INDIAN SCHOOL MUSCAT

CLASS :……XII……

SUBJECT:……Physics……..

WORKSHEET

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DATE :……

TOPIC/SUB-TOPIC :……Electromagnetic waves ,Ray optics and Optical instruments

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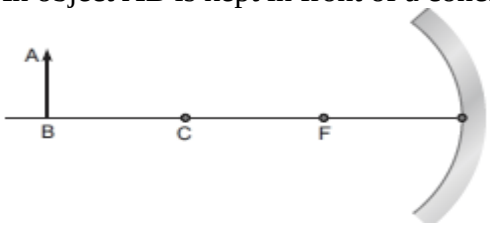
Section A Conceptual and application type questions

1	State the conditions required for total internal reflection to take place.	1
2	Mention the advantages of total reflecting prisms over plane mirrors in optical instruments?	1
3	Name two factors on which lateral displacement in a transparent slab depends.	1
4	Parallel rays of red and blue wavelengths enter a convex len , Will they converge at the same point? Justify.	1
5	A glass lens of refractive index 1.5 is placed in a trough of liquid. What must be the refractive index of the liquid in order to make the lens disappear?	1
6	Define absolute refractive index of a medium	1
7	Out of blue and red light which is deviated more by a prism? Give reason.	
8	Show that the radius of curvature of a spherical mirror is twice the focal length of the spherical mirror.	2
9	Define critical angle and derive a relation between critical angle and refractive index of a medium.	2
10	With the help of a suitable ray diagram, derive the mirror formula for a concave mirror forming a real image.	3
11	Draw a labelled ray diagram to show the formation of final image at near point in an astronomical telescope for a distant object. Write the expression for its magnification Power.	3
12	Draw a ray diagram to show refraction of a ray of monochromatic light passing through a glass prism. Deduce the expression for the refractive index of glass in terms of angle of prism and angle of minimum deviation.	3
13	(a) Obtain lens makers formula using the expression $\frac{n_2}{v}-\frac{n_1}{u}=\frac{(n_2-n_1)}{R}$	3

Here the ray of light propagating from a rarer medium of refractive index (n_1) to a denser medium of refractive index (n_2), is incident on the convex side of spherical refracting surface of radius of curvature R.

14 An object AB is kept in front of a concave mirror as shown in the figure. 3



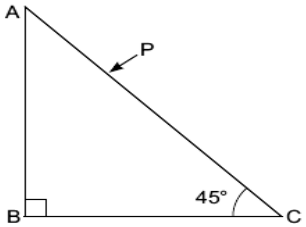
(i) Complete the ray diagram showing the image formation of the object.
(ii) How will the position and intensity of the image be affected if the lower half of the mirror's reflecting surface is painted black?

15 A capacitor is connected to a battery by copper wire .There is no conduction current between the plates of the capacitor but the magnetic field is continuous ,explain how the inconsistency in Ampere's circuital law was resolved by the introduction of displacement current and derive expression for displacement current . 3

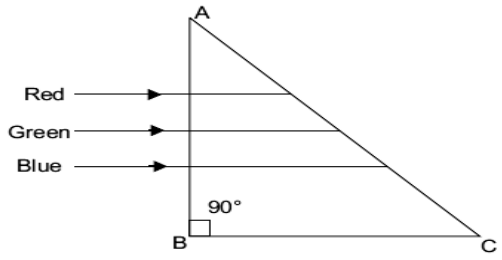
16 Three components of electromagnetic spectrum are A , Band C . A produces heat on any surface on which it incident. B produces Ozone layer in the atmosphere. C is produced by the stopping of fast electrons by a metal target of high atomic mass. Identify A , B and C. Mention the uses of A , B and C. Arrange them in increasing order of their wave lengths. 3

17 State any four characteristics of electromagnetic waves. 2

18 Trace the path of ray (P) of light passing through the glass prism as shown in the figure. The prism is made of glass with critical angle ic= 40°. 2



19 In the figure given below, light rays of blue, green, red wavelengths are incident on an isosceles right-angled prism. Explain with reason, which ray of light will be transmitted through the face AC. The refractive index of the prism for red, green, blue light are 1.39, 1.424, 1. 476 respectively. 3



Section B Numerical problems

1 Light of wavelength 5000 Å falls on a plane reflecting surface. Calculate the wavelength and 2

frequency of reflected light. For what angle of incidence, the reflected ray is normal to the incident ray?

2 A biconvex lens has a focal length2/3 times the radius of curvature of either surface. Calculate the refractive index of lens material. 2

3 A small telescope has an objective lens of focal length 144cm and an eyepiece of focal length 6.0cm. What is the magnifying power of the telescope? What is the separation between the objective and the eyepiece? 2

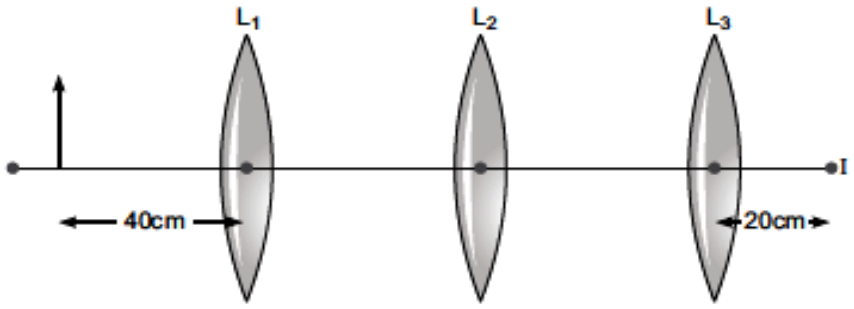
4 You are given following three lenses. Which two lenses will you use as an eyepiece and as an objective to construct i) an astronomical telescope? 2
ii) compound microscope.

Lense	Power in dioptre	Aperture in cm
L1	3	8
L2	6	1
L3	10	1

5 The amplitude of electric field is 40N/C and frequency is 2 x10^6 Hz find the amplitude of magnetic field and wave length of the electromagnetic wave. Write the equations of the electromagnetic waves . 2

6 What is the focal length of a thin lens if the lens is in contact with 2.0 dioptre lens to form a combination lens which has a focal length of − 80 cm? 2

7 You are given three lenses L1, L2 and L3 each of focal length 20 cm. An object is kept at 40 cm in front of L1, as shown. The final real image is formed at the focus 'I' of L3. Find the separations between L1, L2 and L3. 3



8 A ray passes through an equilateral prism such that the angle of incidence is equal to the angle of emergence and the later is equal to 3/4 of the angle of prism. Find the angle of deviation 2

9 A small bulb is placed at the bottom of a tank containing water to a depth of 80cm. What is the area of the surface of water through which light from the bulb can emerge out? Refractive index of water is 1.33. (Consider the bulb to be a point source) 2

10 The figure given shows an equiconvex lens (of refractive index n = 1.50) in contact with a liquid layer on top of a plane mirror. A small needle with its tip on the principal axis is moved along the axis until its inverted image is found at the position of the needle. The distance of the needle from the lens is measured to be 45.0cm. The liquid is removed and the experiment is repeated. The new distance is measured to be 30.0cm. What is the refractive index of the liquid? 3