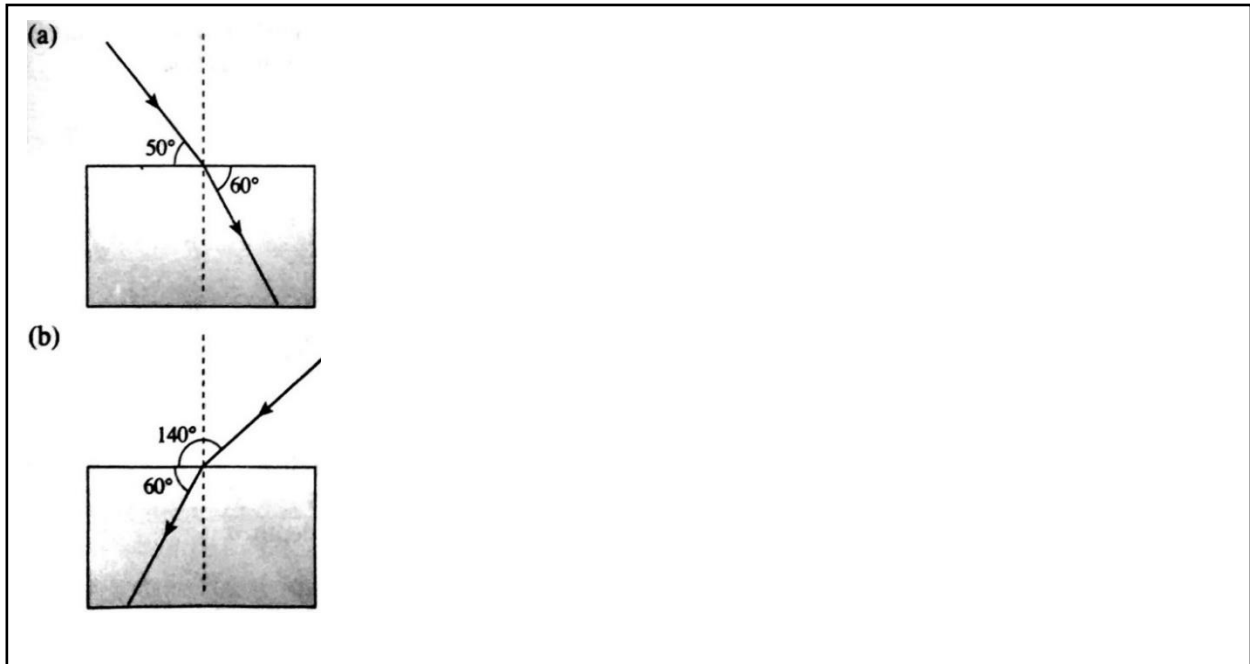Signature: [ ]   Name: [ ]   Marks: [ ]

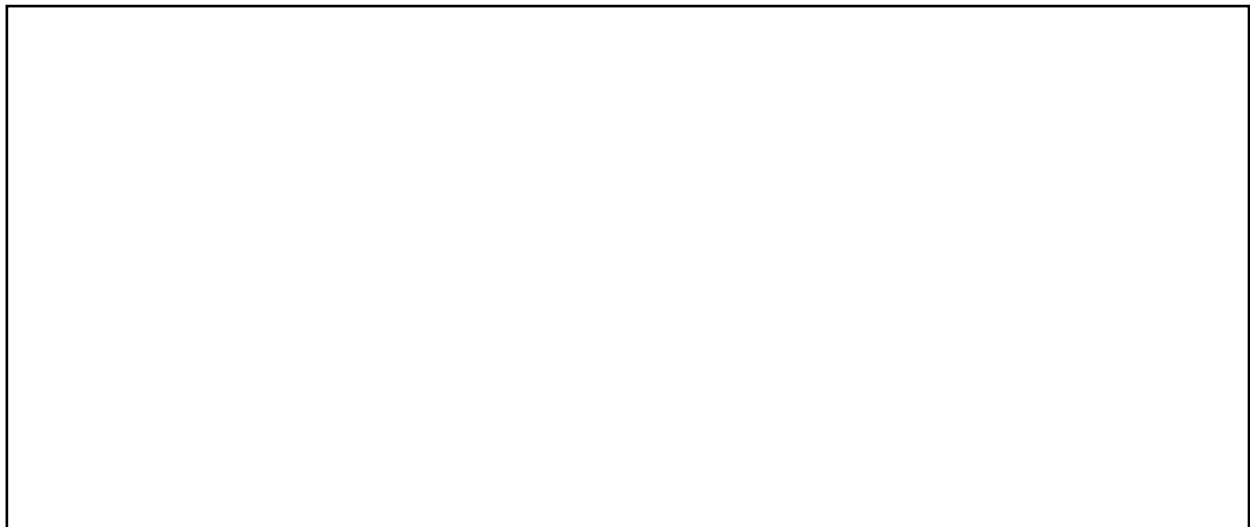# Snell's Law and Total Internal Reflection Worksheet

Q1.

Calculate the refractive index for the following figures.

Q2.

If the speed of light in vacuum is 3×10^8 ms^{-1} and the speed of light in the glass block is 2×10^8 ms^{-1}, calculate the angle of refraction for a glass block with refractive index, n if the angle of incidence is 45°.

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Q3.

The refractive index of a glass block is n. If the speed of light in a vacuum is 3×10^8 ms^{-1}, what is the speed of light in the glass block?

Q4.

The figure shows a light ray which travels from air into a liquid. If the refractive index of the liquid is 1.23, find the value of i.
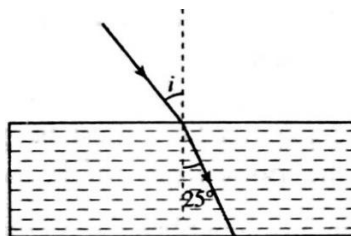

Figure 2

Q5.

The apparent depth of a coin in a glass of water is 3.2 cm. If the refractive index of water is 1.33, calculate the actual depth of the coin in the glass.

Q6.

The real depth and apparent depth of a substance are 2.4m and 1.8 m respectively. If the real depth of the object is increased to 5m, what is the new apparent depth of the object.

Q7.

In the figure below, a coin is placed at the bottom of a glass container of height 40 cm. The image of the coin is seen by an observer from the top of the container. If the refractive index of the glass block is 1.5, what is the height of x?
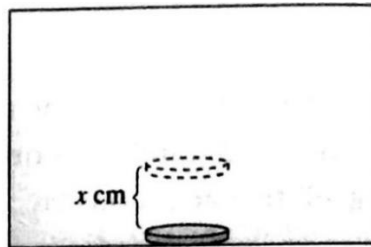

x cm

Figure 3

Q8.

A beam of light AB is incident on a glass block as shown in the figure. Calculate

a) the critical angle,

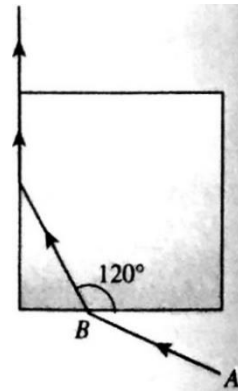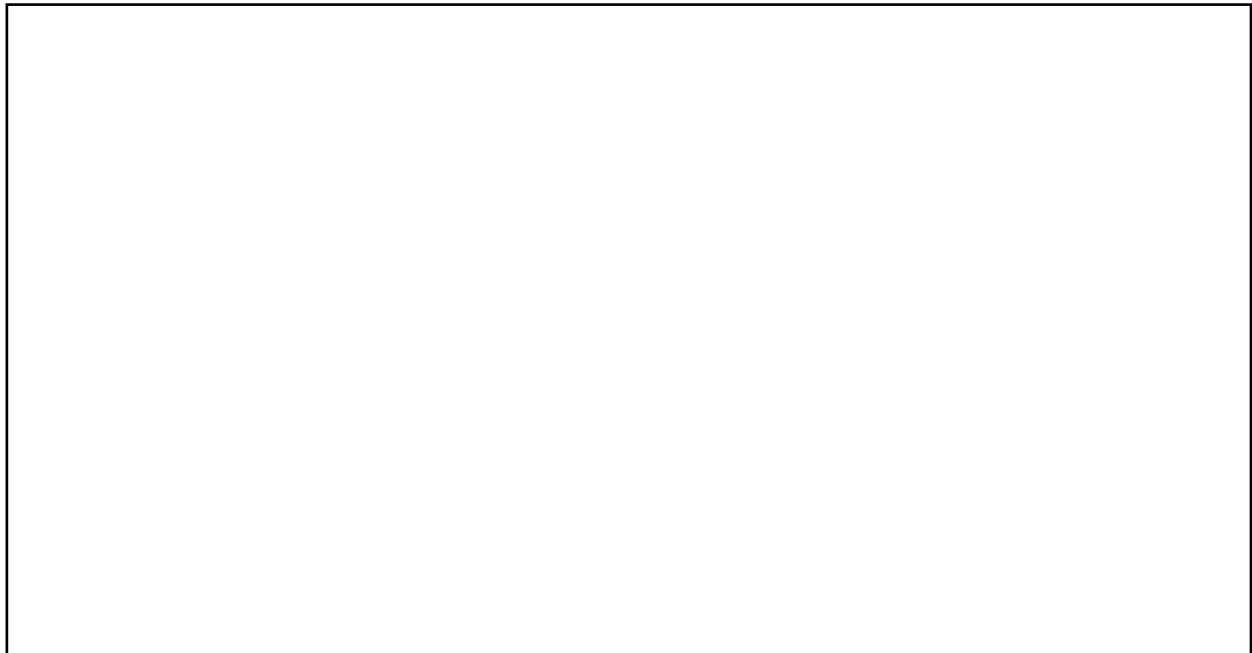b) the refractive index of the glass block

Figure 4

Q9.

The figure shows a path of light ray travelling inside a glass block. Calculate the critical angle of the glass block.
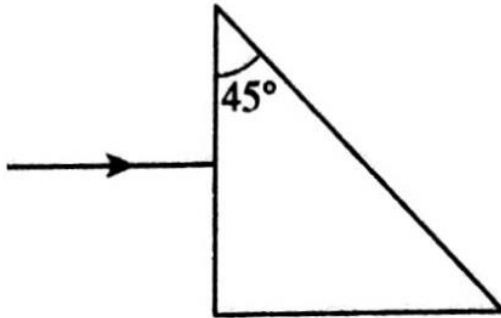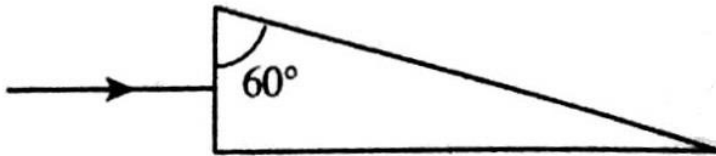
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Q10.

The figure below show light rays directed into glass prisms. If the critical angle of the glass is 42°, complete the path of the light ray in each figure.
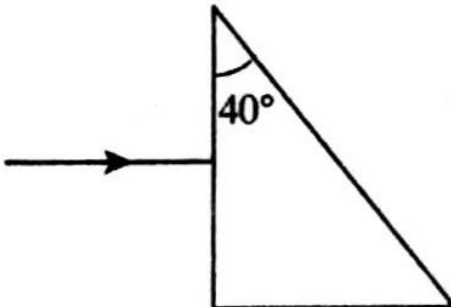
(a)

45°

(b)

60°

(c)

40°

Q11.

The figure shows a path of light ray travelling inside a glass block. Calculate the critical angle of the glass block.
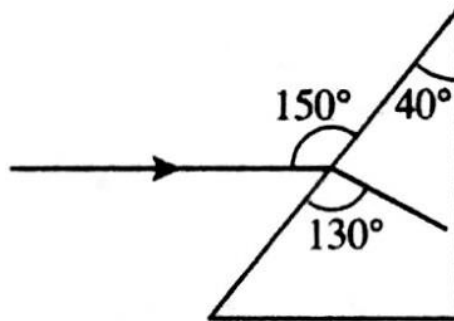

Figure 6

Q12.

The figure shows a ray of light travelling from glass into air. Calculate the refractive index for the glass block.
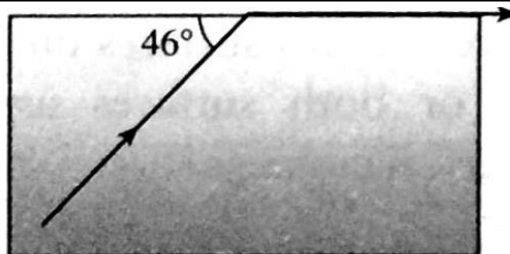

Figure 7

Q13.

The figure shows a light ray travelling through a glass block. What is the critical angle?
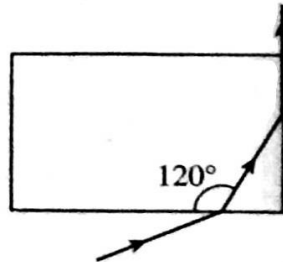

Figure 8

Q14.

Figure 9 and 10 show a light ray passing through prism A and B respectively. Prism A and prism B are made of glass with the same optical density and their critical angle is 42°.

a) What is meant by critical angle?

b) i) On both diagrams, draw a path of the rays passing through the prism and emerging out of it.
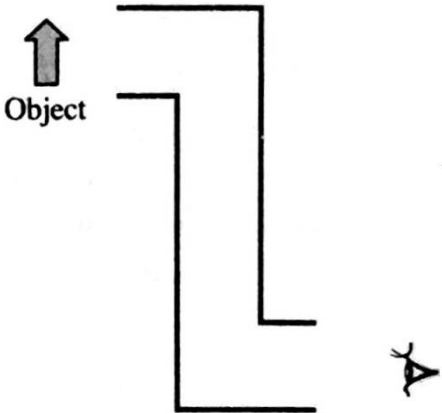
   ii) Name the phenomenon in prism B.

Figure 9

c) The diagram above shows a periscope without right angled prisms. Draw the prisms to enable the observer to see through the periscope. On the diagram draw the correct position of the right-angled prisms so that the observer can see the image of the object. Complete the path of the light ray of the object to the observer's eye.

Q15.

The figure shows a coin in a glass which seems shallower than its actual depth.

a) Name the light phenomenon involved
b) Explain how this phenomenon occurs.
c) On the diagram, draw a ray diagram the path of the light ray from the coin to the eye and show how the coin appears to be shallower in water.
d) Given that the depth of water is 20 cm and the refractive index of water is 1.33 calculate the distance of the image from the base of the glass.
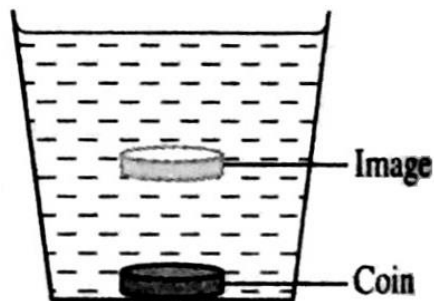

Figure 10