

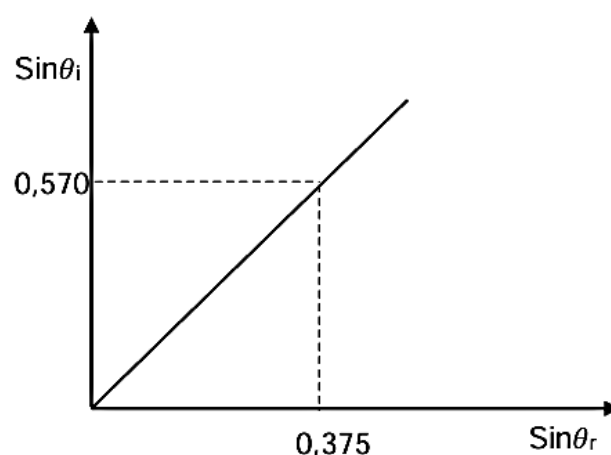
Geometric Optics: Exam Revision Tracker

Attempt #1		Attempt #2		Attempt #3		Attempt #4		Attempt #5	
Total	Score	Total	Score	Total	Score	Total	Score	Total	Score
18		17		18		9		10	
Percentage =		Percentage =		Percentage =		Percentage =		Percentage =	

Geometric Optics: Attempt #1

Total = 18 Marks

Learners conducted an experiment to verify Snell's law. Using a ray box, light rays were incident at different angles on a glass prism and the corresponding angles of refraction measured and recorded. They plotted their results on the graph below. The refractive index of air is 1,00.



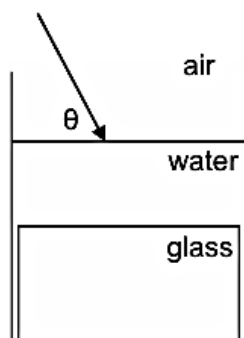
- Calculate the:
 - Speed of light in a glass (4)
 - Critical angle for the glass (4)
 - Angle of incidence for which the angle of refraction is 25° (4)
- In another experiment learners incident the light ray on a Perspex prism of refractive index at 1,42. Re-draw the graph on the question paper in your ANSWER BOOK. On the same set of axes draw a second graph for the experiment with Perspex prism. Label the graphs (Glass and Perspex). (2)
- In which of the two graphs (Glass or Perspex), will light travel faster? Explain your answer. (2)
- State TWO conditions necessary for total internal reflection to occur. (2)

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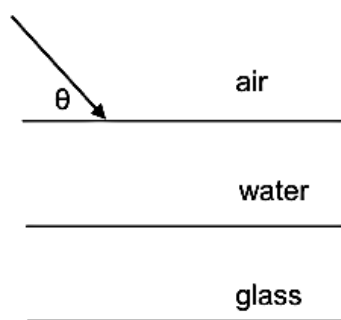
Geometric Optics: Attempt #2 ⚡

Total = 17 Marks

A glass prism is placed at the bottom of a container filled with water. A light ray passes from the air through the water into the glass prism. The light ray changes direction every time it passes into a new medium.



1. Name the phenomenon described by the underlined words above. (1)
2. If the refractive index of water and air is 1,33 and 1 respectively, calculate the angle θ between the light ray and the SURFACE OF THE WATER if the angle of refraction in the water is 40° . (4)
3. The angle of refraction in the glass is 35° . Calculate the refractive index of glass. (3)
4. Draw the sketch below and complete the diagram of the path of the light ray from the air to the water to the glass. Show ALL the values of the angles of incidence, angles of refraction and normal in EACH medium.



5. Calculate the speed of light through the glass prism if the refractive index of glass is 1,5. (3)
6. Is it possible that total internal reflection of the light ray can occur in the above situation? Write only YES or NO. (1)

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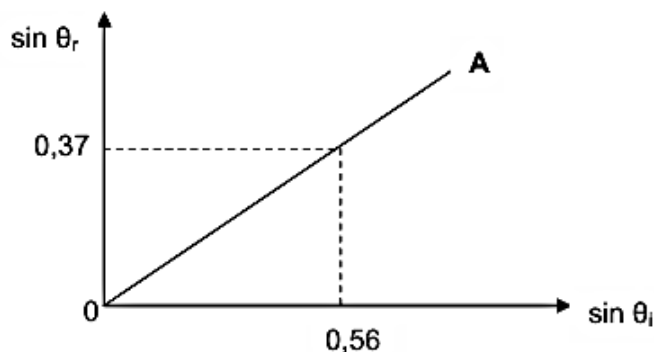
Geometric Optics: Attempt #3 ⚡

Total = 18 Marks

Experiments are performed to compare the refractive indices of different materials.

In one experiment a light ray passes from air to material **A** and the angles of incidence and refraction are measured. The refractive index for air is 1.

The graph below was drawn using the results of material **A**.



1. Define the term *angle of incidence*. (2)
2. Calculate the refractive index of material **A** using the data in the graph. (3)
3. Calculate the speed of the light through material **A**. (3)
4. If material **A** is replaced by material **B**, the angle of refraction is 31° when the angle of incidence is 40° .
 - 4.1 Calculate the refractive index of material **B**. (4)
 - 4.2 Redraw the graph of material **A**, and on the same set of axis, draw the graph you expect for material **B**. Label the graphs of material **A** and material **B** clearly. (2)
5. Total internal reflection occurs when a light ray passes from material **A** to material **B**. The critical angle of material **A** is 49° .
 - 5.1 Which range of angles will make it possible for total internal reflection to occur? (2)
 - 5.2 What OTHER condition is necessary for total internal reflection to take place? (2)

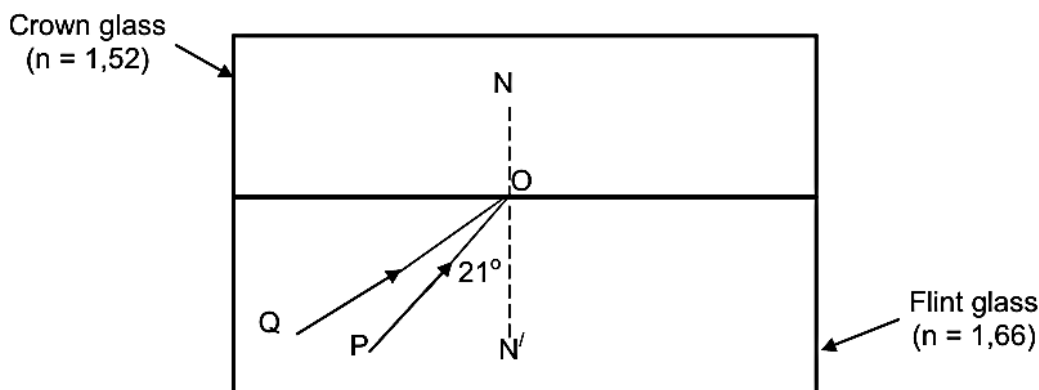
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Geometric Optics: Attempt #4 ⚡

Total = 9 Marks

In the diagram below (not to scale), a ray of light, **PO**, is travelling from flint glass towards the boundary with crown glass.

The angle of incidence of ray **PO** at the boundary between the two surfaces ($\angle PON'$) is 21° .



1. Write down Snell's law in words. (2)

The refractive indices of crown glass and flint glass are 1,52 and 1,66 respectively as shown in the diagram above.

2. Calculate the critical angle for the boundary between the two glass materials. (3)

Copy the diagram into your ANSWER BOOK.

3. On your diagram draw a ray to show what happens to light ray **PO** at the boundary between the two glass surfaces. Label the ray **OX**. (1)

4. Ray **QO** is incident at the boundary at 40° .

Draw a ray to show what happens to light ray **QO** at the boundary between the two glass surfaces. Label the ray **OY**. Include the angle $\angle N'OY$ on your drawing. (2)

5. How does the speed of light in the crown glass compare to that in the flint glass? Write down only GREATER THAN, LESS THAN or EQUAL TO. (1)

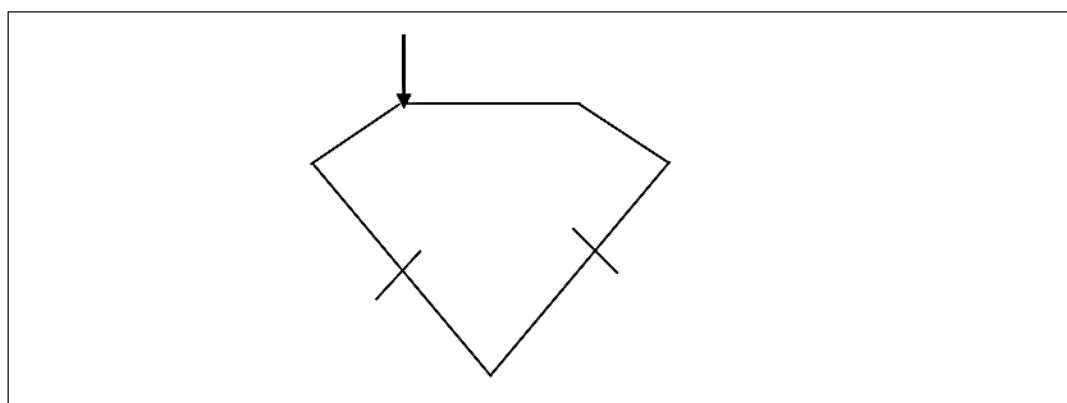


Geometric Optics: Attempt #5 ⚡

Total = 10 Marks

A diamond glitters in light because of its high refraction index of 2,42 and the small critical angle of the diamond-air boundary.

1. Calculate the critical angle of a diamond-air interface.
Take the refraction index of air as 1. (4)
2. The angle of incidence of light at the diamond-air interface is increased to 30° .
Redraw the diagram and complete the path of ray of light.



3. Name the phenomenon that will now be observed at the diamond-air interface. (1)
4. What are the TWO CONDITIONS that are necessary for the phenomenon in QUESTION 9.3 to happen? (2)
5. Name the medical instrument used to examine internal parts of the body that makes use of the phenomenon in QUESTION 9.3. (1)

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