

Name:	Target Grade:	Actual Grade:
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## LIGHTS

### MCQ and STRUCTURED QUESTIONS

#### READ THESE INSTRUCTIONS FIRST

#### INSTRUCTIONS TO CANDIDATES

1. Find a quiet, comfortable spot free place from distractions.
2. Spend one minute on each mark.
3. Time yourself for every single question.
4. Every chapter has their own question types. Ensure that you know the different question type for each chapter.
5. Make a conscientious effort to remember your mistakes, especially in terms of answering techniques. E.g. Take a picture for the mistakes that you made, keep it in a photo album, and revise it over and over again.
6. Highlight question types that you tend to keep making mistakes and review them nearing exams.
7. Always review the common questions and question type that you tend to make mistakes nearing exams.
8. During exams, classify the question type and recall what you have learnt, how you need to analyse the questions for the different question type, what you need to take note of and answer with the correct answering techniques!

✨ Wishing you all the best for this test!

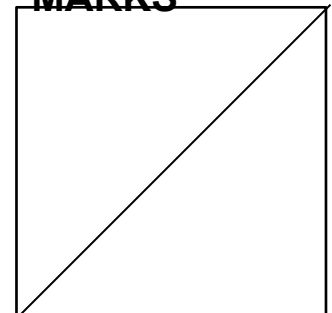
You've got this!

💡 With lots of love,  
Bright Culture 🧡



**GOOD LUCK  
FOR YOUR EXAM!**

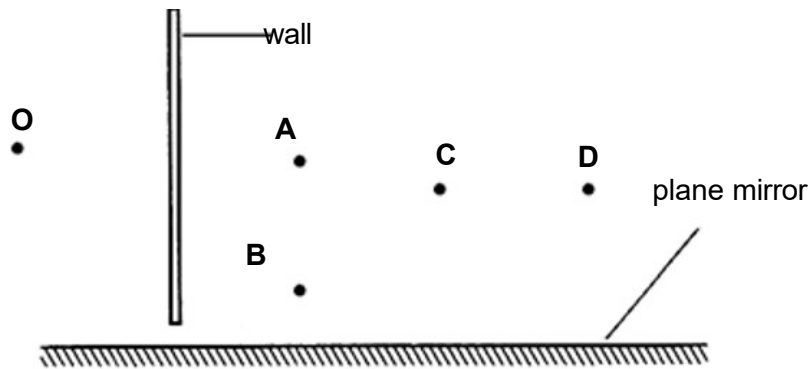
**MARKS**



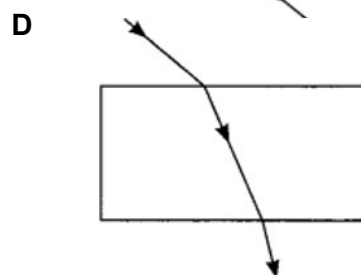
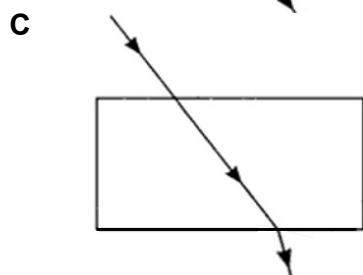
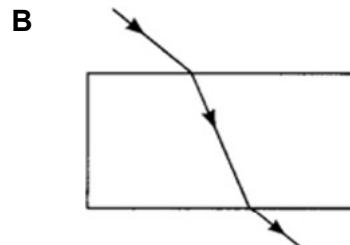
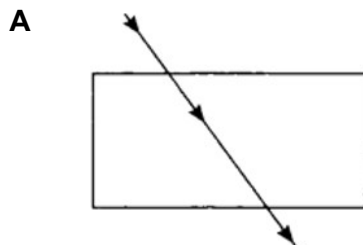
**LIGHTS MCQ**

- 1 The diagram shows an observer at **O** and 4 objects (**A**, **B**, **C**, and **D**) being blocked by a wall. A plane mirror is placed alongside the observer and the objects.

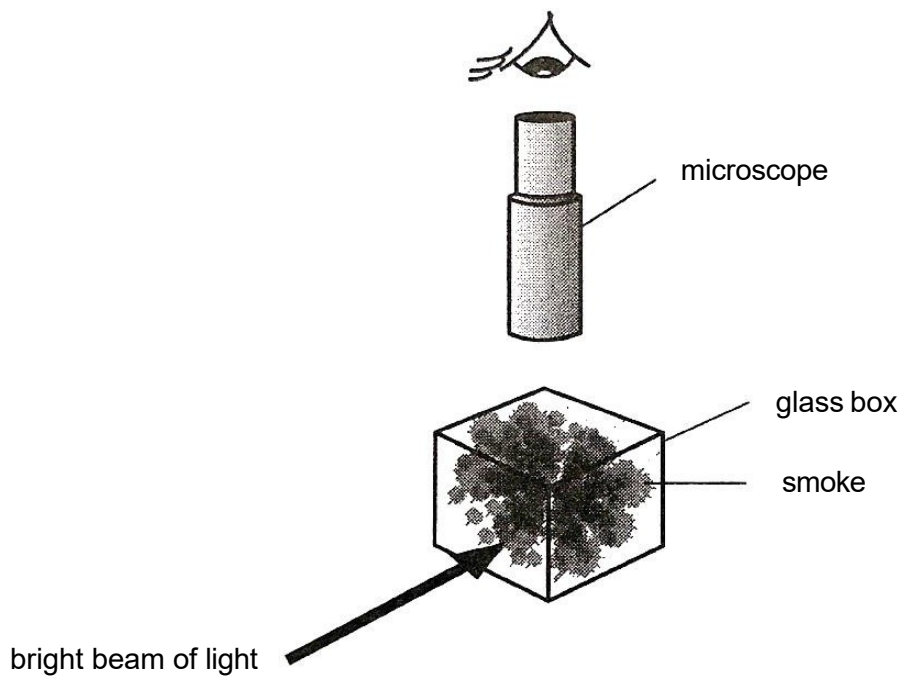
Which object is visible to the observer?



- 2 Which describes the properties of an image formed by a convex mirror?
- A real, inverted and diminished
  - B real, upright and magnified
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  - D virtual, upright and diminished
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- 4 Which diagram correctly shows a light ray as it passes from air into a rectangular glass block?



- 5 Smoke particles in air are illuminated by a beam of light and viewed through a microscope. The smoke particles undergo jerky, random motion.



What causes this motion?

- A** atomic vibrations within the smoke particles
  - B** bombardment of the smoke particles by fast-moving air molecules
  - C** collisions between the smoke particles
  - D** the energy of the beam of light
- 6 Which of the following has the weakest forces of attraction between its particles at room temperature?
- A** iron
  - B** oxygen
  - C** sugar
  - D** water



10 Which of the following explains why the path of a light beam cannot be seen in a vacuum?

- A It is because light can travel in a straight line through a vacuum.
- B It is because light travels very fast in a vacuum.
- C It is because light is absorbed in a vacuum.
- D It is because there are no particles in a vacuum to scatter light.

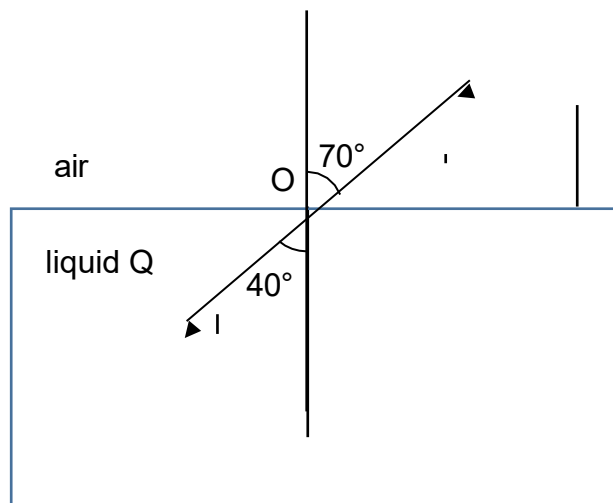
11 Which statement about the diffuse reflection is **incorrect**?

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- C In diffuse reflection, incident rays from different directions are reflected in the same direction.
- D The laws of reflection can be applied to diffuse reflection.

12 A man stands at 3.0 m in front of a plane mirror. If the man moves away from the mirror by 1.0 m, which of the following correctly describes how his image will change?

- A It will become smaller.
- B It will move towards the mirror by 1.0 m.
- C It will move away from the mirror by 1.0 m.
- D It will move away from the mirror by 2.0 m.

13 The diagram below shows a ray of light entering liquid Q from the air.



What is a possible angle of refraction if the angle of incidence is 50°?

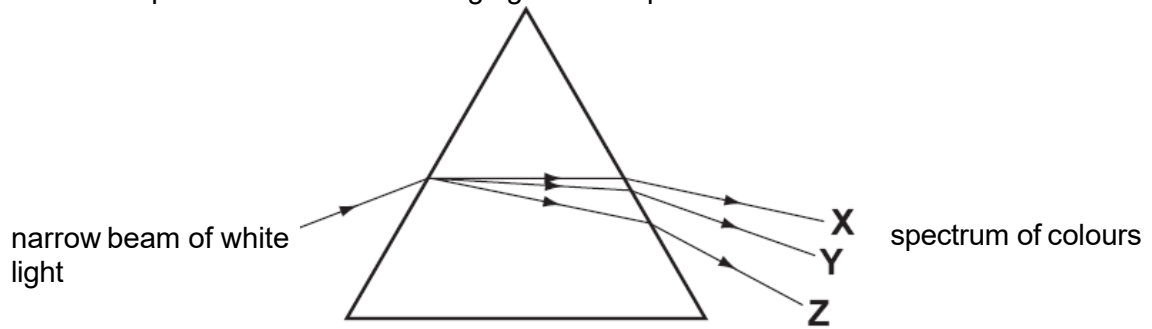
- A 30°
- B 40°
- C 50°
- D 60°

14 An object is placed 5 m in front of a mirror. A boy sits between the object and the mirror and viewed that the image of the object is 7 m away from him.

What is the distance between the boy and the object?

- A**    2 m
- B**    3 m
- C**    4 m
- D**    5 m

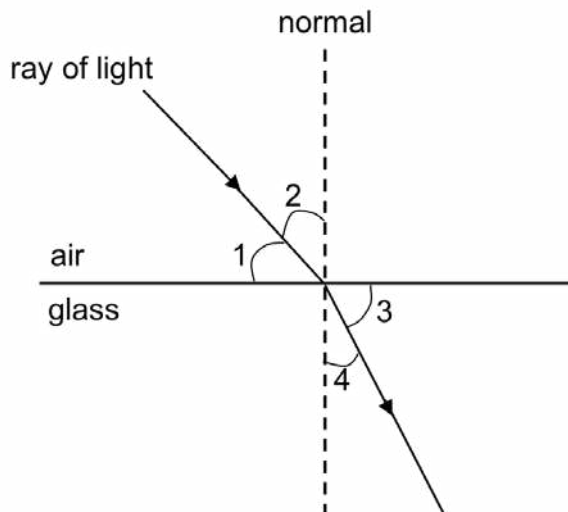
15 A student shines a narrow beam of white light into a prism as shown in the diagram. He sees a spectrum of colours emerging from the prism.



Which three colours does he see at X, Y and Z?

	<b>X</b>	<b>Y</b>	<b>Z</b>
<b>A</b>	violet	yellow	red
<b>B</b>	red	violet	yellow
<b>C</b>	red	yellow	violet
<b>D</b>	yellow	red	violet

16 The diagram shows a ray of light entering a block of glass.



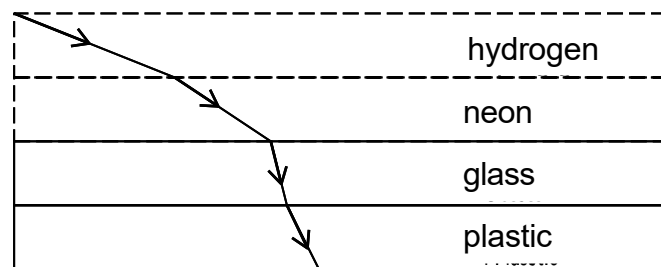
Which numbered angles are the angles of incidence and of refraction?

	angle of incidence	angle of refraction
<b>A</b>	1	3
<b>B</b>	1	4
<b>C</b>	2	3
<b>D</b>	2	4

17 Which of the following statements is true?

- A** A red object appears red in blue light.
- B** A blue object appears blue only in blue light.
- C** A green object appears yellow in white light.
- D** A black object appears black in light of any colour.

18 The following diagram shows the path of light as it passes through four substances.



Which of the following options ranks the four substances in increasing order of optical density?

- A** glass, plastic, neon, hydrogen
- B** hydrogen, neon, glass, plastic
- C** hydrogen, neon, plastic, glass
- D** plastic, glass, neon, hydrogen

**LIGHTS STRUCTURED QUESTIONS**

- 1 Mirrors use a process known as silvering, where a coat of silver nitrate is sprayed onto glass to give it its reflective coat.

One-way mirrors use a thinner coat, which allows some light to pass through, but most light is reflected. In Fig 9.1, a suspect in a police station can only see his reflection in the mirror, while being observed by a police officer in the same room.



**Fig 9.1**

- (a) State the *Law of Reflection*.

.....  
 ..... [1]

- (b) (i) On Fig 9.1, draw and label the position of the suspect's image, S'. [1]

- (ii) State what is meant by the *angle of incidence*.

.....  
 ..... [1]

- (iii) Draw a light ray to show how the police officer, P, can see the reflection of the suspect in the one-way mirror. [2]

- (c) Another officer on the other side of the mirror will be able to observe the suspect. However, the suspect would appear to be darker.

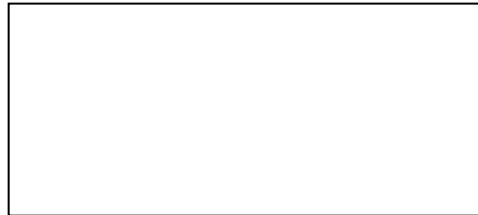
Explain why this happens.

.....  
..... [1]

- (d) The suspect is wearing a shirt with the following print and is facing the mirror.



In the space below, draw the image of the shirt in the mirror as seen by the suspect.  
[1]



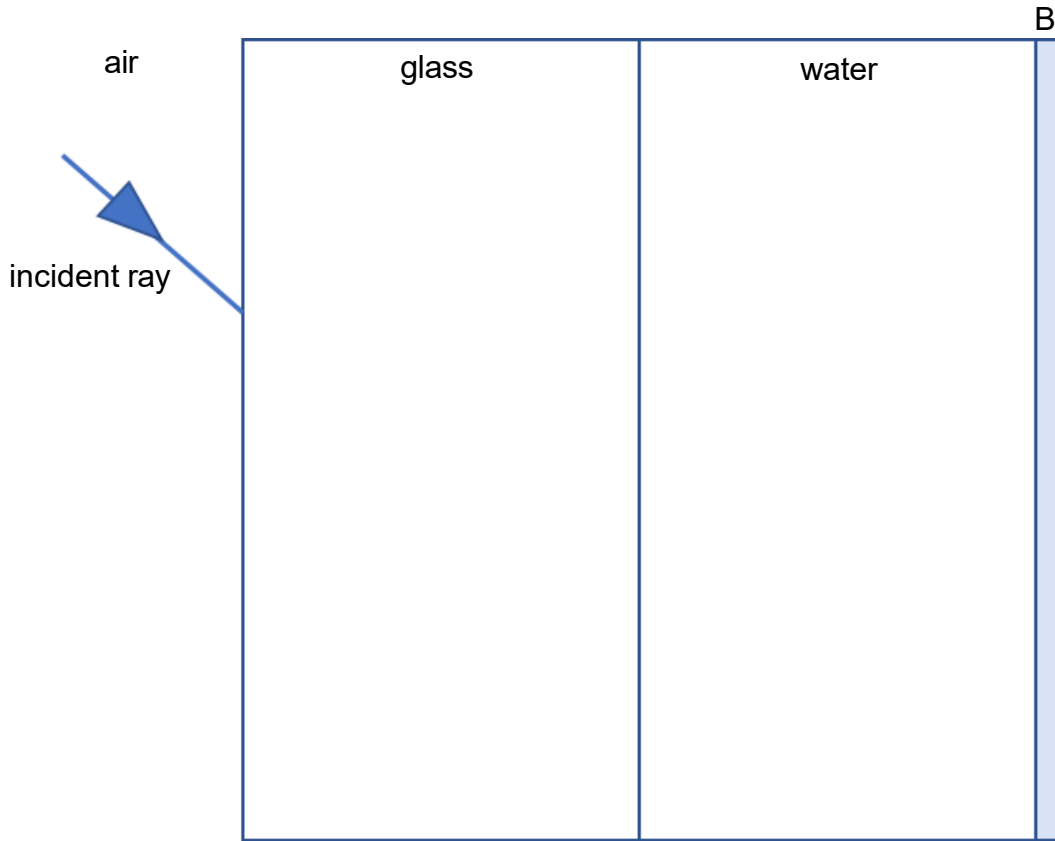
2 An object in water tends to appear differently due to the bending of light.

- a. (i) Fig 10.1 shows a light ray is incident onto a layer of glass before entering water.

Complete the diagram to show how the light ray travels from air to water and reaches the other end,

B.  
2]

[



**Fig. 10.1**

- (ii) State and explain what will happen to the light ray if the water layer was replaced with a medium that is optically less dense than water.

.....

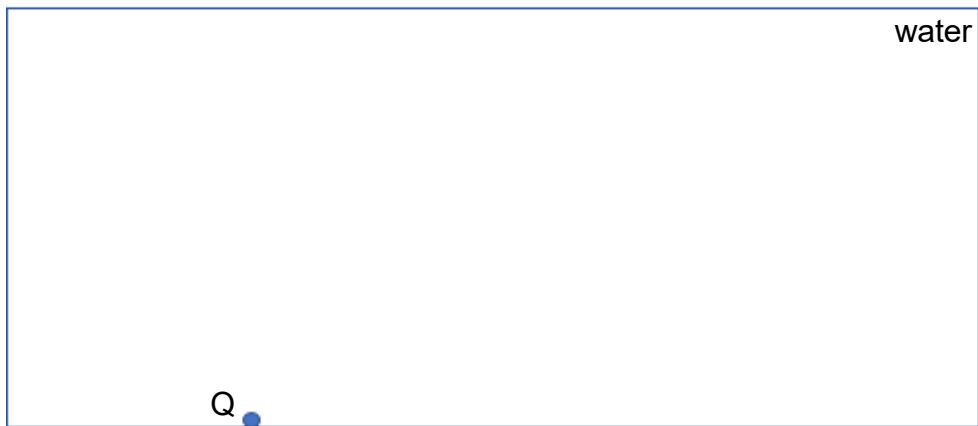
.....

.....

.....

[2]

- b. Fig 10.2 shows an object, Q, submerged under water.
  - (i) On Fig 10.2, indicate the image of the object, Q', as seen by the observer. [1]
  - (ii) Draw 2 rays to show how Q can be seen by an observer that is above the water's surface. [1]



**Fig. 10.2**

- (iii) The object is blue in colour. State and explain how the object appears under yellow light.

.....

.....

.....

[2]

- 3 (a) Fig. 10.1 shows a lamp that emits red light being placed in front of a plane mirror and an observer's eye.



**Fig. 10.1**

The mirror forms an image of the lamp.

- (i) State two characteristics of an image formed by a plane mirror.  
[1]

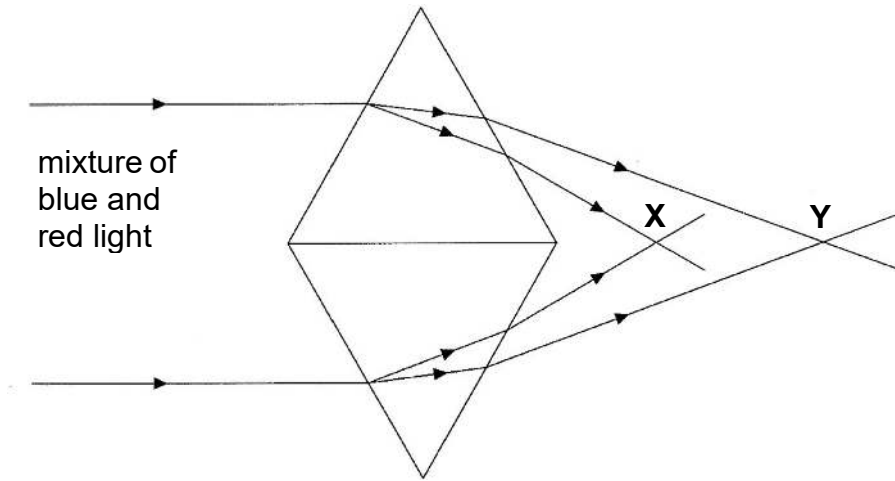
- (ii) On Fig. 10.1, draw the image of the lamp.  
[1]

- (iii) By drawing two rays of light from the centre of the lamp in Fig. 10.1, show how the observer sees the image of the lamp.  
[2]

- (b) A beam of light is made up of a mixture of red and blue light.

- (i) If the beam of red and blue light is shone on a yellow object with white dots, state the colour of the object. [1]

- (ii) The beam of light is shone through two glass prisms arranged as shown in the Fig. 10.2.



**Fig. 10.2**

State the colour that is focussed at point **X** and **Y**. [1]

**X:** .....

**Y:** .....

- (iii) Explain why one of the colours bends more than the other when they enter the prism. [2]

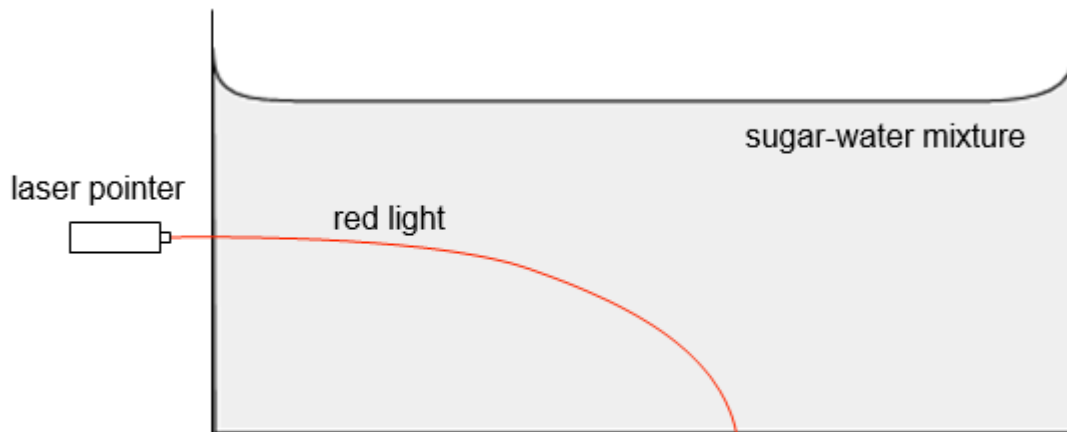
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- (c) Fig. 10.3 shows a tank containing a sugar-water mixture. As the sugar was left to dissolve in water without stirring, there is a higher concentration of sugar at the bottom and nearly pure water near the top. When a ray of red light from a laser pointer is shone into the tank, it is observed that the red light bends downward as shown in Fig. 10.3.



**Fig. 10.3**

Explain why the ray of light curves downwards as it travels through the sugar-water mixture [2]

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Total [10]

4 When light hits a surface, it is reflected, following the laws of reflection.

(a) State one Law of Reflection. [1]

.....

.....

.....

(b) Light falling on a sheet of white paper is reflected but no image is produced.

(i) State the type of reflection that would occur on a sheet of white paper. [1]

.....

(ii) Figure 9.1 shows the path of three light rays incident on a sheet of white paper. Complete the path of the light rays, showing all necessary working. [2]

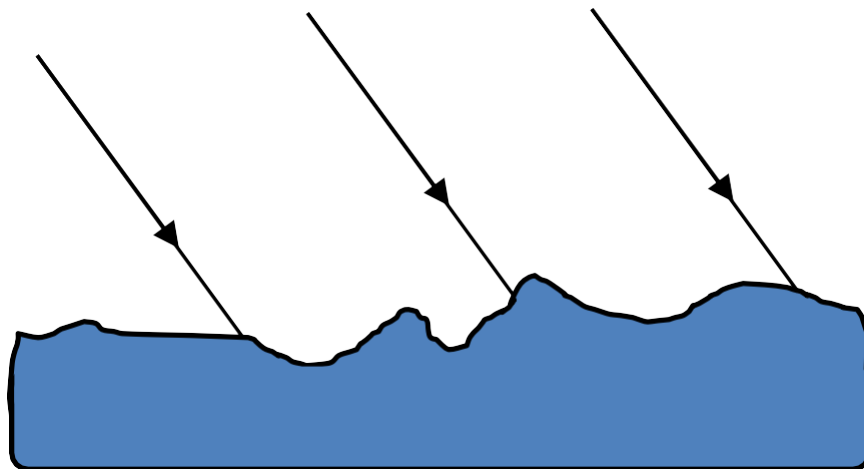
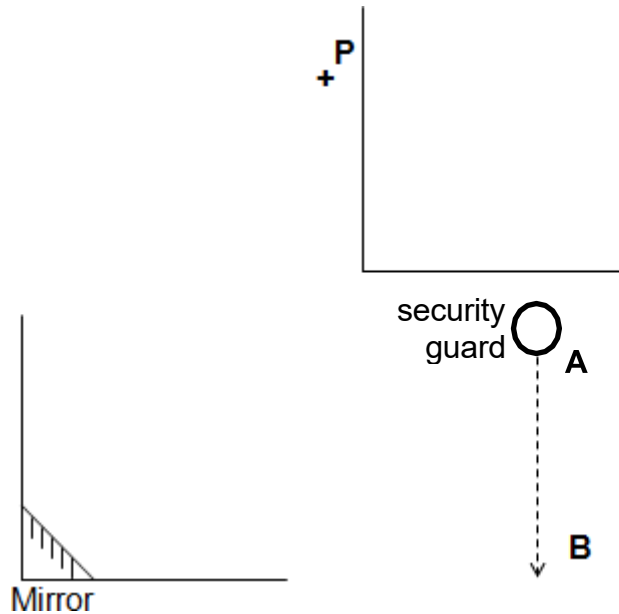


Figure 9.1

- (c) A security guard at point **A** in a museum uses a mirror to keep watch on an exhibit at point **P**. The location of the exhibit is marked with a **+**.



- (i) On the diagram above, mark with a **+** the location of the image of the exhibit, showing all relevant construction lines.  
[2]
- (ii) The security guard walks towards point **B** in the direction of the arrow. Mark with an **X** the farthest that the guard can walk along line **AB** and still see the exhibit in the mirror. Show all relevant construction lines.

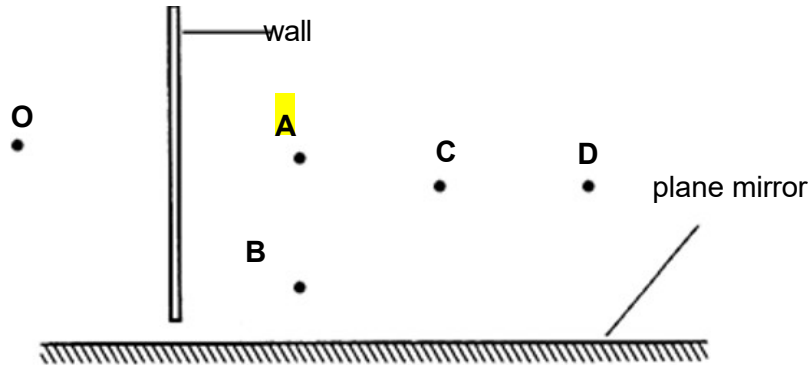
[3]

**Total [9]**

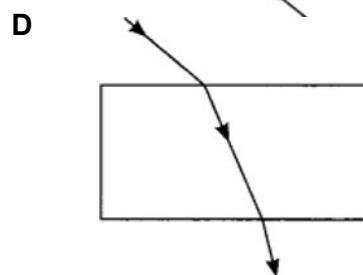
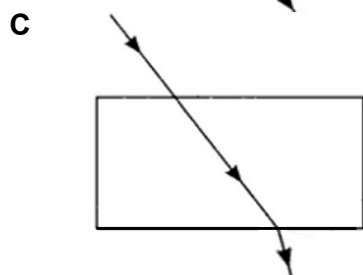
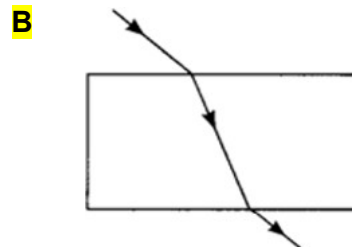
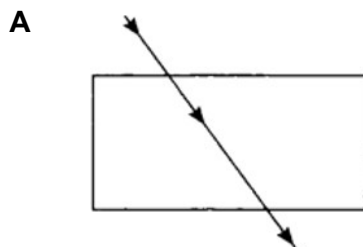
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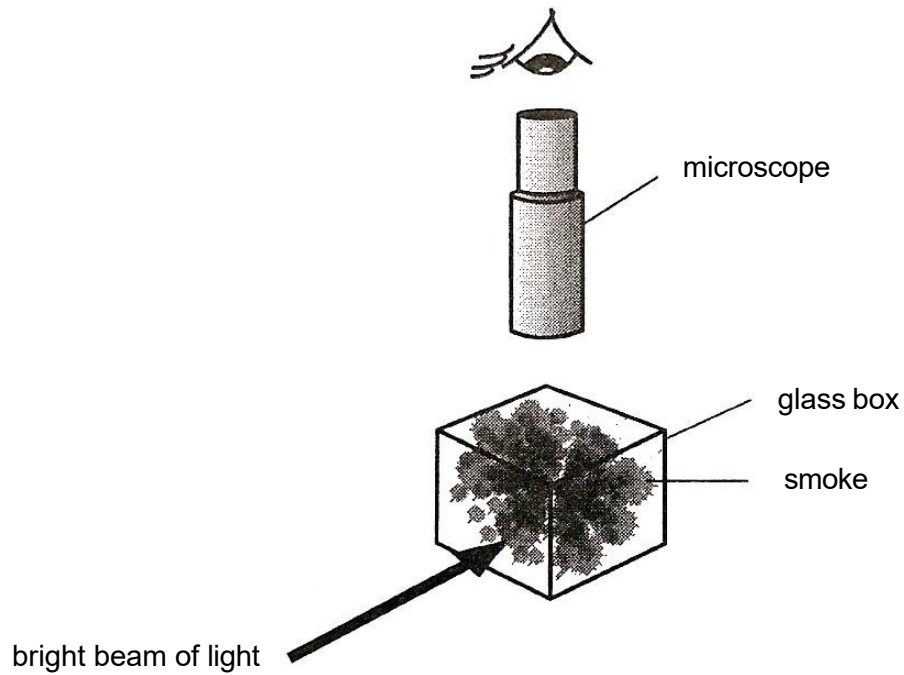
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What causes this motion?

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- 6 Which of the following has the weakest forces of attraction between its particles at room temperature?
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  - C sugar
  - D water



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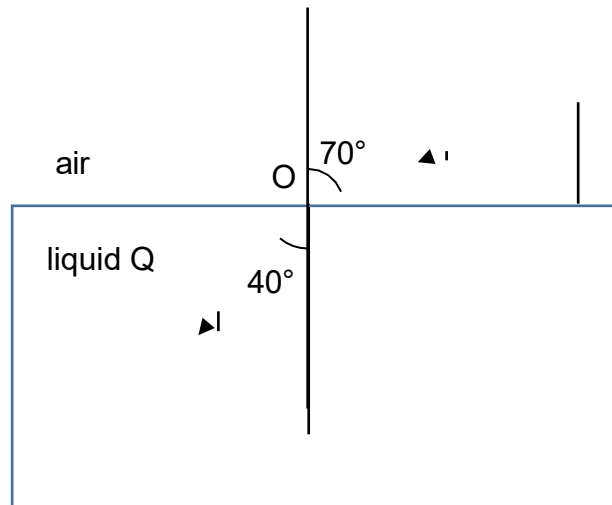
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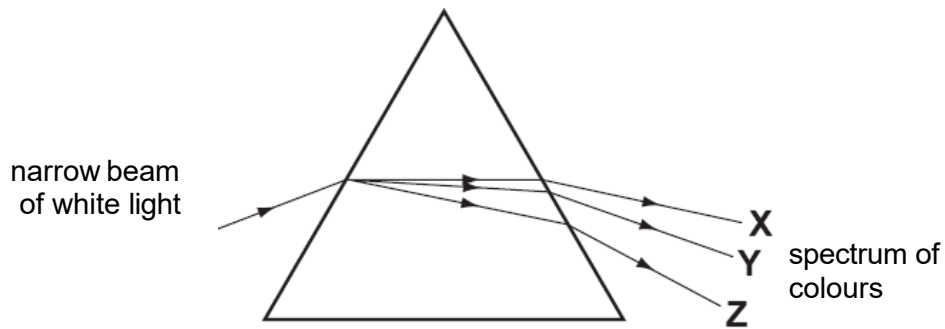
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- B**  $40^\circ$
- C**  $50^\circ$
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What is the distance between the boy and the object?

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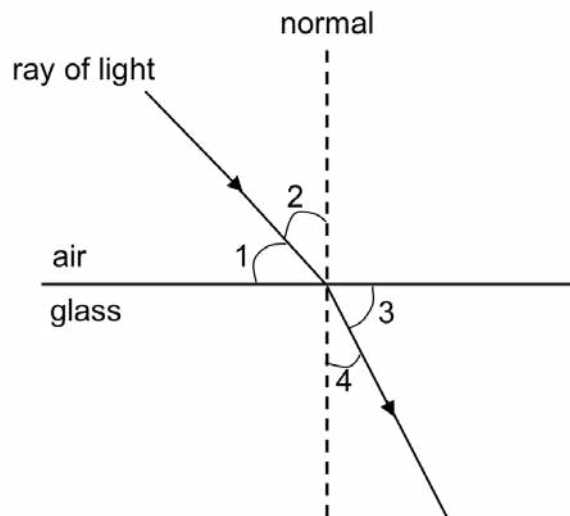
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	X	Y	Z
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B	red	violet	yellow
C	red	yellow	violet
D	yellow	red	violet

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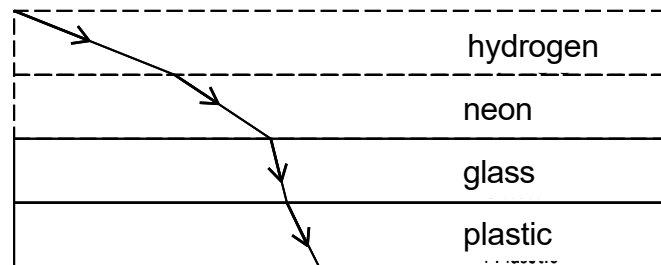
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Which of the following options ranks the four substances in increasing order of optical density?

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- B hydrogen, neon, glass, plastic
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**ANSWERS FOR LIGHTS STRUCTURED QUESTIONS**

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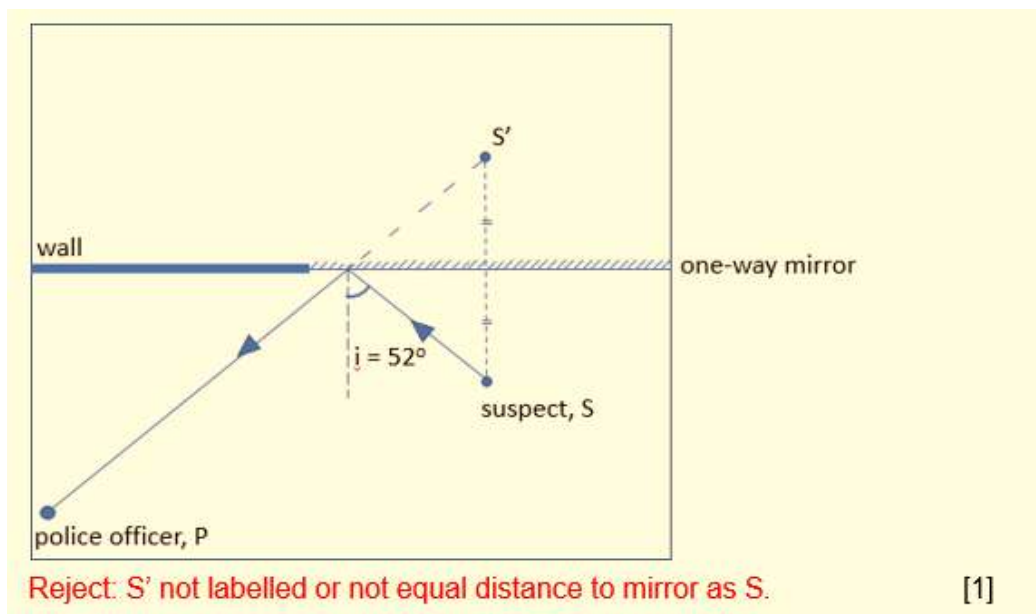
One-way mirrors use a thinner coat, which allows some light to pass through, but most light is reflected. In Fig 9.1, a suspect in a police station can only see his reflection in the mirror, while being observed by a police officer in the same room.

- (a) State the *Law of Reflection*.

The angle of incidence is equal to the angle of reflection. OR  
The incident ray, reflected ray, normal all lie on the same plane.

[1]

- b (i) On Fig 9.1, draw and label the position of the suspect's image, S'. [1]



- (ii) State what is meant by the *angle of incidence*.

The angle between the normal and the incident ray.

[1]

- (iii) Draw a light ray to show how the police officer, P, can see the reflection of the suspect in the one-way mirror. [2]

- Dotted lines behind the mirror
- Arrow from suspect to officer
- ECF if (i) was incorrect.

- c. Another officer on the other side of the mirror will be able to observe the suspect. However, the suspect would appear to be darker. Explain why this happens.

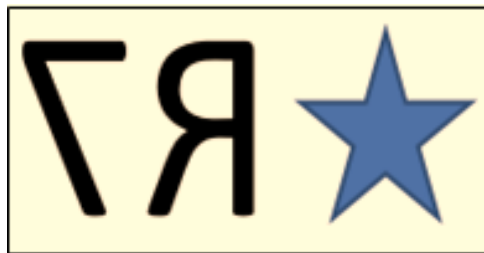
**Some light is reflected, less light passes through from the suspect to the officer.**

[1]

- d The suspect is wearing a shirt with the following print and is facing the mirror.



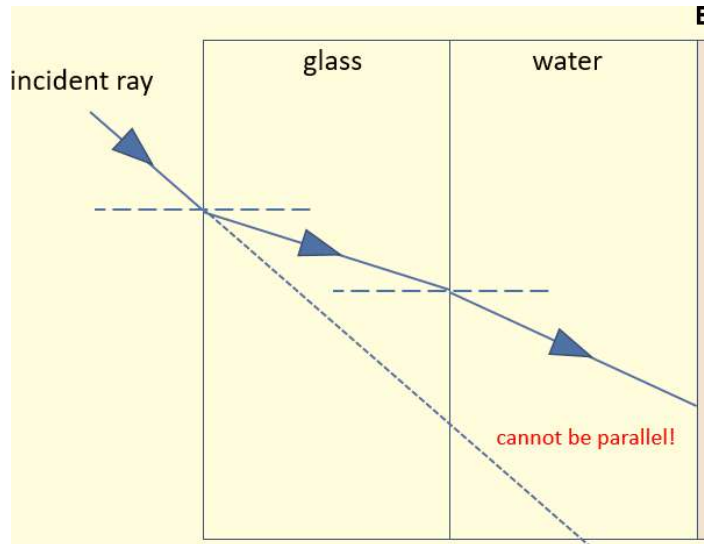
In the space below, draw the image of the shirt in the mirror as seen by the suspect.  
[1]



2 An object in water tends to appear differently due to the bending of light.

- a (i) Fig 10.1 shows a light ray is incident onto a layer of glass before entering water.

Complete the diagram to show how the light ray travels from air to water and reaches the other end, B. [2]



**Fig. 10.1**

- (ii) State and explain what will happen to the light ray if the water layer was replaced with a medium that is optically less dense than water.

When compared to water, the light ray will **bend further away** from the normal.

Reject: bend up/down

ECF awarded if drawing was wrong

The **speed of light increases** as it enters the new medium, but more when compared with water.

[2]

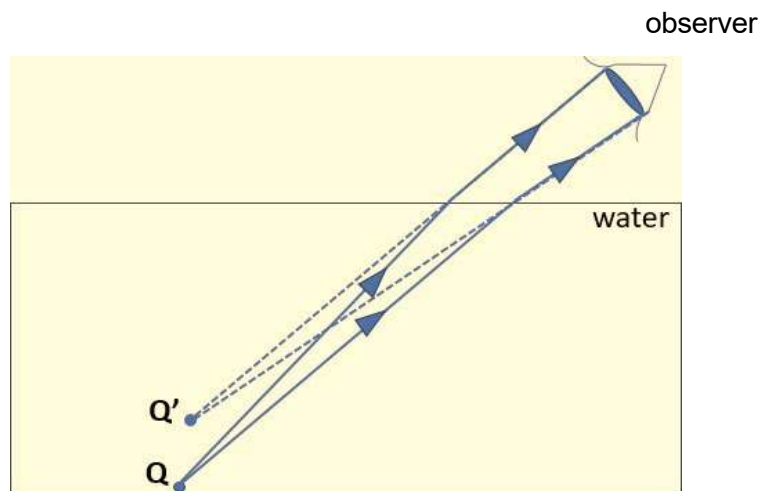
b Fig 10.2 shows an object, Q, submerged under water.

- (i) On Fig 10.2, indicate the image of the object, Q', as seen by the observer.

Q' should be **elevated** (and possibly closer to eye) [1]

- (ii) Draw 2 rays to show how Q can be seen by an observer that is above the water's surface.

dotted lines straight to Q' Solid lines to Q.  
Penalty for no arrows / wrong direction of arrows [1]

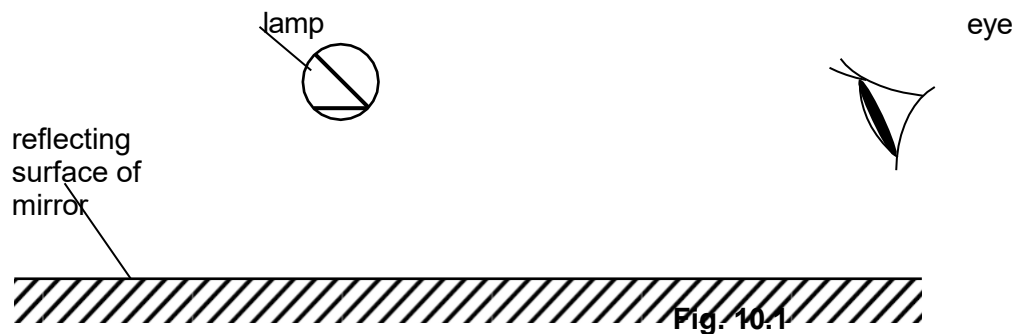


**Fig. 10.2**

- (iii) The object is blue in colour. State and explain how the object appears under yellow light.

The object will appear black. [1]  
Yellow consists of red and green light.  
**All light is absorbed OR no light will be reflected** into the eyes. [1]

- 3 (a) Fig. 10.1 shows a lamp that emits red light being placed in front of a plane mirror and an observer's eye.

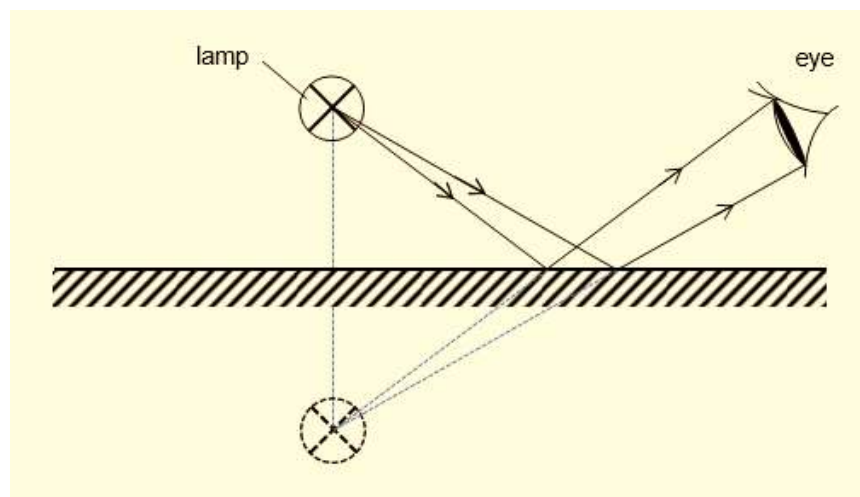


The mirror forms an image of the lamp.

- (i) State two characteristics of an image formed by a plane mirror. [1]

upright, virtual, laterally inverted, same size as the object, same distance behind the mirror as the object is in front of it. [any 2]

- (ii) On Fig. 10.1, draw the image of the lamp. [1]



- (iii) By drawing two rays of light from the centre of the lamp in Fig. 10.1, show how the observer sees the image of the lamp.

[2]

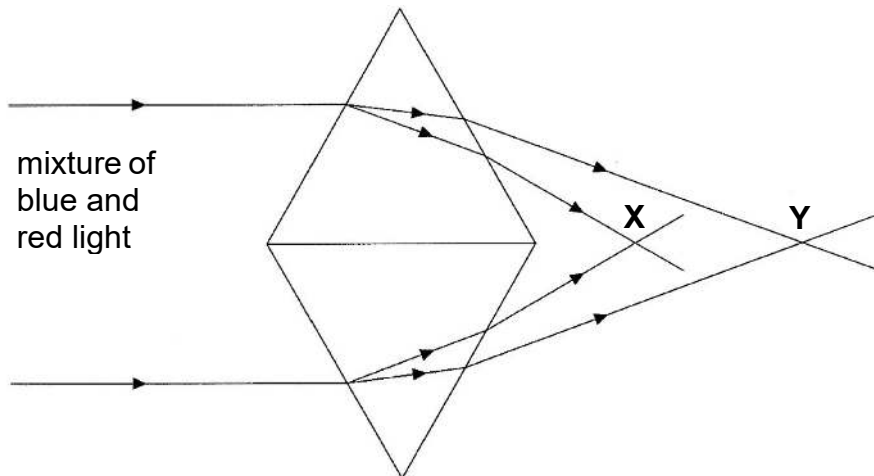
correct construction of ray from object into the eye  
using of broken/dotted lines for construction, arrows on rays

- (b) A beam of light is made up of a mixture of red and blue light.

- (i) If the beam of red and blue light is shone on a yellow object with white dots, state the colour of the object. [1]

red object with magenta dots

- (ii) The beam of light is shone through two glass prisms arranged as shown in the Fig. 10.2.



**Fig. 10.2**

State the colour that is focussed at point X and Y. [1]

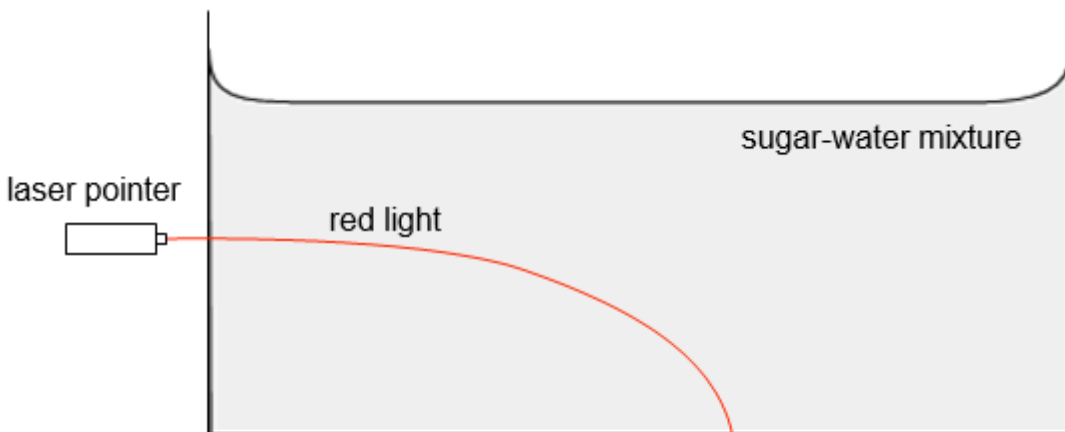
X: blue .....

Y: red .....

- (iii) Explain why one of the colours bends more than the other when they enter the prism. [2]

Different colour lights travels at different speed in the glass prism.  
Red light travels faster than blue lights and will bend less than blue light.

- (c) Fig. 10.3 shows a tank containing a sugar-water mixture. As the sugar was left to dissolve in water without stirring, there is a higher concentration of sugar at the bottom and nearly pure water near the top. When a ray of red light from a laser pointer is shone into the tank, it is observed that the red light bends downward as shown in Fig. 10.3.



**Fig. 10.3**

Explain why the ray of light curves downwards as it travels through the sugar-water mixture [2]

The optical density of the sugar-water mixture is not uniform; it is denser at the bottom. As the light passes through the sugar-water mixture, successive refraction occurs and bends the light downwards.

Total [10]

4 When light hits a surface, it is reflected, following the laws of reflection.

a. State one Law of Reflection. [1]

**Either:** The angle of incidence is equal to the angle of reflection.

**OR:** The incident ray, reflected ray and the normal at the point of incidence all lie in the same plane.

b. Light falling on a sheet of white paper is reflected but no image is produced.

(i) State the type of reflection that would occur on a sheet of white paper. [1]

Diffuse/irregular reflection

(ii) Figure 9.1 shows the path of three light rays incident on a sheet of white paper. Complete the path of the light rays, showing all necessary working. [2]

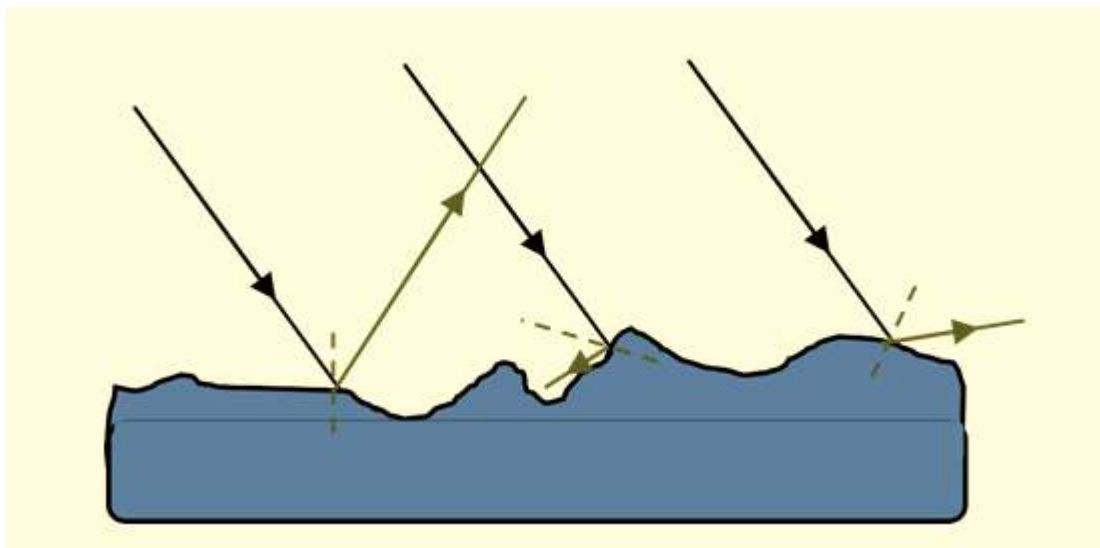
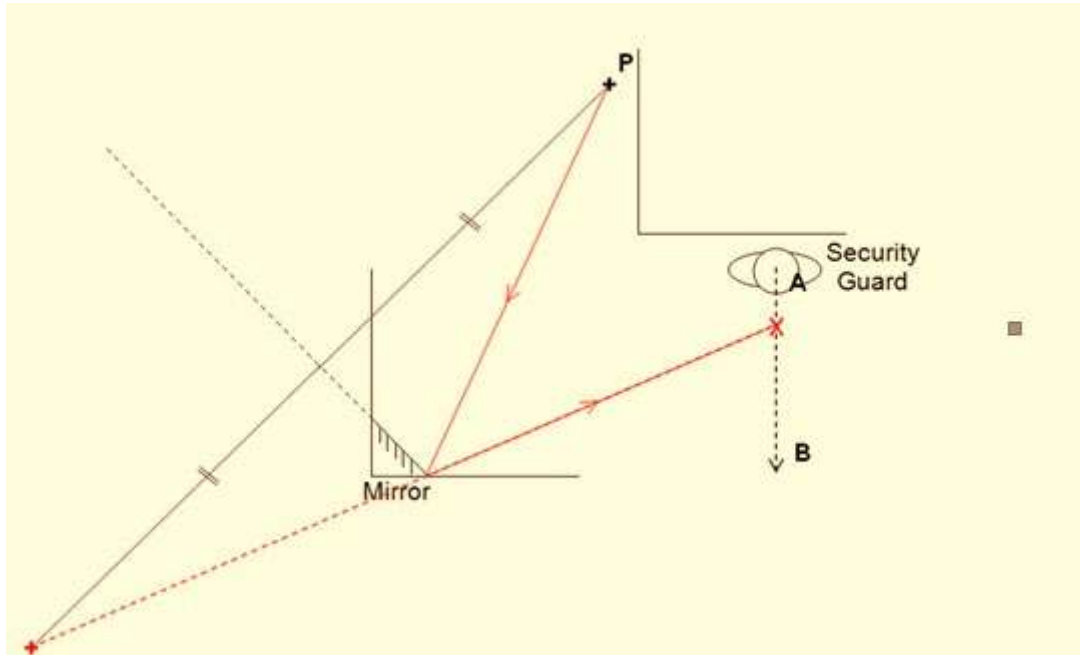


Figure 9.1

- c. A security guard at point **A** in a museum uses a mirror to keep watch on an exhibit at point **P**. The location of the exhibit is marked with a +.



- (i) On the diagram above, mark with a + the location of the image of the exhibit, showing all relevant construction lines. [2]

extension of mirror surface as reference plane  
 construction line showing object distance = image distance

- (ii) The security guard walks towards point **B** in the direction of the arrow. Mark with an **X** the farthest that the guard can walk along line **AB** and still see the exhibit in the mirror. Show all relevant construction lines. [3]

dotted line from + to the security guard  
 Solid line representing actual light ray from P  
 Arrows on the actual light ray

**Total [9]**