# MENGO SENIOR SCHOOL

## S5 PHYSICS PAPER510/2

## MID TERM EXAMS

## TIME: 2 HOURS.

**Instructions**:

(i) Attempt any Four Numbers.
(ii) All numbers carry equal marks.

1- a) (i) Differentiate between absolute and relative refractive index. (2)

(ii) State the laws of refraction of light. (2)

b) (i) State the principle of reversibility of light (1)

(ii) Using a ray diagram show how a concave mirror forms a real image of a real object. (2)

(iii) Use the diagram in (ii) above to prove the mirror formula

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

(4)

c) (i) Show that the net deviation produced after two successive reflections at plane mirrors is twice the angle between the mirrors. (4)

(ii) Explain the principle of operation of a sextant. (5)

2- a) What do you understand by the following terms as applied to curved mirrors:

(i) Principle focus
(ii) Centre of curvature
(iii) Focal length. (3)

b) Show that when a ray of light passes through different media separated by plane boundaries.

$$n \sin i = \text{a constant}$$

Where n is the absolute refractive index of a media and i is the angle made by the ray with the normal in the medium. (4)

c) A ray of light is incident on a prism of refractive index 1.3 and Refracting angle 72°. The ray emerges from the prism at angle of 43°.

(i) the angle of incidence (4)
(ii) the deviation of the ray (2)

d) (i) Describe briefly two uses of glass prisms. (2)

(ii) Describe an experiment to measure the refractive index of a small quantity of a liquid using a concave mirror. (5)

3- a) What do you understand by the following terms.

(i) critical angle (2)

(ii) total internal reflection. (2)

b) (i) Describe and give the theory of the critical angle method for determining the refractive index of water using an air cell. (8)

(iii) ABCD is a plane glass cube. A horizontal beam of light enters the face AB at grazing incidence. Show that the angle θ which any rays emerging from BC would make with the normal to BC is given by $\sin\theta = \cot a$ where a is the critical angle. (4)

c) Describe an experiment to determine the focal length of a concave mirror using a plane mirror. (4)

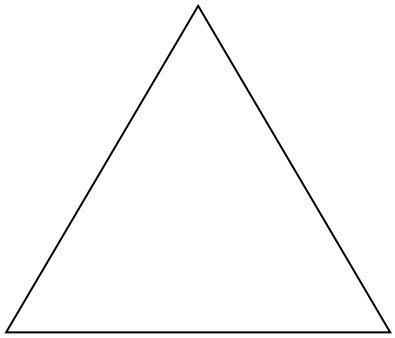
4- a) (i) What do you understand by the term refraction of light. (2)

(iii) Light passes symmetrically through a glass prism of refractive Index n and a large refracting angle A is deviated through an angle d. Derive an expression for n in terms of A and d.

A ray of light is incident at 45° on a glass prism as shown above.
If the refractive index of glass is 1.5, calculate the angle of emergence and sketch the ray diagram. (5)

c) Explain how light from the sun reached an observer in the morning before the sun appears above the horizon. (3)

d)



(i) A ray of light propagating in a liquid is incident on a prism of refracting angle 50° and refracting index 1.6 as shown above. Given that the ray symmetrically passes through the prism, find the refractive index of the liquid. (4)

(ii) Explain why white light is dispersed by a transparent medium. (2)

5- a) (i) A liquid is placed in a concave mirror to a depth of 2cm. An object held above the liquid coincides with it's own image when it is 45.5cm from the pole of the mirror.
If the radius of curvature of the mirror is 60cm, calculate the refractive index of the liquid. (4)

(ii) Explain why a paraboloid mirror is used in search lights instead of a concave mirror. (2)

b) (i) The magnification of an object in a thin convex lens is M. When the lens is moved a distance d towards the object the magnification becomes m′.
Show that the focal length f of the lens is given by:

$$f = \frac{dmm'}{m' - m}$$ (4)

(ii) Explain how a mirrage is formed. (3)

c) (i) An object at a depth t cm below a glass block of refractive index n is viewed from above.
Derive the expression of the displacement “d” through which the object appears. (3)

(ii) A object at a depth of 3.0cm below the surface of water is observed from above. Calculate the apparent displacement of the object if the refractive index is 1.33. (2)

(iii) Differentiate between dispersion and deviation of light by a glass prism.

**⁎GOOD LUCK⁎**