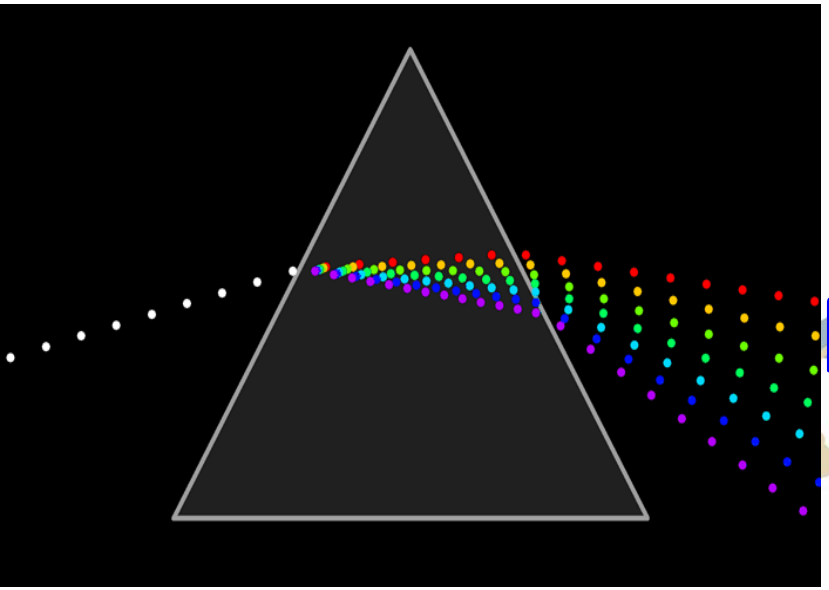


Physics/ Grade 10

Unit Three – Optics

Chapter 11 – Refraction of Light

Prepared Presented by: Mr. Mohamad Seif

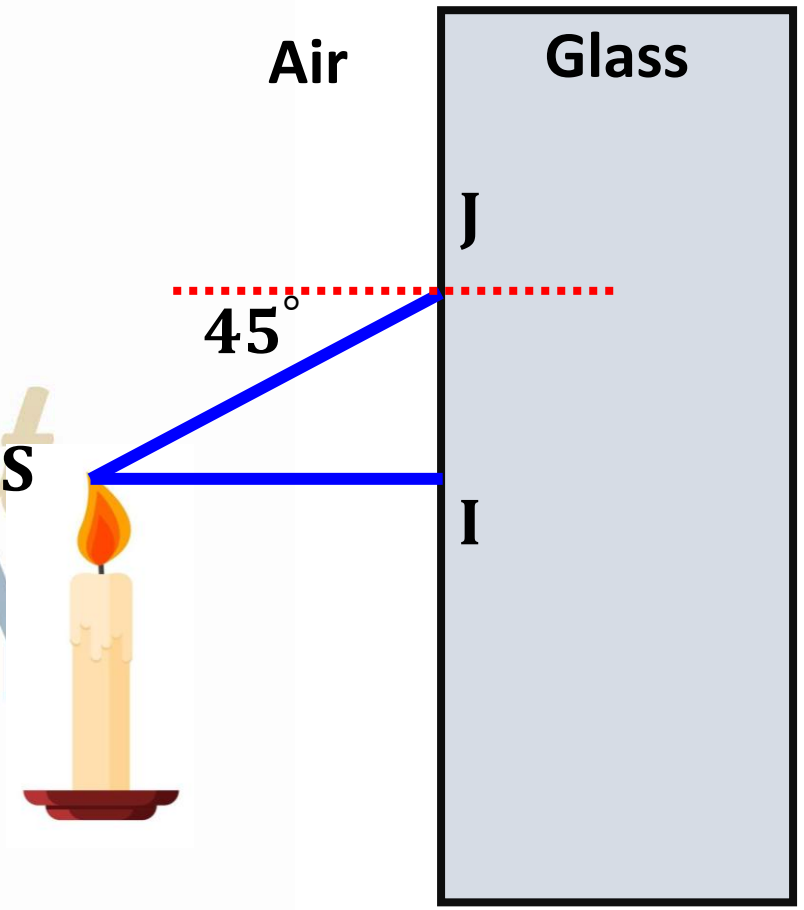

Quiz
Time
Be Smart
ACADEMY

Quiz — Flame of a candle — 20 min

A rectangular plate, like the window pane of a room, with parallel and plane faces is a transparent block generally made of glass.

we take two incident rays from point (S) of a candle flame, and falling on the window pane of a room.

Given that the critical angle i_l s (glass-air) is $i_l = 42^\circ$.



1) Complete the path of the ray (SI) at I.

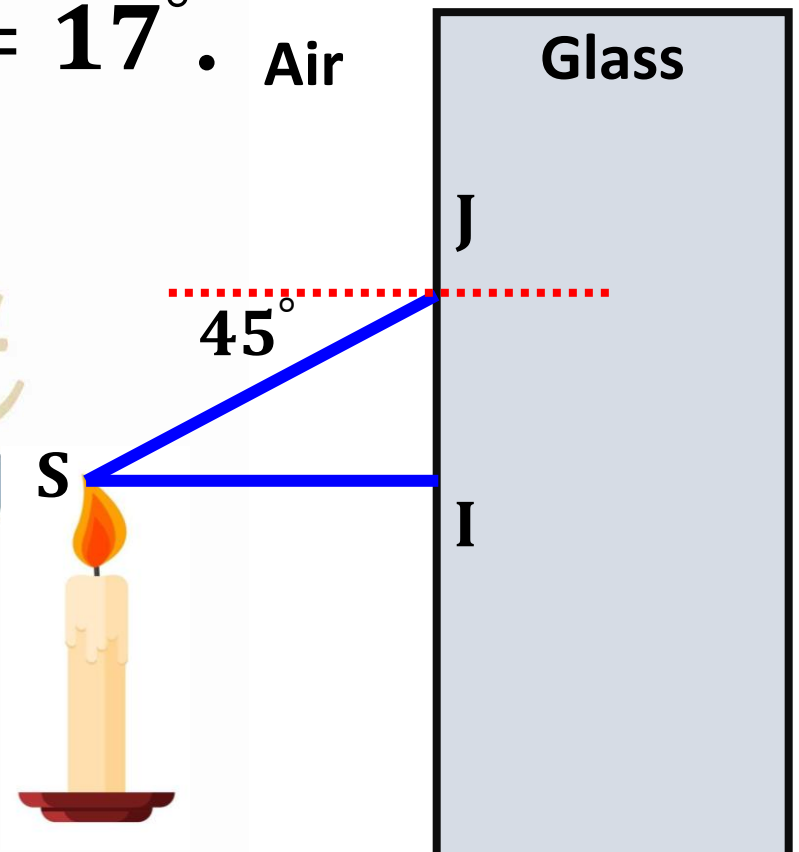
2) Determine the angle of incidence, of refraction, and of deviation that the ray undergoes at "I".

3) The ray (SJ) hits the surface at an angle of incidence 45°, it undergoes deviation by an angle $D_1 = 17^{\circ}$.

a) Is this deviation away from or towards the normal? Justify your answer.

b) Calculate the angle of refraction of the ray at "J".

c) Complete the path of the ray (SJ) at "J".

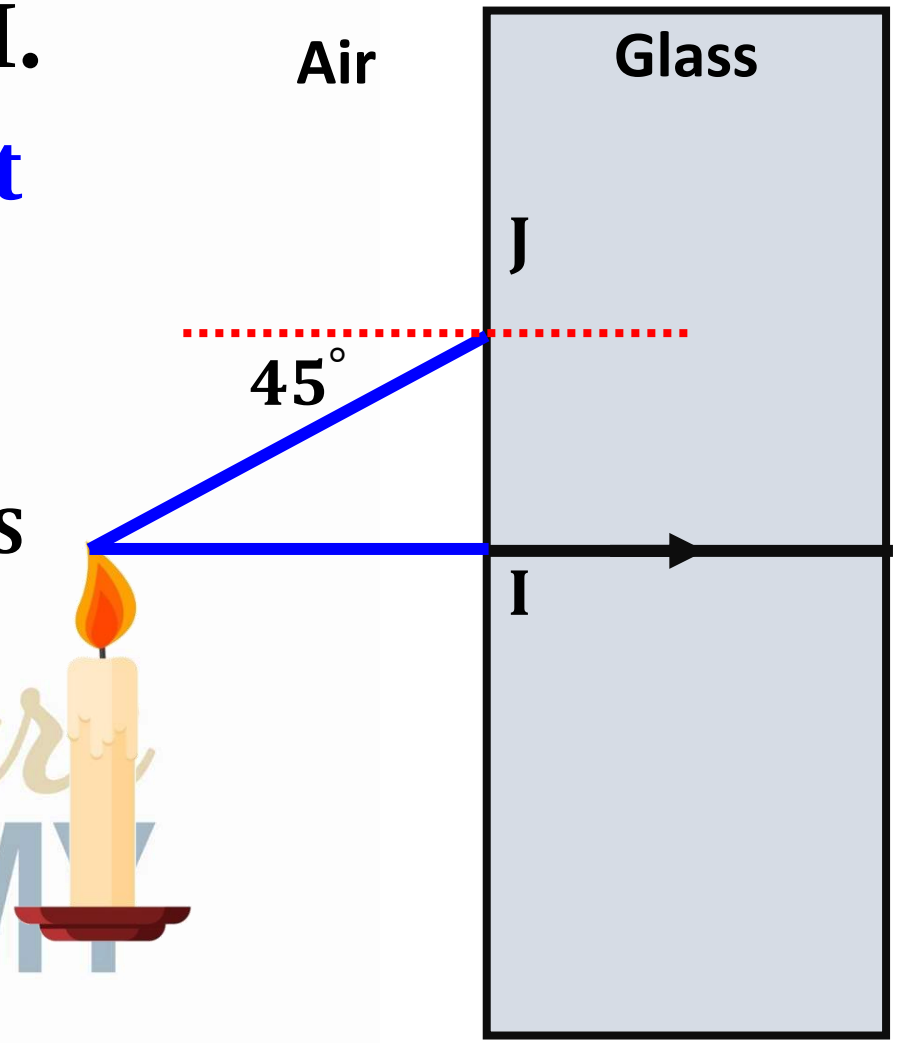


Quiz Flame of a candle 20 min

1) Complete the path of the ray (SI) at I.

The ray SI is normal to the surface, it completes without any deviation

2) Determine the angle of incidence, of refraction, and of deviation that the ray undergoes at "I"



$$i = r = 90^\circ$$

$$d = |i - r| = |90^\circ - 90^\circ|$$

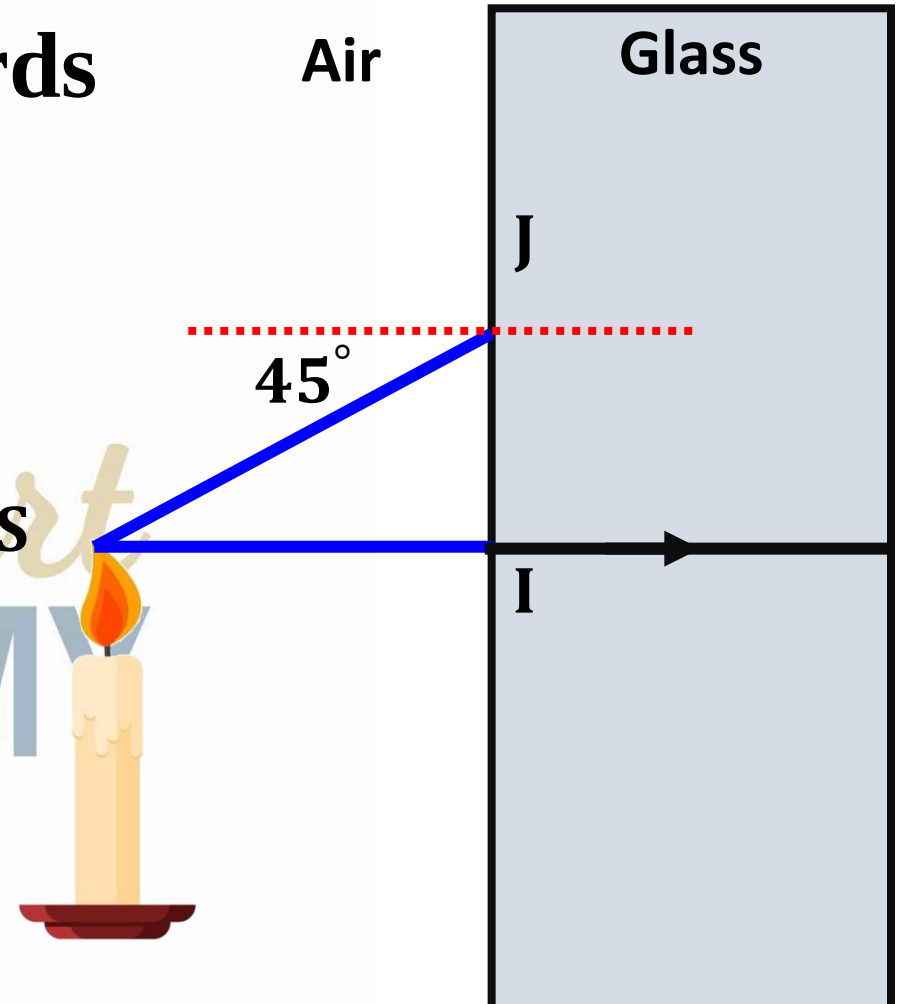
$$d = 0$$

3) The ray (SJ) hits the surface at an angle of incidence 45°, it undergoes deviation by an angle $D_1 = 17^\circ$.

a)Is this deviation away from or towards the normal? Justify your answer.

The ray SJ passes from a medium of less index (air) to medium of more index.

Therefore, it is refracted towards the normal.



Quiz 1:

b) Calculate the angle of refraction of the ray at "J".

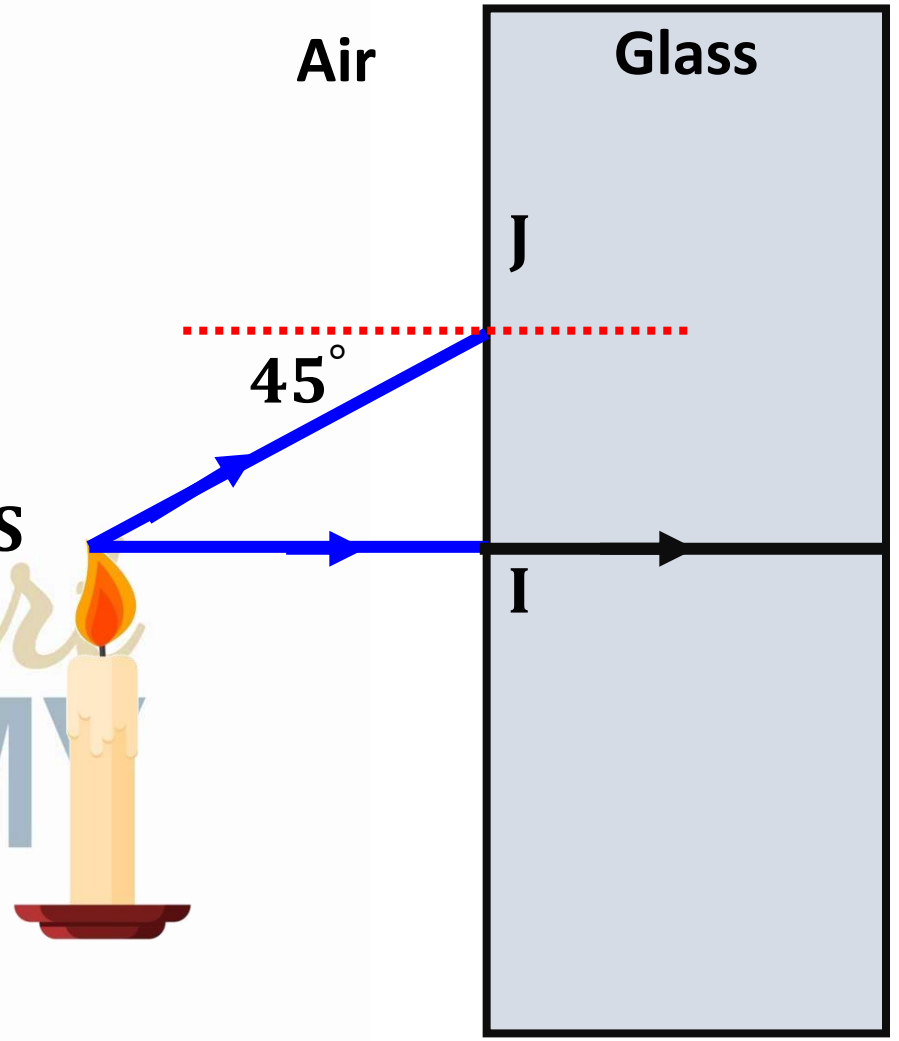
$$n_1 \sin(i) = n_2 \sin(r)$$

$$1 \times \sin(45) = 1.5 \sin(r)$$

$$\sin(r) = \frac{1 \times \sin(45)}{1.5}$$

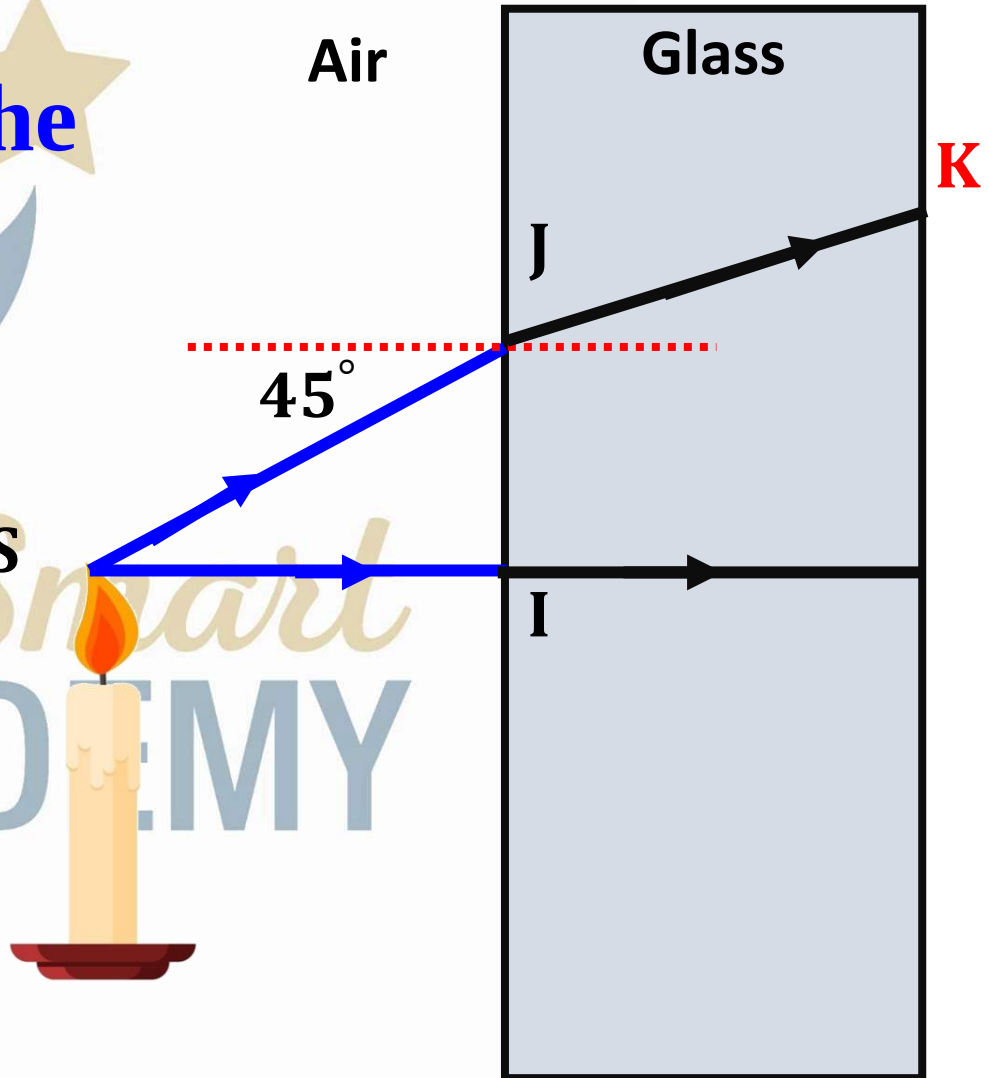
$$\sin(r) = 0.47$$

$$r = 28.1^\circ$$



c) Complete the path of the ray (SJ) at “J”.

The ray SJ refracted towards the normal.



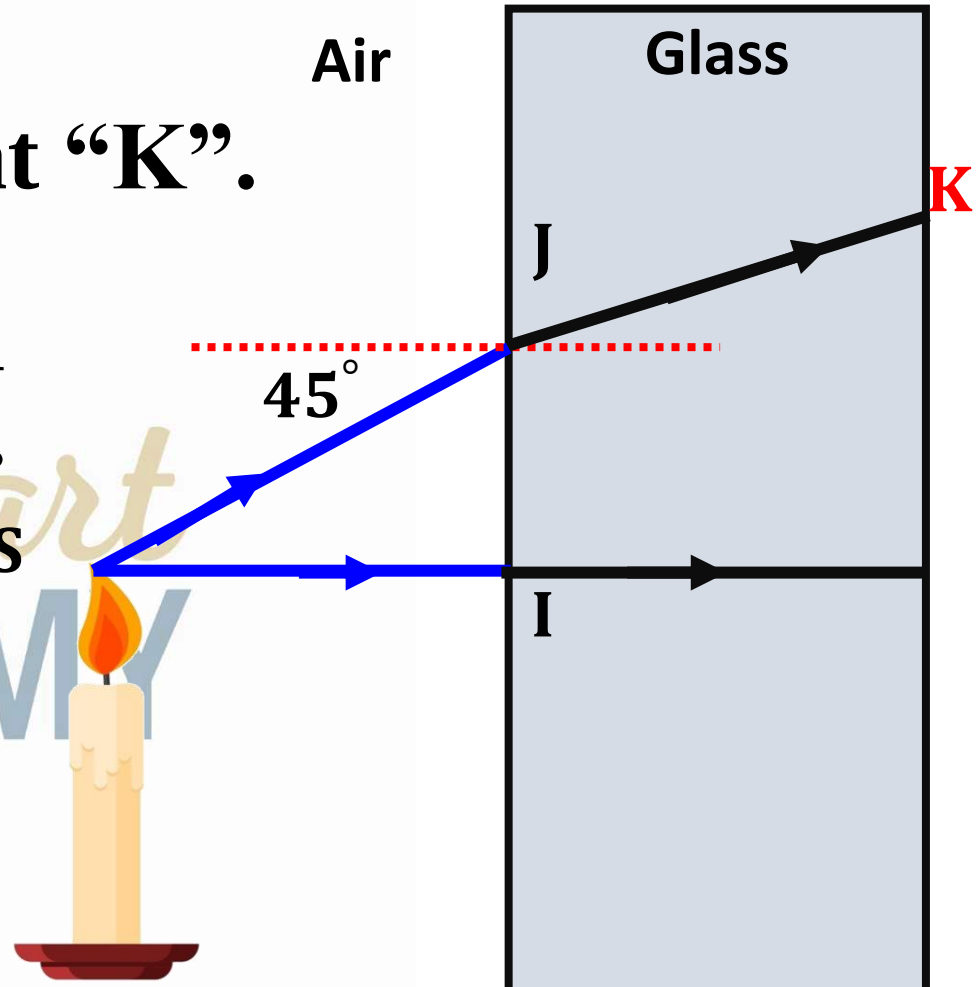
Quiz Flame of a candle 20 min

4) The refracted ray at “J” meets the other face at K.

a) Can the ray (JK) cross the surface of separation glass-air? Justify

b) Complete the path of the ray (JK) at “K”.

c) Calculate the angle of deviation D_1 that the ray (JK) undergoes at “K”.



4) The refracted ray at "J" meets the other face at K.

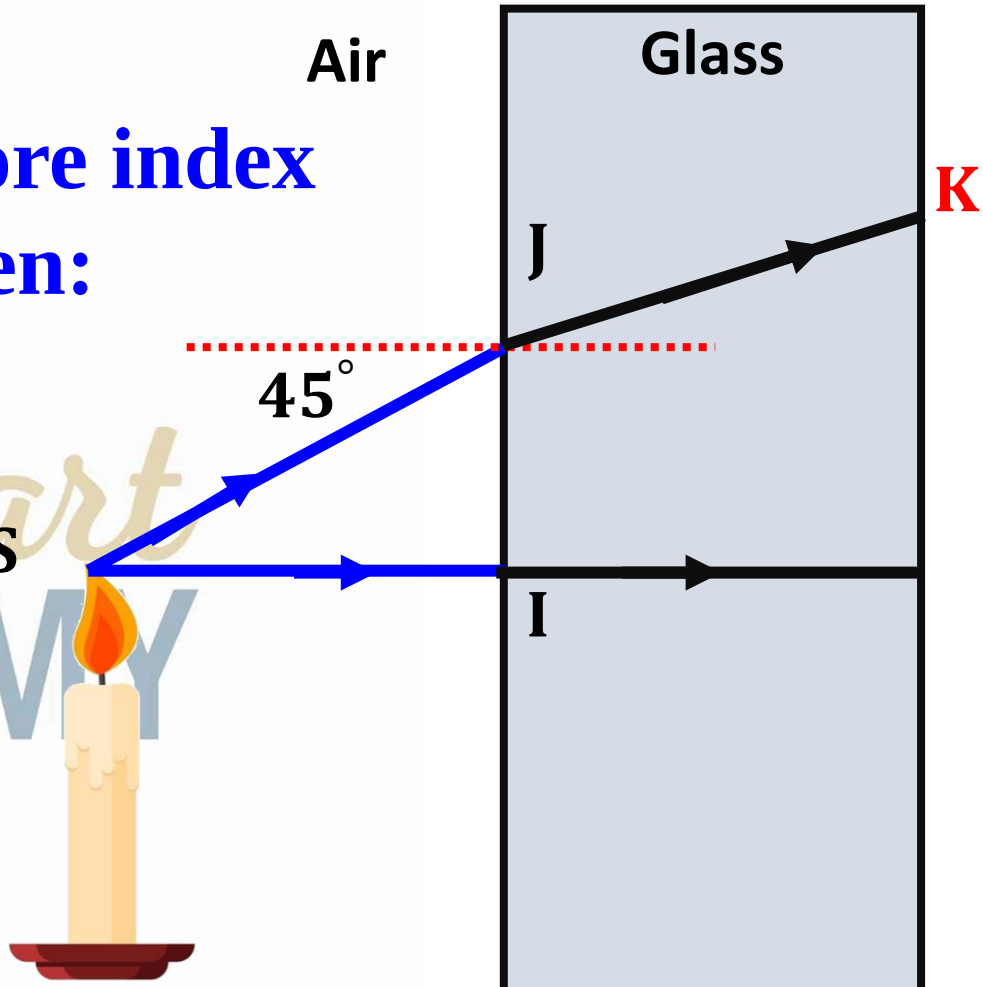
a) Can the ray (JK) cross the surface of separation glass-air? Justify your answer.

The ray JK passes from a medium of more index (glass) to a medium of less index (air) then:

$$i = r = 28.1^\circ$$

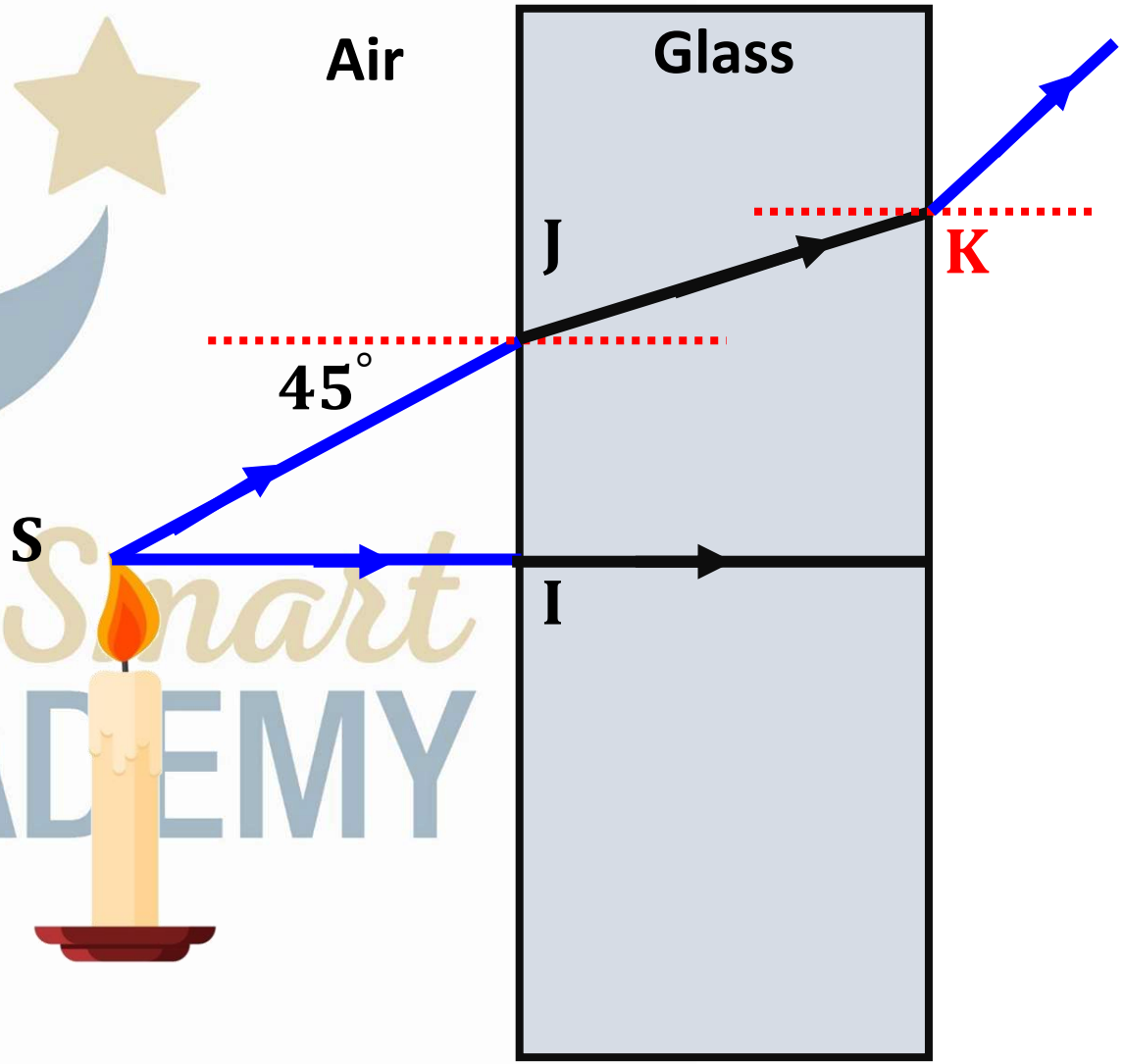
$$i = 28.1^\circ < i_l = 42^\circ$$

The ray refracted away from the normal.



b)Complete the path of the ray (JK) at “K”.

The ray refracted away from the normal.



c) Calculate the angle of deviation D_1 that the ray (JK) undergoes at "K".

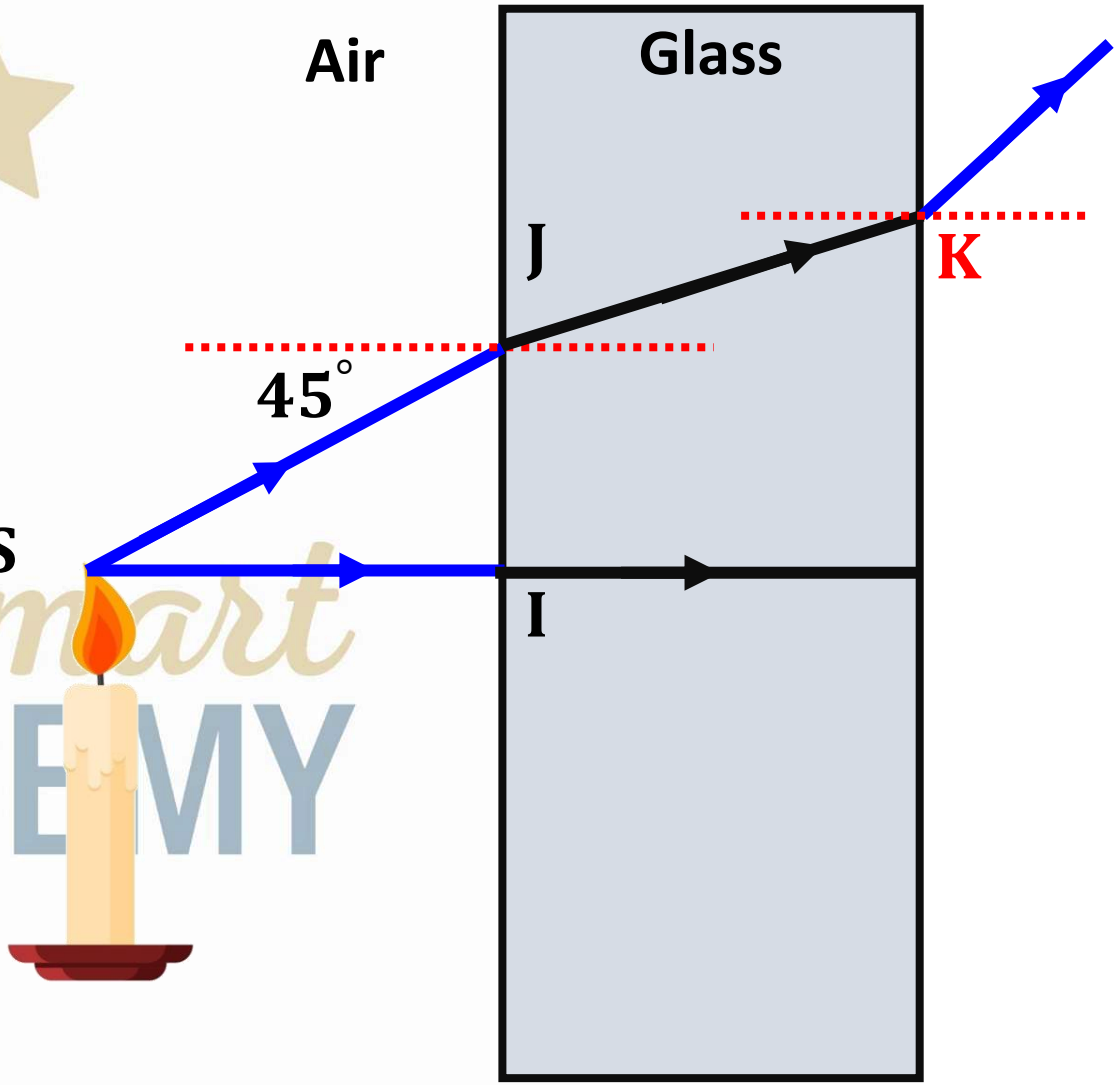
$$n_1 \sin(i) = n_1 \sin(r)$$

$$1.5 \times \sin(28.1) = 1 \sin(r)$$

$$\sin(r) = \frac{1.5 \times \sin(28.1)}{1}$$

$$\sin(r) = 0.706$$

$$r = 45^\circ$$

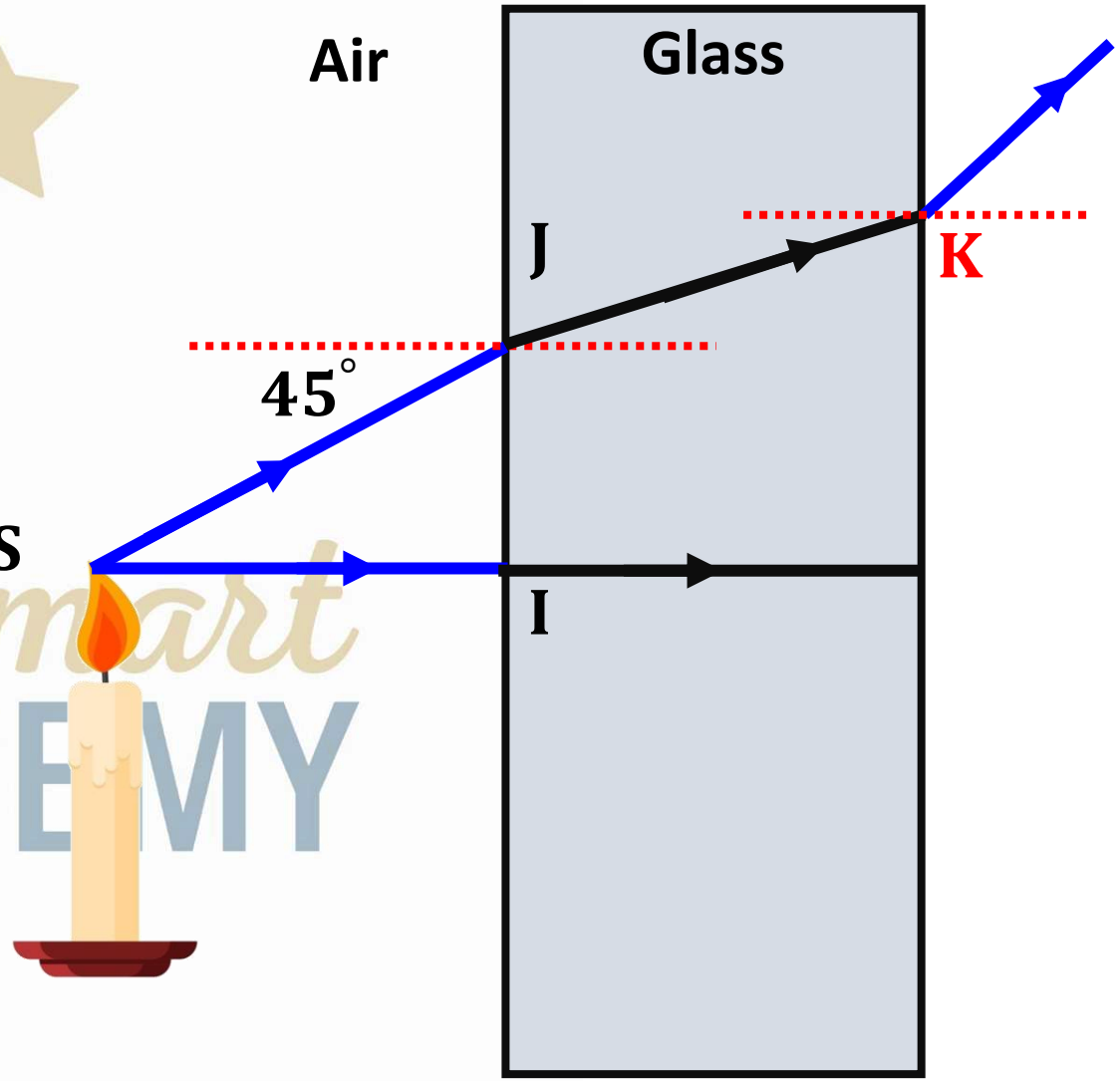


Quiz Flame of a candle 20 min

$$D_2 = |i - r|$$

$$D_2 = |28.1 - 45|$$

$$D_2 = 16.9$$

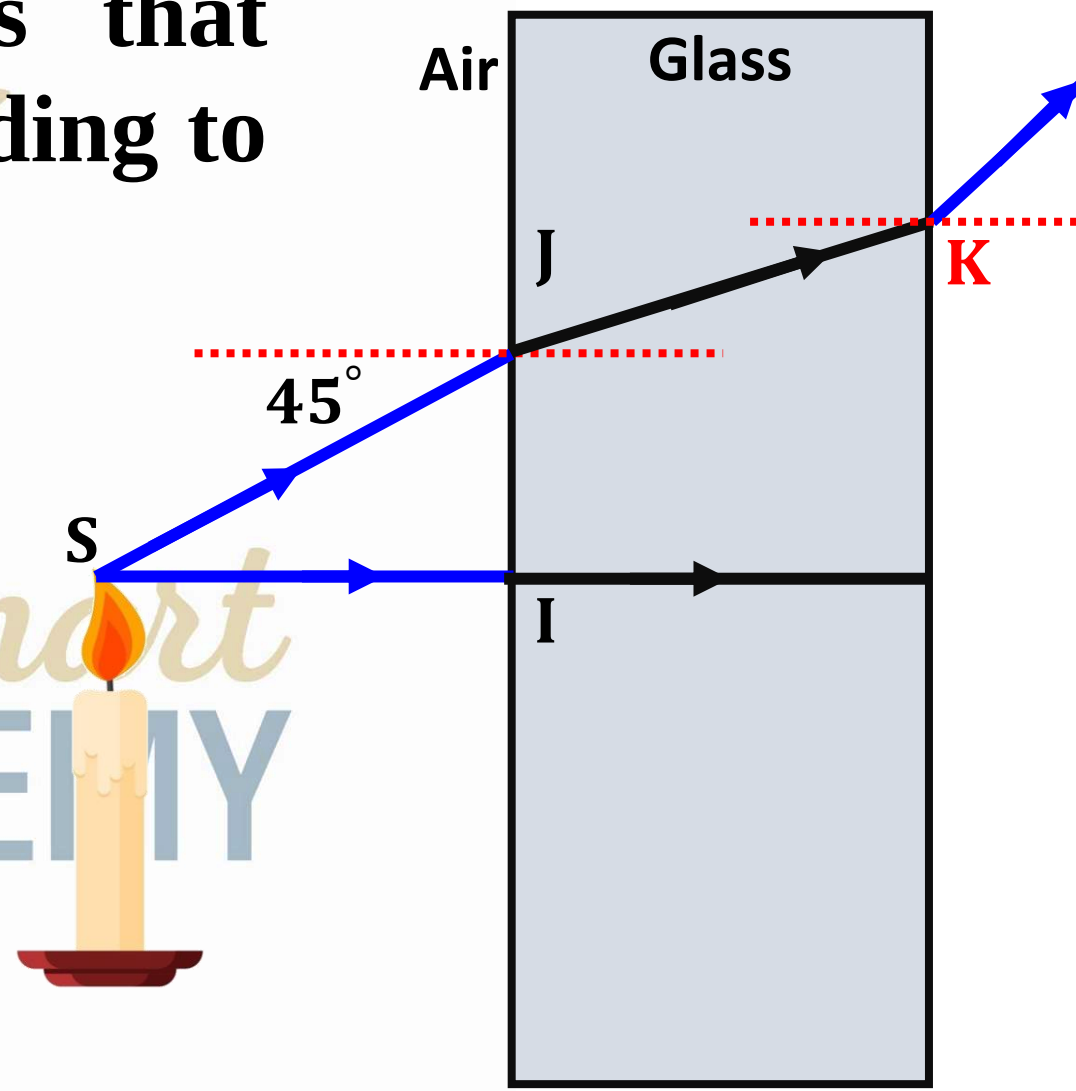


5) Deduce the angle of total deviation D that the ray (SJ) undergoes through the rectangular plate.

6) The prolongations of the rays that emerge from the plate corresponding to (SJ) and (SI) intersect at S'.

a) Construct the image point S'.

b) Deduce the effect of the glass plate on the position of an object with respect to an observer behind the plate.



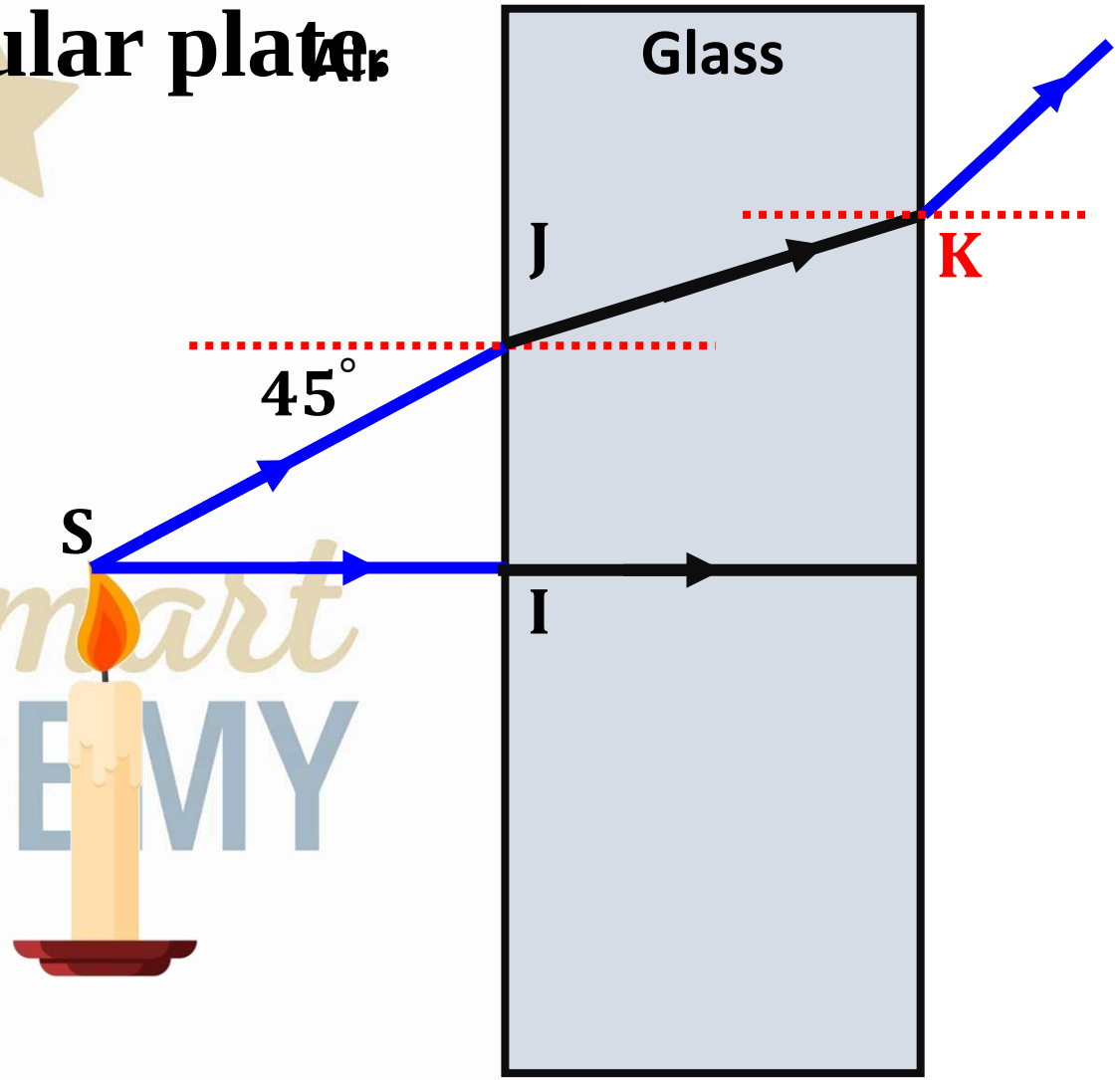
5) Deduce the angle of total deviation D that the ray (SJ) undergoes through the rectangular plate.

At:

$$D = D_1 + D_2$$

$$D = 17^\circ + 16.9$$

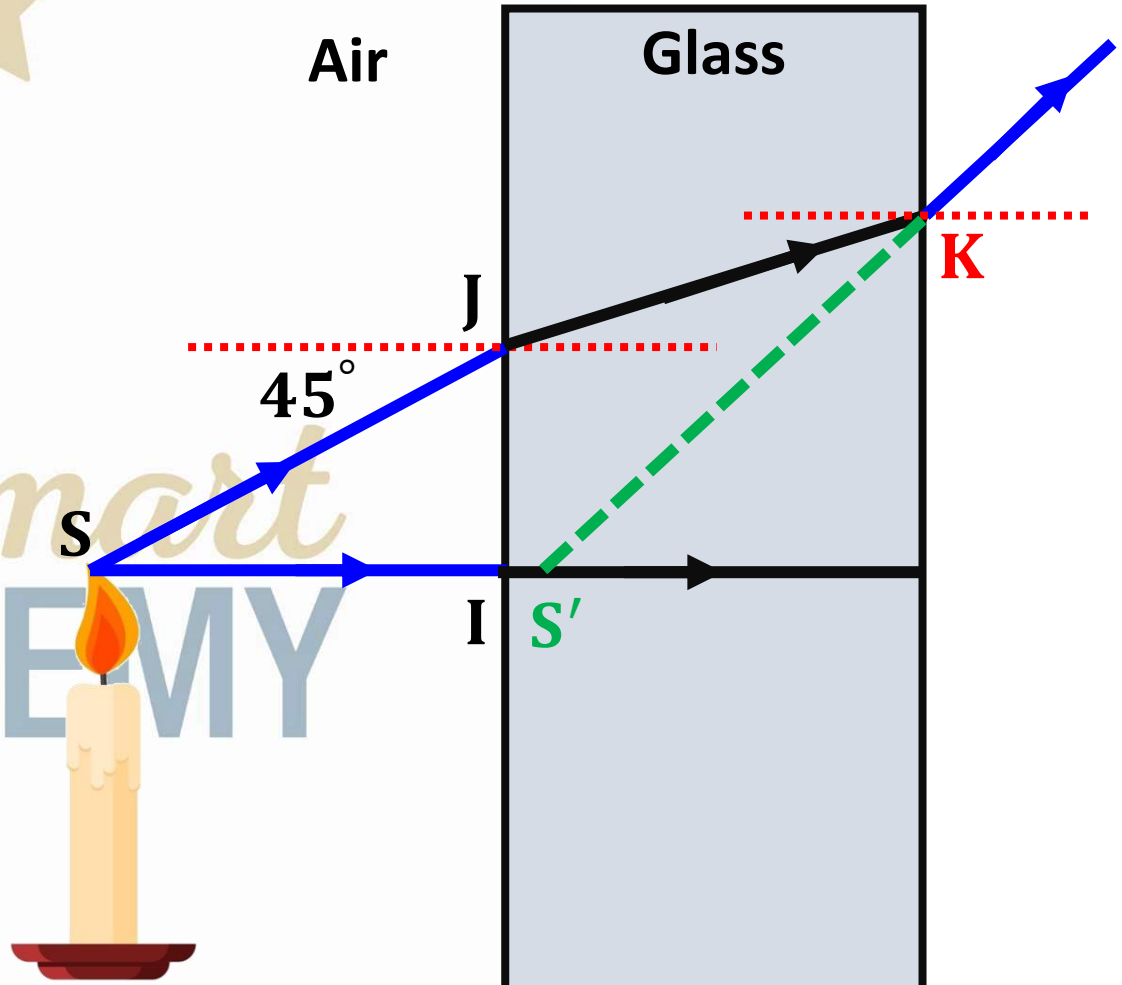
$$D = 33.9^\circ$$



6) The prolongations of the rays that emerge from the plate corresponding to (SJ) and (SI) intersect at S'.

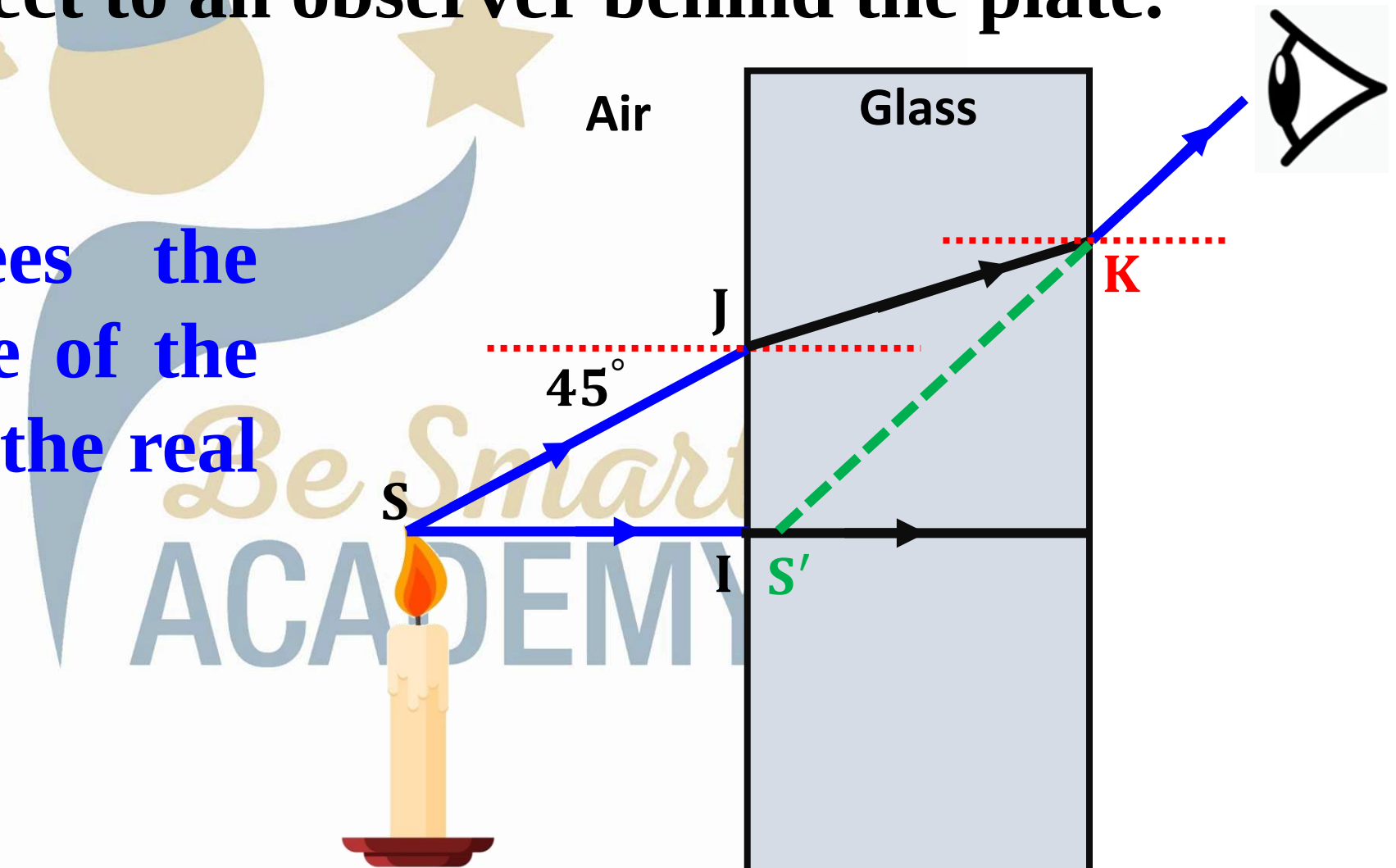
a) Construct the point S'.

The prolongation meets the ray SI at S'



b) Deduce the effect of the glass plate on the position of an object with respect to an observer behind the plate.

The observer sees the image of the flame of the candle closer than the real flame.



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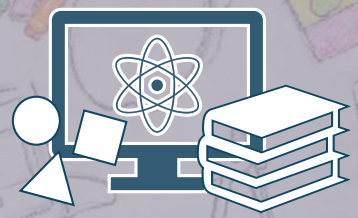


Quiz
Time
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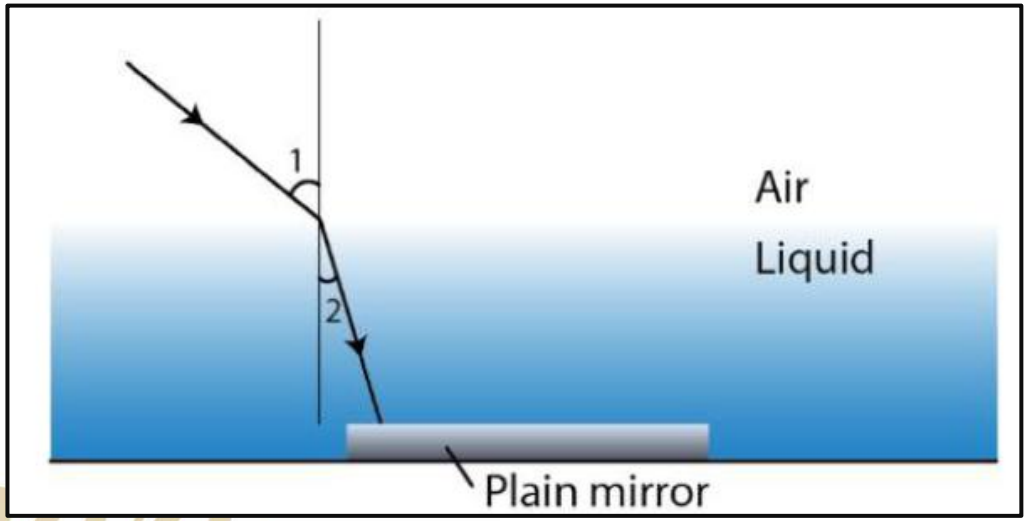
Quiz 2 — Nature of a liquid — 15 min

A ray of green light enters a liquid from air, as shown in the figure. The angle 1 is 45° and angle 2 is 28.5°.

1) **Calculate the refractive index of liquid.**

2) **Using the table below, identify the nature of the liquid.**



liquid	Water	Acetone	Benzene
Index (n)	1.33	1.36	1.47

1) Calculate the refractive index of liquid.

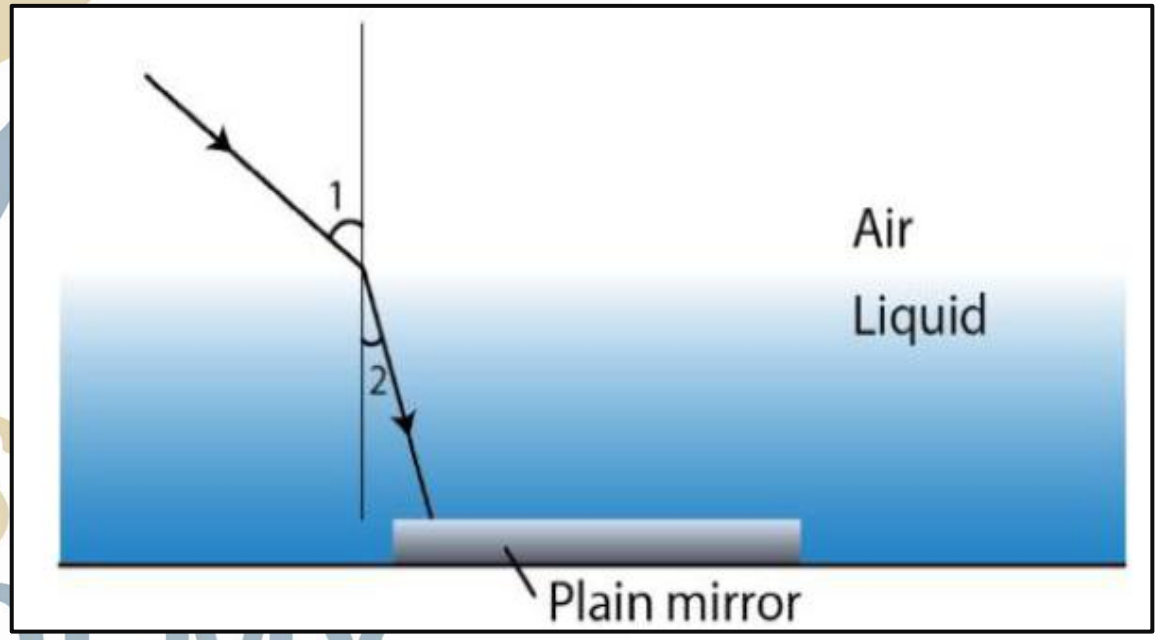
Apply Snell's law of refraction

$$n_1 sini = n_2 sinr$$

$$1 \times sin(45) = n_2 sin(28.5)$$

$$n_2 = \frac{1 \times sin(45)}{sin(28.5)}$$

$$n_2 = 1.47$$



Quiz 2 Nature of a liquid 20 min

2) Using the table below, identify the nature of the liquid.

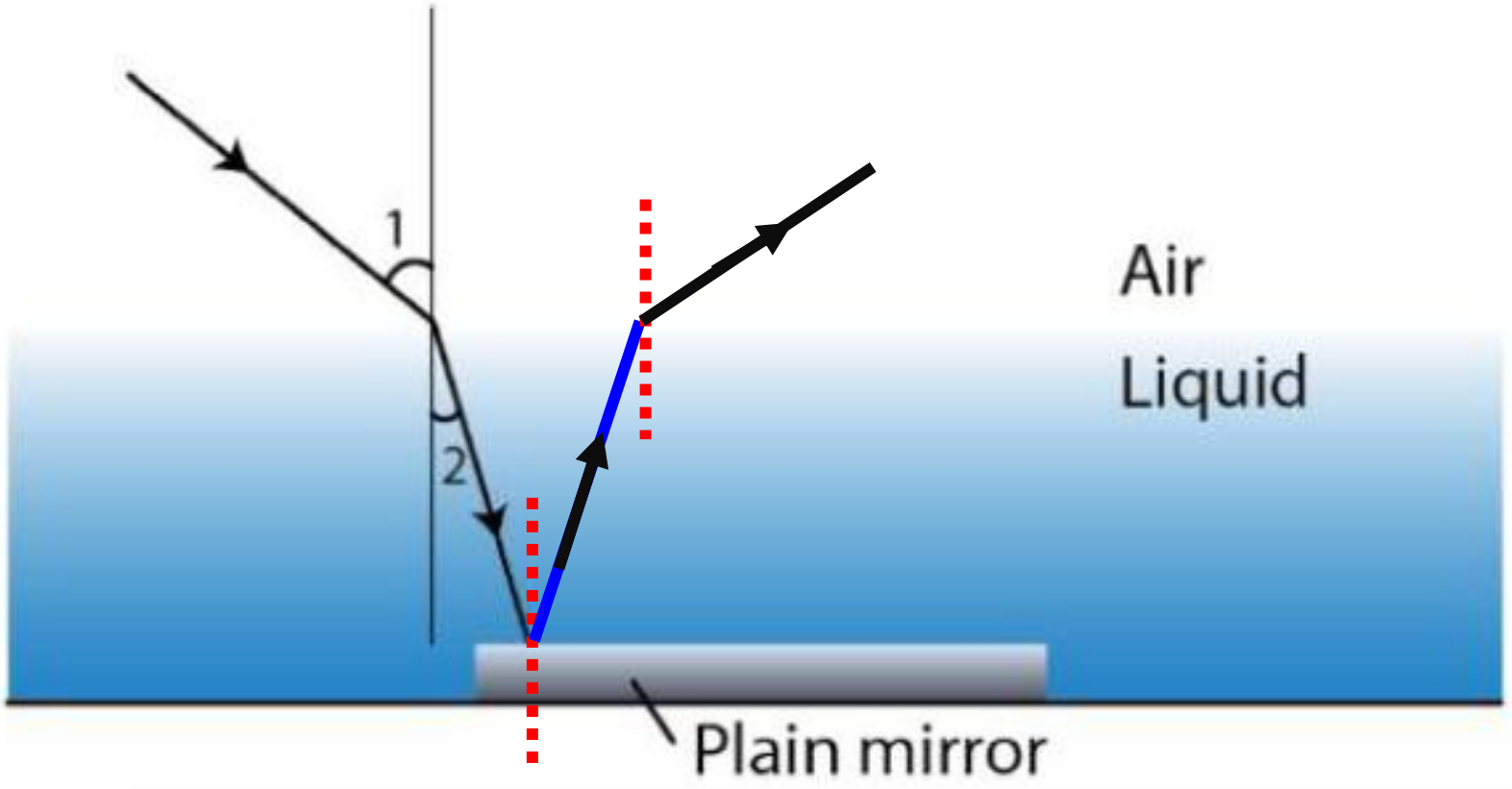
The index of the liquid is $n_2 = 1.47$

liquid	Water	Acetone	Benzene
Index (n)	1.33	1.36	1.47

From the given table, we deduce that the liquid is benzene

Quiz 2 Nature of a liquid 20 min

2) Show in the diagram the path of the ray after it strikes the mirror and re-enters in air.



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