image because it is free from spherical aberration.

Que 13: An astronomical telescope has a large aperture to

(a) reduce spherical aberration

(b) have high resolution

(c) increases span of *observation*

(d) have low dispersion   *Marks :(1)*

Ans: (b) have high resolution

Que 14: To increase the angular magnification of a simple microscope, one should increase

(a) the focal length of the lens

(b) the power of the lens

(c) the aperture of the lens

(d) the object size   *Marks :(1)*

Ans: (b) the power of the lens

Que 15: The image formed by an objective of a compound microscope is

(a) Real and diminished   **(b) Real and enlarged**

(c) Virtual and enlarged   **(d) Virtual and diminished**
Marks :(1)

Ans: (b) real and enlarged

Que 16: Astigmatism is corrected using   *Marks :(1)*

(a) cylindrical lens   **(b) plano-convex lens**

(c) plano-concave lens   **(d) convex lens**

Ans: (a) cylindrical lens

Que 17: Identify the mismatch in the following

(a)Myopia - Concave lens

(b)For rear view - Concave mirror

(c)Hypermetropia - Convex lens

(d)Astigmatism - Cylindrical lens   *Marks :(1)*

Ans: (b)For rear view - Concave mirror

Que 18: In secondary rainbow what is the order of colours observed from earth?

(a) Violet innermost, red outermost.

(b) Red innermost, violet outer most.

(c) Random.

(d) White and dark alternatively.   *Marks :(1)*

Ans: (b)Red innermost, violet outer most.

Que 19: When light rays undergoes two internal reflection inside a raindrop, which of the rainbow is formed?   *Marks :(1)*

(a) Primary rainbow   **(b) Secondary rainbow**

(c) Both (a) and (b)   **(d) Can't say**

Ans: (b) Secondary rainbow

Que 20: (i) draw a ray diagram showing the image formation by a compound microscope. Obtain expression for total magnification when the image is formed at infinity.

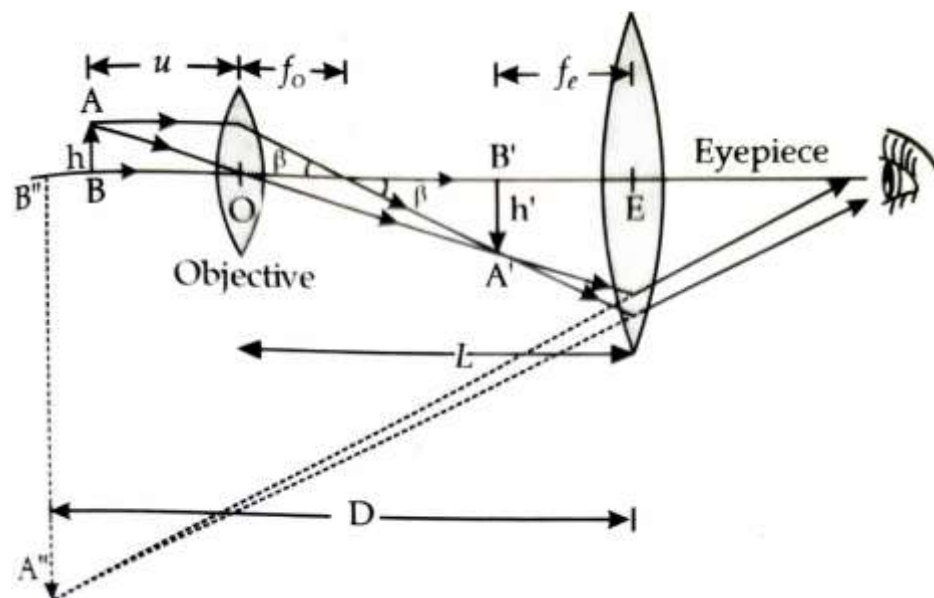**ii) how does the resolving power of a compound microscope get affected , when**

a) diameter of objective is increased and focal length is increased.

b) the wavelength of light is increased?

Give reasons to justify your answer.   *Marks :(5)*

Ans:

Magnification, m = [L/ f_o] x [D/f_e]

ii) Resolving piwer = (2n sinϴ) / λ

a) Increase of objective diameter will increase ϴ hence resolving power increases.

Resolving power is independent of focal length of the objective.

.b) resolving power decreases when the wavelength of light is increased. This is because the minimum separation d_{min} increases when λ is increased.

Que 21: Draw a ray diagram to show image formation when the concave mirror produces a real inverted and magnified image of the object   *Marks :(5)*

ii) Obtain the mirror formula and write the expression for the linear magnification.

Ans: ii) Derivation mirror formula

$1/f = 1/u + 1/v$
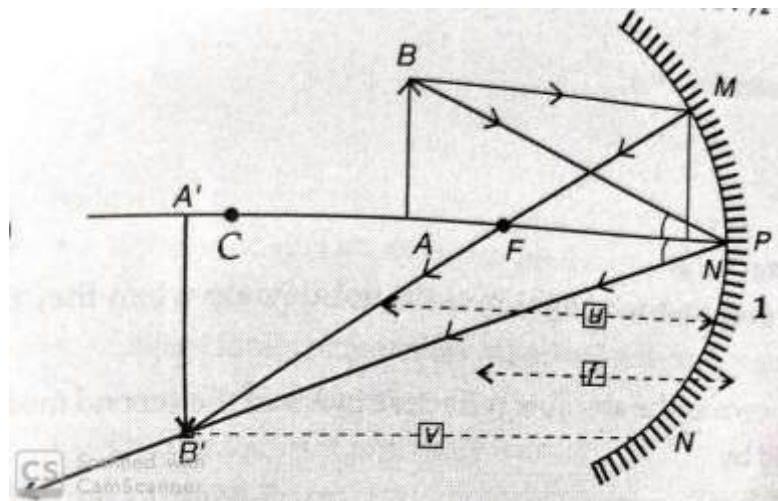
Que 22: You are given three lenses having powers P and aperture A as follows

P1 = 6D. A1 = 3cm

P2 = 3D. A2 = 15cm

P3 = 6D.A3 = 1.5 cm

Which two of these will you select to construct (i) a telescope and (ii) a microscope?

State the basis for your answer in each case.   *Marks :(3)*

Ans: For telescope:

1. Objective- more focal length, less power ,more Aperture.

P2, A2 for objective.

2. Eyepiece- less focal length, more power.

P1, A1 for eyepiece

For microscope

1. Objective - less focal length, more power

P1, A1 for objective

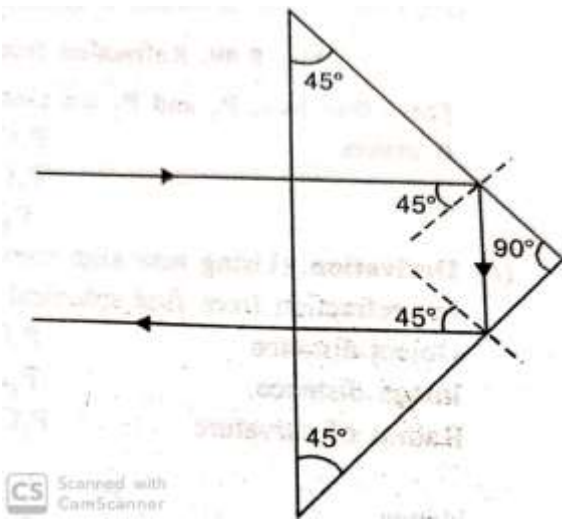2. Eyepiece - P2, A2 for eyepiece

Que 23: By drawing the ray diagram

a) Show that how a right angled isosceles prism can be used to deviate A Ray of light through (i) 90° (ii) 180°? b) Calculate the value of refractive index if critical angle is 45 °. **[3 marks.]**

Ans: a) deviation of ray is shown in figure below

i) Deviation of the ray by 90°.
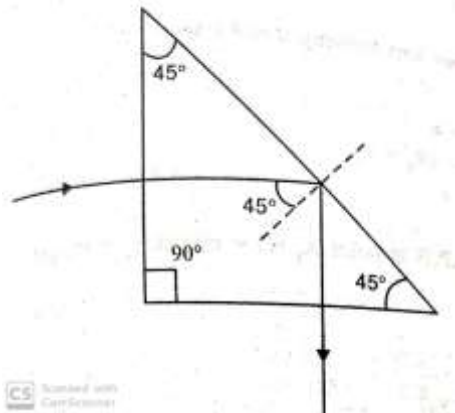
ii) Deviation of the ray by 180°.
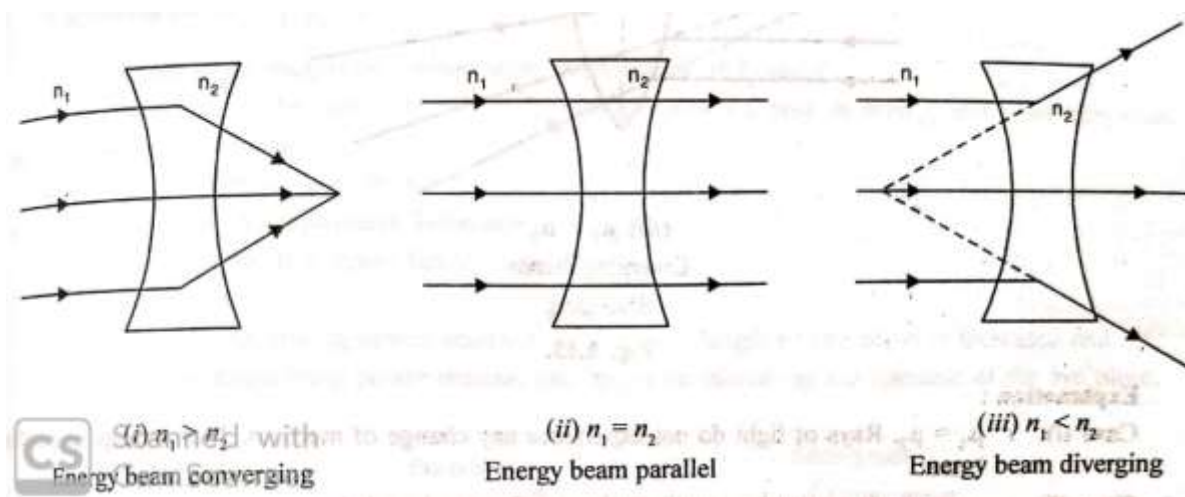

b) n= 1/ sinC

= 1/sin45

= √2 = 1.414

Que 24: A concave lens made of a material of refractive index n_2 is kept in a medium of refractive index n_1. A parallel beam of light is incident on the lens. Complete the path of rays of light emerging from the concave lens *Marks :(3)*

If (i) $n_1 > n_2$

(ii) $n_1 = n_2$

(iii) $n_1 < n_2$

Ans:

(i) $n_1 > n_2$ (ii) $n_1 = n_2$ (iii) $n_1 < n_2$
Energy beam converging   Energy beam parallel   Energy beam diverging

1. i) $n_1 > n_2$ Here lens medium is rare r. Concave lens behaves as converging lens (convex lens)

2. $n1 = n_2$. Rays of light do not experience any change of medium. They emerges as parallel.

3. $n_1 < n_2$. Here lens medium is denser. It behaves as a diverging lens.

Que 25: Power of a concave lens is   *Marks :(1)*

a) zero   b) infinite   c) positive   d) negative.

Ans: negative

Que 26: Power of a convex lense is   *Marks :(1)*

a) zero   b) infinite   c) positive   d) negative

Ans: positive

Que 27: i) define the magnifying power of a compound microscope when the final image is formed at infinity.

ii) does the magnifying power of a microscope depend on the colour of the light used? Justify your answer.

iii) both the objective and eyepiece of a compound microscope have short focal lengths. Why?   *Marks :(4)*

Ans: magnifying power is defined as the angle subtended by the image to the angle subtended (at the unaided eye) by the object.

        Or

$m = m_o \times m_e$

$= [L/ f_o] \times [D/f_e]$

ii) Magnifying power α $1/f_of_e$

Different colour of light has different refractive index with respect to the medium of lens material. Hence magnifying power of microscope depends on the color of the light used.

iii) We have

m = [L/ f_o] x [D/f_e]

To increase the magnifying power both the objective and eyepiece must have short focal lengths.

Que 28: A convex lens is used as a simple microscope.

i) draw the ray diagram of the simple microscope and locate the position of objects.

ii) what is the nature of the image?

iii) A magnifying glass is made of a combination of a convex lens of power 21 D and a concave lens of -5D. If the distance of distinct vision of the eye is 25 cm, calculate the magnifying power?   *Marks :(5)*

Ans: i) Object is between optical centre and principal focus
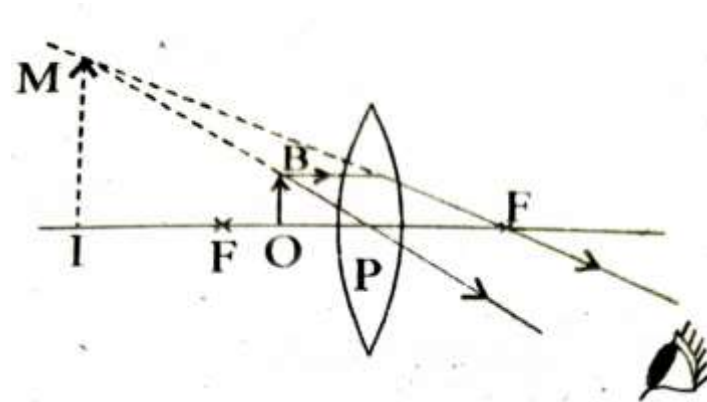
ii) Magnified, virtual, erect image is formed on the same side and behind the object.

iii) P_1 = 21   D P_2 = - 5D   D = 25 cm

$\qquad$ P = P_1 + P_2

$\qquad$ = 16D

$\qquad$ f = 100/P   = 100/16

$\qquad$ = 25/4 cm.

$\qquad$ m = 1 + D/f

$\qquad$ = 5

Que 29: "Sunglasses aur goggles has zero power even though its surface is covered".

i) do you agree with the statement? Justify your answer. *Marks :(2)*

Ans: yes. Since the two surfaces are curved in the same direction and also the curvatures

R1 = R2 = R

Therefore

P =(n - 1) [$1/(R_1 - 1/R_2)$] = 0

Que 30: A number of concentric coloured arc are seen in the sky after the rain when the sun is behind the observer, is called rainbow

i) the second rainbow has inverted colours why

ii) can any two people see the same rainbow .Give reason for your answer. *Marks :(2)*

Ans: i) light enters from the bottom of the drop. Two refraction and two internal reflection takes place and hence secondary rainbow has inverted colours.

ii) No. The angular positions depend upon the position of the observer.

Que 31: when a ray of light incident on a convex lens, after refraction, they converge to a point On the principal axis. *Marks :(4)*

i) What do you observe in the figure?

ii) What is the name given to this defect? explain.

iii) How cab it be rectified?

Ans: i) in the figure violet rays are focused near to the lens and rays are focused further from the lens.

ii) Chromatic aberration.

After refraction red light deviate least and violet deviate most, so violet focussed nearer to the lens and red focused away from the lens. The image will be blurred and coloured.

iii) It can be rectified using a combination of convex and concave lens of suitable focal length and material called acromatic doublet or achromat.

Que 32: A white light is passed through a prism.

i) What happens as the ray emerges out from the prism.

ii) What is the phenomenon called and which colour deviates maximum and least?

iii) What is dispersive power? Give an expression for dispersive power. *Marks :(5)*

Ans: i) White light split up into its constituent colours.

ii) Dispersion

iii) Violet and red.

iv) Dispersive power is the ratio of angular dispersion to mean deviation.

$\omega = (dv - dr) / d$

Where $d = (dv + dr) / 2$

Also $\omega = (n_v - n_r) / (n - 1)$

Where $n = (n_v + n_r) / 2$

Que 33: i) Draw a ray diagram to show the image formation by a combination of two thin convex lenses in contact .Obtain the expression for the power of this combination in terms of the focal lengths of the lenses. ii) What is the advantage in the combination?
iii) if one of the lenses is concave how will you find its focal length with the help of lens combination? *Marks :(5)*

Ans:
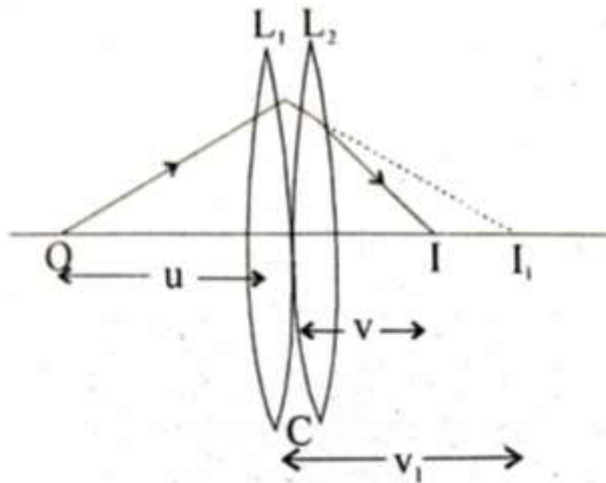
Derivation, $\quad 1/f = 1/ (f_1 + f_2)$

$\qquad$ or $\quad$ P = P$_1$ + P$_2$

ii) Lens combination can be used for magnifying and image and for erecting and image

iii) f_1- due to focal length of the convex lens.

f- Focal length of the combination.

By u - v method,

$f = uv/ (u+v.)$

Then f_2 can be found out using the formula,

$1/f_2 = 1/f - 1/f_1$

Que 34: An object is placed in front of convex lens made of glass. How does the image distance vary if the refractive index of the medium is increased in such a way that still it remains less than the glass? *Marks :(2)*

Ans: From the lens makers formula

$1/f = (n_{21} - 1)(1/R_1 - 1/R_2)$

Here refractive index of glass with respect to surrounding material decreases. Hence focal length increases which will also increase the image distance

Que 35: i) A fish underwater looks obliquely at a fisherman standing on the bank of a lake. Would the fisherman look taller or shorter to the fishr than what he actually is?

ii) a small pin fixed on a table top is viewed from above from a distance of 40 cm .By what distance would the pin appear to be raised if it is viewed from the same point through a 15 cm thick glass slab held parallel to the table? refractive index of glass is 1.49 . Does the answer depend on the location of the slab? *Marks :(3)*

Ans: i) taller

ii) $t = d [1 - 1/n]$

$\qquad = 15[1 - 1/1.49]$

$\qquad = 4.93$ cm. It is independent of the location of the slab.

Que 36: What is the focal length of a convex lens of focal length 25 cm in contact with a concave lens of focal length 15 cm? Is the system a converging or a diverging lens? Ignore thickness of the lenses. *Marks :(2)*

Ans: $f_1 = 25$ cm, $f_2 = -15$ cm

$f = f_1 f_2 / f_1 + f_2$

$= - 37.5$cm.

Que 37: (i) Draw the ray diagram showing refraction of light through a glass prism and hence obtain the relation between the refractive index of the prism, angle of prism and angle of minimum deviation.

ii) Determine the value of angle of incidents for a ray of light travelling from a medium of refractive index n = √2 into the medium of n = 1, so that it just graces along the surface of separation. *Marks :(5)*

Ans: i) diagram.
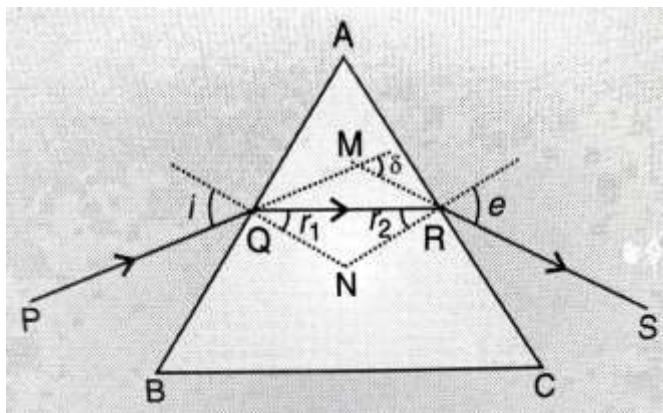
Obtaining the expression for refractive index.

ii) From snell's law

   $n_1 \sin i = n_2 \sin r$

   Here, r= 90° (just grazing)

$\sqrt{2} \sin i = 1 \sin 90°$

Or. $\sin i = 1/\sqrt{2}$

Or. i. = 45°.

Que 38: (i) plot a graph to show variation of the angle of deviation as a function of angle of incidence for light passing through a prism. *Marks :(5)*

derive an expression for refractive index of the prism in terms of angle of minimum deviation and angle of prism.

ii) A Ray of light incident on an equal lateral glass prism of refractive index 1.73 moves parallel to the base line of the prism inside it. Find the angle of incidence for this ray.

Ans: i)
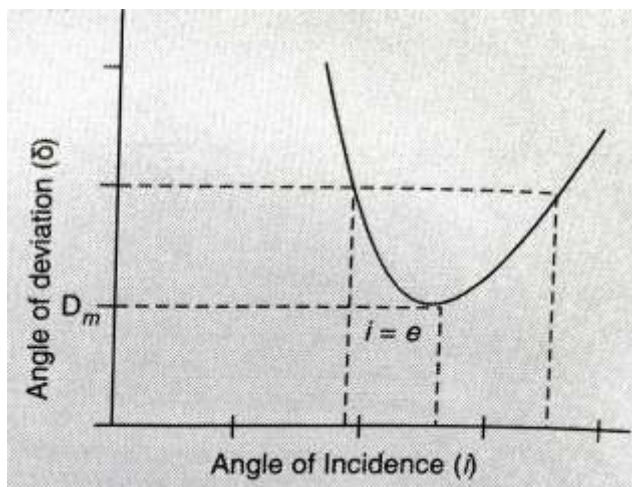
ii)

From fig. r = 30°

Also. n_{21} = sin i /sin r

or. 1.73 = sin i / sin 30°

or. sin i = 1.73 x1/2

or i = 60°

Que 39: How does the angle of minimum deviation of a glass prism vary if the incident violet light is replaced by red light? give reason. *Marks :(2)*

Ans: Decreases,
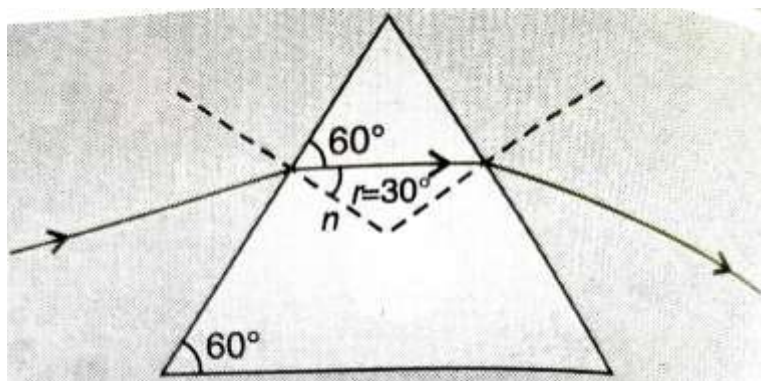
Refractive index of violet is greater than refractive index of red.

δ = (n_{21} - 1)A. Larger the refractive index largest the deviation.

Que 40: A pulse of white light is incident from air to a glass slab at normal incidence. After travelling through the slab the first colour to emerge is *Marks :(2)*

a) blue   b) green   c) violet   d) red

Ans: Red

We know that

V = v λ

Frequency of light remains unchanged. So v proportional to λ, or greater the wavelength, greater the speed. Wavelength of red colour is highest, the red colour emerges first.

Que 41: Splitting up of white light into its constituent colours while passing through a transparent medium is called dispersion. *Marks :(3)*

(i) why does this happens ?

(ii) show by drawing diagrams how one understands formation of a rainbow.

Ans: refractive index of glass for different wavelength for colours of light ray is different. Hence different colours bend with different angles. This is dispersion of light when it passes through a transparent medium.

(ii) a) the rays of light reach the observer through re fraction followed by reflection and refraction.

Figure shows red light from drop 1 and violet light from drop 2, reaching the observer's eye.
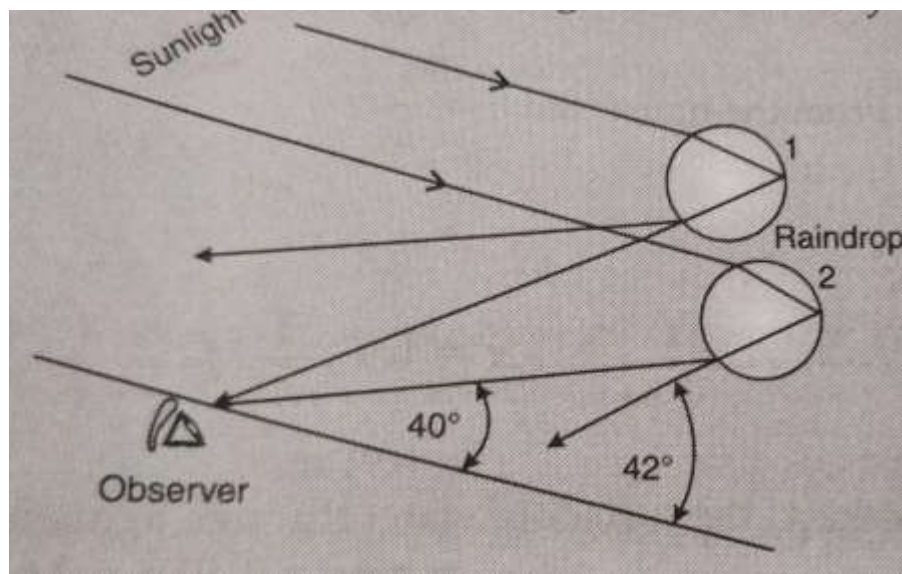
Que 42: i) write the necessary conditions for the phenomenon of total internal reflection to occur.

(ii) Write the relation between critical angle and refractive index for a given pair of optical media. Does critical angle depend on the colour of light? Explain.
Marks :(4)

Ans: i) (a) the ray should travel from denser medium to rarer medium.

b) angle of incidence should be greater than critical angle

(ii) $n_{12} = 1/\sin C$, Where C is the critical angle.

Yes, since refractive index depends upon the wavelength of light, the critical angle for a given pair of media is different for different wavelengths of light.

Que 43: i) Calculate the distance of an object of height h from a concave mirror of radius of curvature 20 cm, so as to obtain a real image of magnification 2. Find the location of the image also. *Marks :(3)*

ii) Using mirror formula explain why does a convex mirror always produce a virtual image.

Ans: i) given R = 20 cm magnification m = - 2.

f = R/2 = -10 cm.

Magnification = -v/u.

-2 = -v/u

v = 2u

Using mirror formula,

1/f = 1/v + 1/u

- 1/10 = 1/2u + 1/u

v = - 30 cm.

ii) from the formula

1/ v = 1/f - 1/u

for convex mirror,

f > 0 & u < 0

f is positive , then v is always +ve, hence image is always virtual.

Que 44: State two positions in which a concave mirror produces a magnified image of a given object. *Marks :(2)*

Ans: 1. Object is between centre of curvature and principal focus of the mirror.

2. Object is between principal focus and pole of the mirror.

Que 45: A concave or convex mirror is held under water will its focal length change ? *Marks :(2)*

Ans: No, the focal length of small aperture mirror is half of its radius it does not depends upon the refractive index of the surrounding medium.

Que 46: An object AB is kept in front of a concave mirror as shown in the figure.
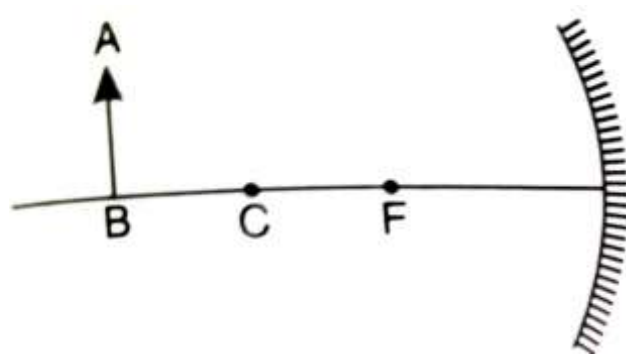
i) Complete the ray diagram showing the image formation of the object.

ii) How will the position and intensity of the image be affected if the lower half of the mirror reflecting surface is painted black? *Marks :(3)*

Ans: i)

ii) The position of image will remain same or unchanged, but the intensity of the image will decrease

Que 47: Name the mirror which are used in

(i) Security mirror

(ii) Solar furnace.   *Marks :(1)*

Ans: (i) convex mirror

(ii) Concave mirror

Que 48: Name the mirror which are used in

(i) Security mirror

(ii) Solar furnace.   *Marks :(1)*

Ans: (i) Convex mirror

(ii) Concave mirror

Que 49: When an object is placed 20 cm in front of a spherical mirror it produces an erect image of magnification 1/ 5.

a) What is the focal length of the spherical mirror?

b) What kind of mirror is it?   *Marks :(3)*

Ans: a) m = 1/5

u = -29cm, f = ?

m = f /(f-u)

1/5 = f/(f+20)

f = 5cm.

b) f being positive, it is a convex mirror.

Que 50: A boy uses spectacles of power - 0.75 D.

a) Name the defect of vision he is suffering from.

b) Which type of lens is used and why?   *Marks :(3)*

Ans: a) short sight.

b) Concave lens is used.

Power of lens= -0.75D

Focal length,

f = - 1/P= -100/75= -4/3. A short sighted person can see only nearby objects clearly by using a concave lens of power -0.75 D the image is made to fall on the retina.

Que 51: During sunrise and sunset sun appears in crimson red. Name and explain the phenomenon.   *Marks :(2)*

Ans: Scattering.

At the time of sunrise or sunset sun rays have to travel longer distances during his travel shorter wavelength gets scattered as you received only longer wavelength. ie, red

Que 52: "Sun becomes visible before actual sunrise" Do you agree with the statement?. Explain.   *Marks :(2)*

Ans: Yes, I agree with the above statement

It is due to atmospheric refraction of light. When light enters into the different layers of atmosphere, due the variation of refractive indices, it refracted and gets deviated.

Que 53: Match the following   *Marks :(2)*

A	**B**
1. Resolving power of telescope	**Concave lens**
2. Telescope	**$D/1.22\lambda$**
3. Short sight	**$m = fo/fe\ [1+fe/D]$**
4. Reading lens	**$m = L/fo\ [1+D/fe]$**
	Convex lens.
	$1.22\lambda/D$

Ans: 1. m= fo/fe[1+fe/D]

   2. D/1.22λ

   3. Concave lens.

   4. Convex lens

Que 54: i) You are given three lenses of power. 5D,4D and 10D to design a telescope.

a) which lenses should be used as objective and eyepiece. Justify your answer.

b) Why is the aperture of the objective preferred to be large?

ii) Write any two advantages of a reflecting telescope over a refracting telescope
Marks :(4)

Ans: i) a) objective = 5 D

Eye lens = 10D.

$m = f_o/f_e = P_e/P_o$

b) High resolving power or brighter image or lower limit of resolution

ii) 1. Magnifying power is large.

2. Resolving power is large.

3. Spherical aberration is reduced.

4. Free from chromatic aberration

Que 55: "A Ray of light shows no dispersion on emerging from a glass slab .But when it is passed through a Prism it shows dispersion" Do you agree with the above statement? Justify your answer. *Marks :(2)*

Ans: Yes. In the case of glass slab the rays suffers no deviation but laterally displaced.

$d = (n - 1)A = 0$

In the case of prism, refractive index of material depends on the wavelength. White light falling on a Prism gets deviated as well as dispersed into its constituent colours.