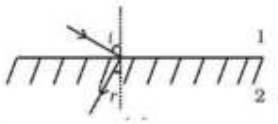
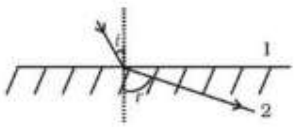
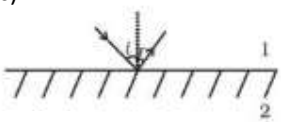
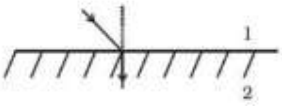
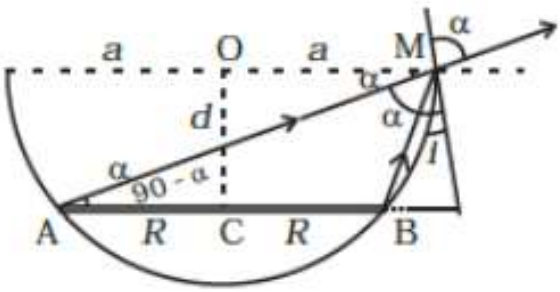
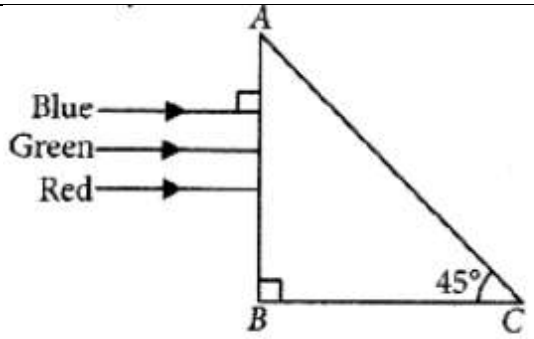
1.	Angle of prism is A and its one surface is silvered. Light rays falling at an angle of incidence 2A on first surface return back through the same path after suffering reflection at second silvered surface. Refraction index of the material of prism is (a)cos 2A (b) 2cosA (c) 2sinA (d) tanA
2.	A beam of monochromatic blue light of wavelength 4200 Å (in air) travels in water. It's wavelengths in water will be (a) 2800 Å (b) 5600 Å (c) 3150 Å (d) 4000 Å
3.	A ray of light incident at an angle θ on a refracting face of a prism emerges from the other face normally. If the angle of the prism is 5°and the prism is made of a material of refractive index 1.5, the angle of incidence is. (a) 7.5° (b) 5° (c) 15° (d) 2.5^0
4.	There are certain materials developed in laboratories that have a negative refractive index. A ray incident from the air (medium 1) into such a medium (medium 2) shall follow a path given by: (a)  (b)  (c)  (d) 
5.	A convex lens is in contact with a concave lens. The magnitude of the ratio of their powers is$\frac{2}{3}$. Their equivalent focal length is 30 cm. What are their individual focal lengths? (a) −75 cm,50 cm (b) −10 cm,15 cm

	(c) 75 cm, 50 cm (d) −15 cm,10 cm
6.	An object approaches a convergent lens from the left of the lens with a uniform speed 5 m/s 5 and stops at the focus. The image. (a) moves away from the lens with uniform speed 5 m/s (b) moves away from the lens with uniform acceleration (c) moves away from the lens with a non-uniform acceleration (d) moves towards from the lens with a non-uniform acceleration
7.	The radius of curvature of the curved surface of a Plano-convex lens is 20cm. If the refractive index of the material of the lens be 1.5, it will (a) Act as a convex lens only for the object that lie on its curved side. (b) Act as a concave lens for the objects that lie on its curved side. (c) Act as a convex lens irrespective of the side on which the object lies. (d) Act as a concave lens irrespective of side on which the object lies.
8.	A car is moving with at a constant speed of 60 kmh^{-1}. on a straight road. Looking at the rear view mirror the driver finds that the car following him is at a distance of 100 m and is approaching with a speed of 5 kmh^{-1}. In order to keep track of the car in the rear the driver begins to glance alternatively at the rear and side mirror of his car after every 2 s till the other car overtakes. If the two cars were maintaining their speeds which of the following statement s is/are correct? (a) The speed of the car in the rear is 65 kmh^{-1}. (b) In the side mirror the car in the rear would appear to approach with a speed of 5 kmh^{-1} to the driver of the leading car. (c) In the rear view mirror the speed of the approaching car would appear to decrease as the distance between the cars decreases. (d) In the side mirror the speed of the approaching car would appear to increase as the distance between the cars decreases.
9.	When an object is placed at a distance of 60cmfrom a convex spherical mirror, the magnification produced is $\frac{1}{2}$. Where the object should be placed to get a magnification of $\frac{1}{3}$ will be: (a) -30 cm (b) -120 cm (c) 120 cm (d) 30 cm

	Short Answer Type Qs (2 & 3 Marks)
10.	An astronomical telescope has an angular magnification of magnitude 5 for distant object. The separation between the objective and the eyepiece is 36 cm and the final image is formed at infinity. Calculate the focal length of objective and eyepiece.
11.	An object is placed (a)10cm (b) 5cm in front of a concave mirror of radius of curvature 15cm. Find the position, nature and magnification of the image in each case.
12.	A short object of length L is placed along the principal axis of a concave mirror away from focus. The object distance is u. If the mirror has a focal length f, what will be the length of the image? You may take $L<<\|v-f\|$.
13.	A thin glass having refractive index 1.5 has power of −5D in air. What will its optical power in a liquid medium having refractive index 1.6?
14.	A circular disc of radius 'R' is placed co-axially and horizontally inside an opaque hemispherical bowl of radius 'a'. The far edge of the disc is just visible when viewed from the edge of the bowl. The bowl is filled with transparent liquid of refractive index μ and the near edge of the disc becomes just visible. How far below the top of the bowl is the disc placed? 
15.	A square wire of side 3 cmis placed 25cm away from a concave mirror of focal length 10cm. What is the area enclosed by the image of the wire? The centre of the wire is on the axis of the mirror, with its two sides normal to the axis.
16.	(a) A beam of light consisting of red, green and blue colours is incident on right angled prism as shown in the given diagram. The refractive indices of the material of the prism for the above red, green and blue wavelengths are 1.35, 1.46 and 1.57 respectively. Out of the three colours which colour ray will emerge out of face AC?



(b) How will the situation change if these rays were incident normally on one of the faces of an equilateral prism ?

Long Answer Type Qs (5 Marks)

17. (a) A telescope has an objective of focal length 50 cm and an eye-piece of focal length 5 cm. The least distance of distinct vision is 25 cm. The telescope is focused for distinct vision on a scale 2 m away from the objective. Calculate
(i) The separation between objective and eyepiece, and
(ii) The magnification produced

(b)Which two of the following lenses L_1, L_2 and L_3 will you select as objective and eyepiece for constructing best possible
(i) Telescope and
(ii) Microscope? Give reason to support your answer.

Lenses	Power(P)	Aperture (A)
L_1	3D	8 cm
L_2	6D	1 cm
L_3	10D	1 cm

18. If light passes near a massive object, the gravitational interaction causes a bending of the ray. This can be thought of as happening due to a change in the effective refractive index of the medium given by

$$n(r)=1+2\frac{GM}{rc^2}$$

Where, r is the distance of the point consideration from the centre of the mass of the massive body, G is the universal gravitational constant, M the mass of the body and c the speed of light in vacuum. Considering a spherical object, find the deviation of the ray from the original path as it grazes the object.

	HINTS AND ANSWER
1.	(b)
2.	(c)
3.	(a)
4.	(a)
5.	(a)
6.	(c)
7.	(c)
8.	(d)
9.	(b)
10.	focal length of objective = 30cm , focal length of eyepiece = 6cm.
11.	**Numerical type Question** (a) The image is 30 cm from the mirror on the same side as the object. The image is magnified, real and inverted. (b) This image is formed at 15 cm behind the mirror. It is a virtual image.The image is magnified, virtual and erect.
12.	**Expression Type Questions** Thus, the length of the image formed by the concave mirror is: $L' = \frac{f^2 L}{(u-f)^2}$
13.	**Numerical type Question** 0.625D
14.	**Expression Type Questions** Substuting, we get $d = \frac{\mu(a^2 - R^2)}{\sqrt{(a+R)^2 - \mu(a-R)^2}}$
15.	**Numerical type Question** The area enclosed by the image of the wire is 4 cm².
16.	**Conceptual Type Problem** (a) Right-angled prism: Red ray emerges, green and blue undergo TIR. (b) Equilateral prism, normal incidence: All rays are totally internally reflected, none emerge.

17.	(a) **Numerical type Question** (i) Separation between objective and eye piece =70.83cm (ii) Magnification = -2 (b) **Conceptual Type Problem** (i) Telescope – L_1 as objective because it has the largest aperture. L_3 as eyepiece because it has the smallest focal length. **Reason**- Light gathering power and magnifying power will be larger. (ii) Microscope – L_3 as objective because it has shortest focal length. L_2 as eyepiece because it has short, but larger focal length than L_3. **Reason**- Angular magnification is more for short focal length of objective and eyepiece.
18.	**Expression Type Questions** The deviation of the ray from its original path as it grazes the object is: $\theta = \frac{4GM}{c^2R}$

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