

Name of the Student: _____

Max. Marks : 27 Marks

Time : 27 Minutes

Q1.

A door is fitted with a security lens and a lock.

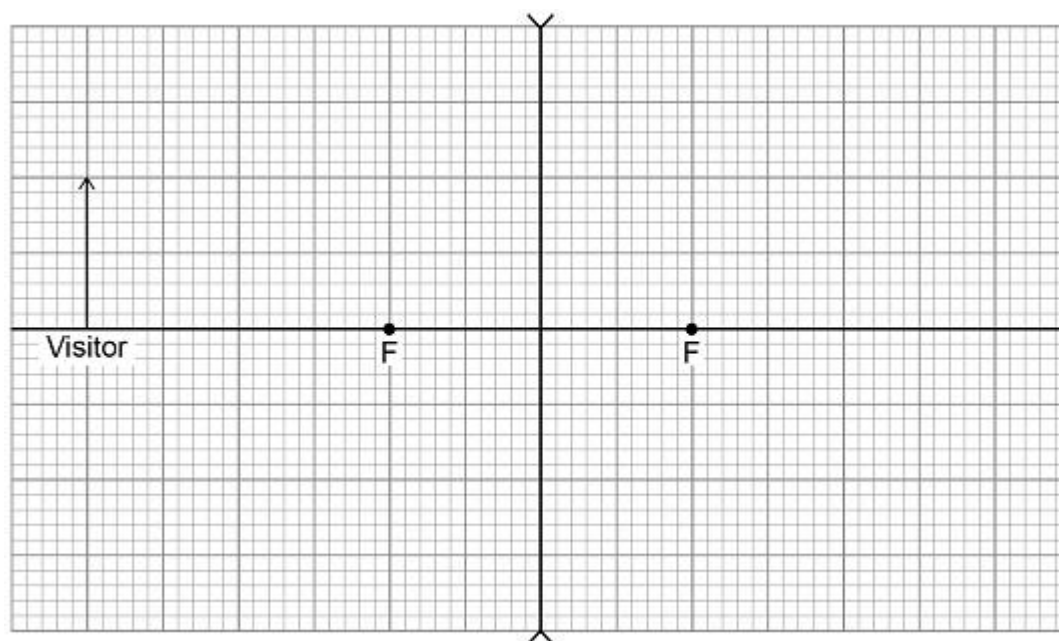
The security lens allows a person to see a visitor before opening the door.

The security lens is concave.

- (a) The diagram below is an incomplete ray diagram representing a visitor standing near the security lens.

Complete the diagram to show how an image of the visitor is formed by the concave lens.

Draw an arrow to represent the image.



(3)

- (b) The visitor moves further away from the security lens in the door.

How does the size of the image change?

Tick (✓) **one** box.

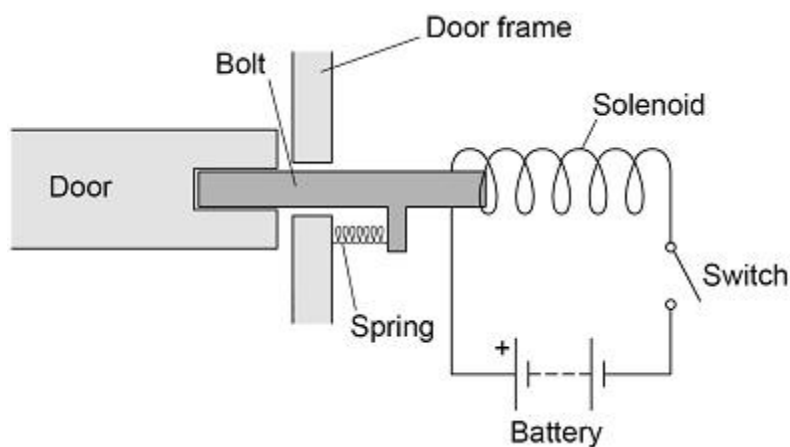
Decreases

☐

- Increases ☐
- Stays the same ☐

(1)

The diagram below shows a diagram of the lock. The door unlocks when the switch is closed.



(c) Which material should the bolt be made from?

Tick (✓) **one** box.

- Aluminium ☐
- Brass ☐
- Copper ☐
- Iron ☐

(1)

(d) Explain why the door unlocks when the switch is closed.

(3)

(e) When the door unlocks, a force of 2.88 N is applied to the spring.

The spring extends by 1.50 cm.

Calculate the spring constant of the spring.

Spring constant = _____ N/m

(4)

(f) Give **two** ways the resultant force on the bolt could be increased.

1 _____

2 _____

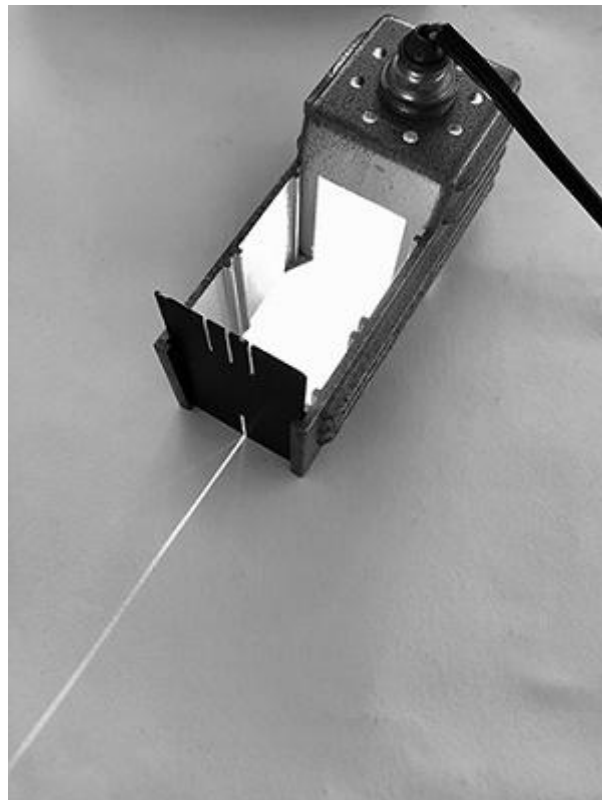
(2)

(Total 14 marks)

Q2.

A student investigated the refraction of light at the boundary between air and glass.

The photograph below shows the ray box used.

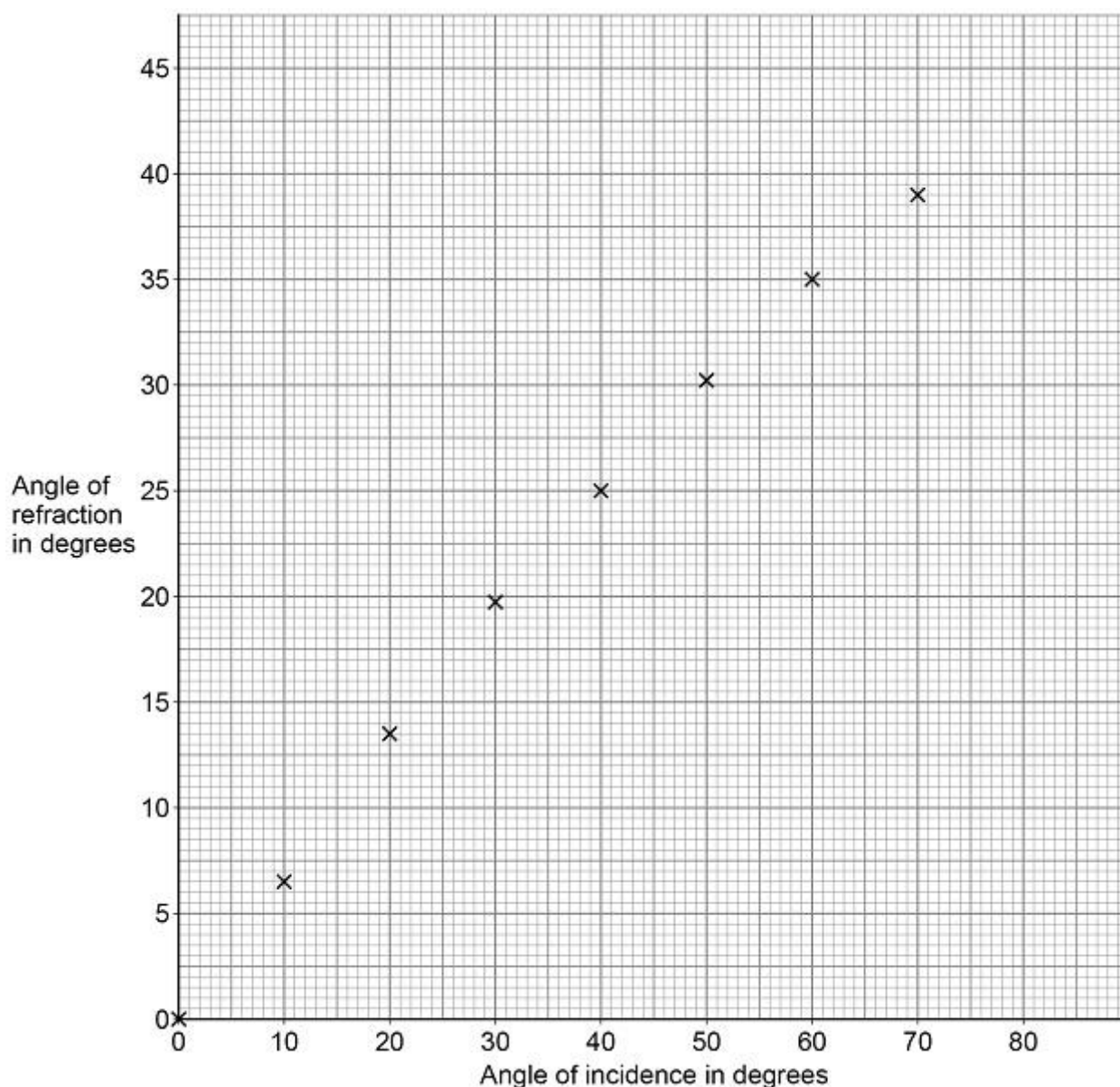


- (a) The ray of light from the ray box should be as narrow as possible.

Explain why using a wider ray would give less accurate results than using a narrower ray.

(2)

The graph below shows the results.



- (b) Estimate the angle of refraction when the angle of incidence is 80° .

Show how you obtained your answer on the graph above.

Angle of refraction = _____ $^\circ$

(2)

- (c) Describe a method the student could have used to obtain the results shown in the graph above.

(6)

- When the angle of incidence was 40° the three measured values for the angle of refraction were

22°

Show how you determine your estimate.

Uncertainty = $\pm$ _____ °

(2)

- Tick (✓) **one** box.



(1)

Downloaded from www.merit-minds.com