THE PRESIDENT'S OFFICE
REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT
TOPICAL EXAMINATION SERIES No. 05
FORM THREE PHYSICS

TIME 3 :00 HOURS **Year 2024**

SUB TOPIC: REFRACTION OF LIGHT THROUGH PLANE MEDIA

INSTRUCTION

1. This paper consists of section A, B and C with a total of Eleven (11) questions
2. Answer ALL question in section A and B and Two (2) from section C
3. Section A carries sixteen (16) marks, Section B fifty-four (54) marks and section C Thirty (30) marks
4. Non-programmable calculators may be used
5. Cellular phones and any unauthorized materials are NOT allowed in the examination room
6. Write your Examination name on every page of your answer sheet provided

SECTION A (16 Marks)

Answer all questions in this section

1. For each items (i) – (x) choose the correct answer among the given alternatives and write its letter beside the item number in the answer booklet provided.

i.) The form of energy which stimulate sensation of vision through our eyes

a) Spectacle

b) Light

c) Microscope

d) Optical instrument

ii) The change in direction of light as it passes obliquely from one medium to another having different densities.

a) Reflection of light

b) Dispersion and colour

c) Angle of refraction

d) Reaction of light

iii) The angle formed between an incident ray and normal ray is known as

a) angle of incidence

b) Emergency ray

c) Angle of refraction

d) Point of incidence

iv) Is the angle formed between refracted ray and normal line at the point of incidence

a) Point of incidence

b) Angle of incidence

c) Angle of refraction

d) Refracted ray

V) Ration of the sine of the angle of incidence since of the angle of refraction

a) law of refraction

b) refractive index

c) refraction of light

d) Reflection of light

vi) The angle of incidence in denser medium produced an angle of refraction of 90^0 in less dense medium

a) Critical angel
b) Angel of incidence
c) Emergent ray
d) Angle of refraction

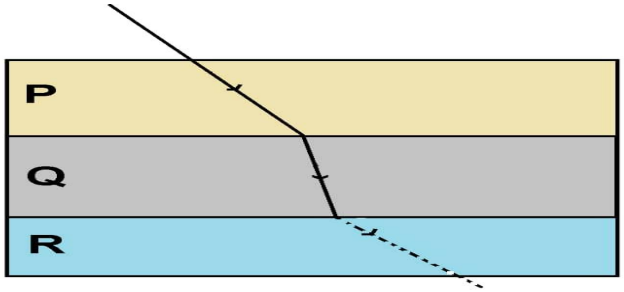
vii) Is an optical phenomenon in the atmosphere that makes an object appears to be displaced from its true position

a) Total internal reflection
b) Colour filter
c) Mirage
d) Binoculars

viii) A pin at the bottom of a basin full of water appears to be 6cm from the surface. Given that the refractive index of the water is 3/4 , what is the actual distance of the pin from the surface?

a) 1.33cm
b) 4.85cm
c) 7.33cm
d) 8.0cm

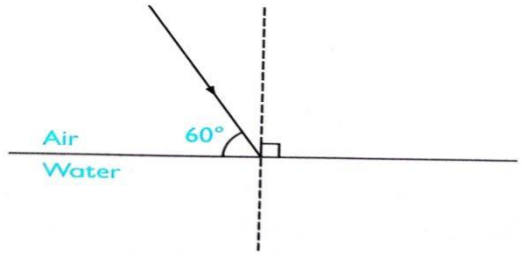
ix) The figure below shows a ray of light travelling from air to water



Given that the refractive index of water is$\frac{4}{3}$, what is the angle of refraction of the ray of light?

a) $Sin^{-1}\frac{3}{4}\sin 60^0$
b) $Sin^{-1}\frac{3}{4}Sin\ 60^0$
c) $Sin^{-1}\frac{4}{3}Sin30^0$
d) $Sin^{-1}\frac{3}{4}\text{Sin } 30^0$

x) The figure below shows a ray of light travelling through three different media



Given that the three media are air, glass and water (not in order) which media are represented by letter P, Q and R respectively?

a) Air, glass, water
b) Air, water, glass
c) Glass, air, water
d) Glass, water, air

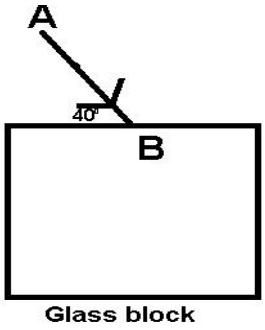
2. Match the materials in **List A** with their corresponding refractive index in **list B** in your answer sheet provided.

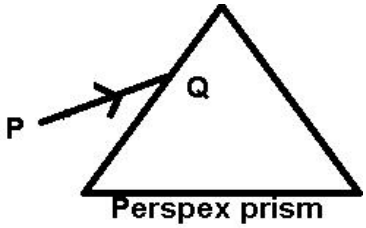
LIST A	LIST B
i) Alcohol	A. 1.36
ii) Paraffin	B. 1.47
iii) Water	C. 1.44
iv) Glass (crown)	D. 1.33
v) Crown (flint)	E. 1.50
vi) diamond	F. 1.65
	G. 1.31
	H. 1.56
	I. 2.42

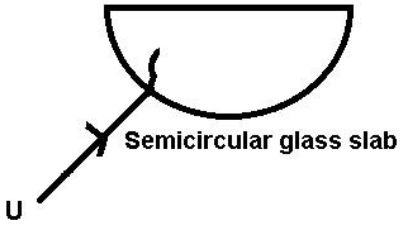
SECTION B: (54 Marks)

Answer **all** questions from this section

3. Copy the diagram and complete to show the appropriate path of the rays as they enter and emerge from medium.







4. (a) State briefly, the cau

(b) A ray of light travelling from air to glass makes angle of incidence of 30^0. Find the angle of refraction given that the refractive index of glass is 1.50

5. (a) Briefly explain why a straight stick appear to be bent when partially immersed in a beaker of water

(c) A gas jar contains paraffin to a depth of 21.6cm. Its apparent depth is found to be 15.0cm. What is the refractive index of paraffin?

6. Find the critical angle for

a) Water of refractive index $\frac{4}{3}$

b) Diamond of refractive index 2.42

7. The critical angle for total internal reflection between water and air is 49^0

a) A beam strikes an air/water boundary and undergoes total internal reflection will the beam stay in the air or in the water?

b) Explain what happens when a beam of light from the air strikes the surface of a calm lake at an angle of 50^0 to the normal

8. a) Give the meaning of the term optical fibres

b) Explain five advantages of using optic fibres rather than cables

c) An Eskimo walking along an Iceland observed an inverted image in the sky of a polar bear standing some distance away. Explain

SECTION C (30 Marks)

Answer **only two** questions from this section

9. a) (i) State the laws of reflection

(ii) Sate four (4) characteristics of the image formed by a plane mirror

b) Why does the swimming pool appear much shallower than its actual depth?

c) These slabs of different types of glasses are placed on table one on top of the other in the following order from below.

Refractive index	Thickness
1.4	1.2cm
1.5	1.6cm
1.6	0.8cm

Where will a mark on the table appear to be.

10. (a) State briefly the cause of refraction of light when passing through transparent media

a) Explain the following

i) Condition giving rise to critical angle and total internal reflection

ii) Two principles in physics used to make telescopes

c) A telescope of 5.0m diameter with a reflector of focal length 18.0m is used to focus the image of the sun. Using the distance of the sun from the earth and diameter of the sun as 1.5×10^{11} m and 1.4×10^{9}m respectively, calculate

i) Position of the image of the sun

ii) Diameter of the image of the sun

11. (a) (i) Briefly explain why part of the road ahead of a person apparently looks as if has a pool of water on a sunny day?

ii) A pin is at the bottom of a vessel 16cm deep. When the vessel is filled with water the pin appears to rise when viewed from above, find the height to which the pin appears to rise

b) Paraffin has a greater refractive index than water, what can you say about the relative velocity of light in paraffin and water?