

**ST EDWARD'S  
OXFORD**



**13+ Entrance Examination**

**For Entry in  
September 2017**

**Science**

**1 hour**

**Candidate Name: .....**

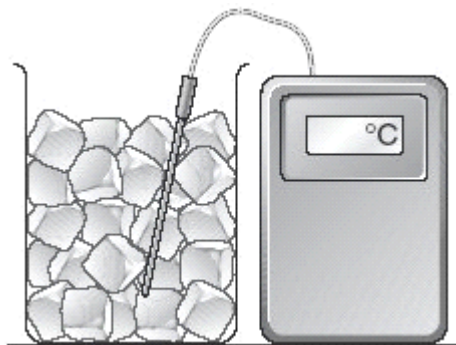


1. (a) Draw a line from each change of state to the correct name.  
Draw only **four** lines.

change of state	name
solid to liquid	evaporating
liquid to gas	melting
gas to liquid	condensing
liquid to solid	freezing

3 marks

- (b) Kate made some ice cubes from pure water.  
She used a sensor to measure the temperature of the ice.



What temperature will the sensor show when the ice is melting?

..... °C

1 mark

- (c) Kate made some more ice cubes from salt solutions. She used a different amount of salt in each ice cube.

The table shows the temperature at which the ice cubes melted.

mass of salt in each ice cube (g)	temperature ice cube melted (°C)
5	-4
10	-8
15	-11
20	-15

Look at the table above.

As the mass of salt increased, what happened to the temperature at which the ice cube melted?

.....

1 mark

- (d) In very cold weather a mixture of salt and sand is spread on roads.

Why are salt **and** sand used?

Tick the **two** correct boxes.

Salt makes the roads white.

Sand dissolves in water.

Salt makes water freeze.

Sand increases friction between car tyres and the road.

Salt makes ice melt.

Sand makes water freeze.

2 marks

maximum 7 marks

2. Paul had four substances:

citric acid

copper sulphate

indigestion tablet

sugar

He dissolved 1 g of each substance in 20 cm<sup>3</sup> of distilled water.  
He used universal indicator to find the pH of each solution.

(a) (i) Sugar solution does **not** change the colour of green universal indicator.

What does this tell you about sugar solution?  
Tick the correct box.

It is an acid.

It is an alkali.

It is neutral.

It is sweet.

1 mark

(ii) Suggest the pH of citric acid.

.....

1 mark

(iii) Indigestion tablets neutralise acid in the stomach.

What does this tell you about indigestion tablets?

.....

1 mark

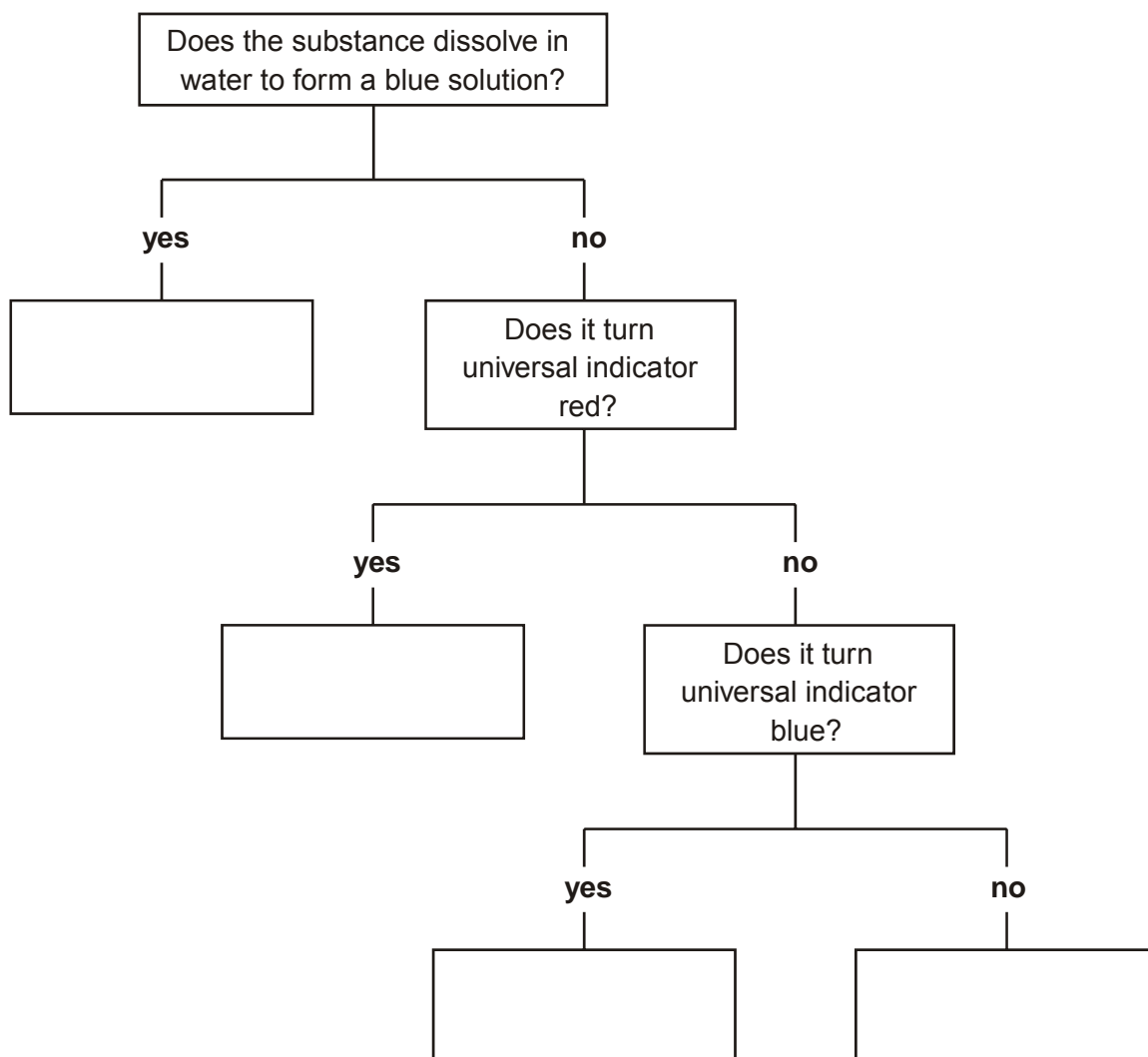
(b) Complete the flow chart below with the names of the substances in the boxes.

citric acid

copper sulphate

indigestion tablet

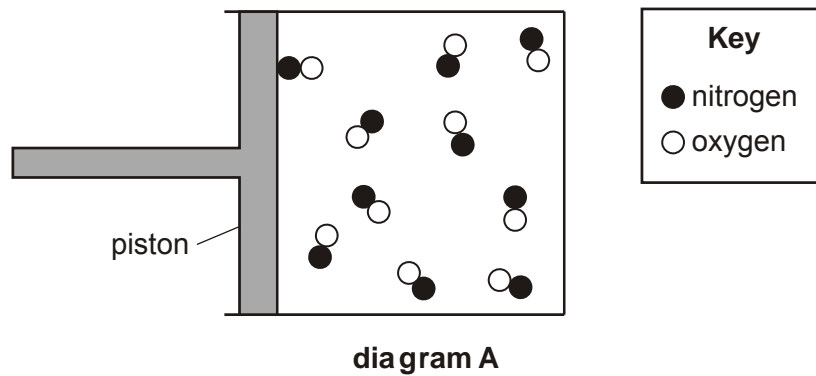
sugar



3 marks

maximum 6 marks

3. Diagram A represents a gas in a container.  
The gas can be compressed by moving the piston to the right.



- (a) (i) How can you tell that the substance in the container is a gas?

.....  
 .....

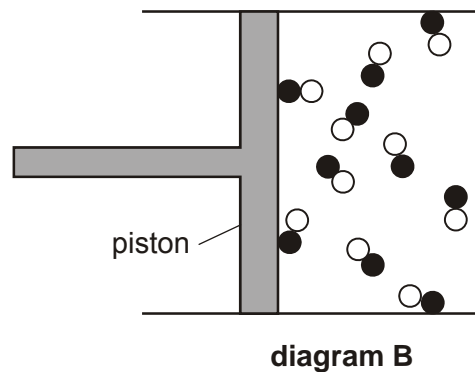
1 mark

- (ii) How can you tell from the diagram that the gas is pure?

.....  
 .....

1 mark

- (b) The piston is moved to the right as shown in diagram B.



How can you tell, from diagram B, that the pressure of the gas has increased?

.....  
 .....

1 mark

- (c) Diagram **C** shows what happened to the molecules after the gas was compressed more.

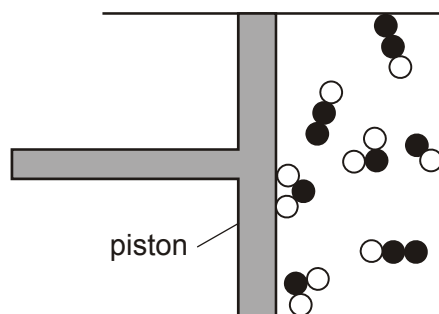


diagram **C**

- (i) How can you tell that a chemical reaction happened when the gas was compressed?

.....  
 .....

1 mark

- (ii) The mass of the gas in both diagrams **B** and **C** was 0.3 g.

Why did the mass of the gas **not** change when it was compressed?

.....  
 .....

1 mark

- (iii) Complete the table below with the correct chemical formula of each substance. Use the key to help you.

substance	formula
●○	
●●○	
● ○ ○	

Key
● nitrogen
○ oxygen

1 mark

- (iv) What is the **name** of the substance represented by the symbol ●○?

.....

1 mark

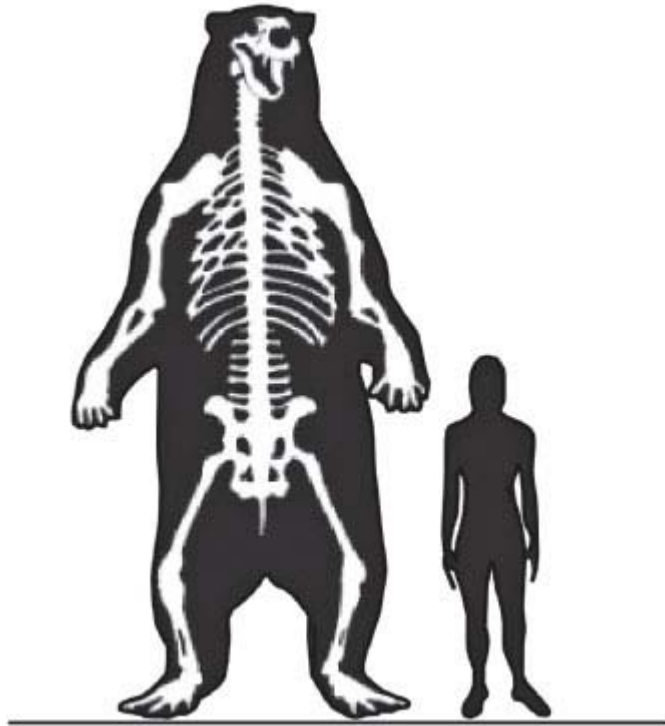
maximum 7 mark



4.

A small number of fossil bones from a very large bear was found in South America in 1935.

The bones were estimated to be about one million years old. Scientists used these bones to predict the shape and size of the bear. The diagram shows the bear and a person who is 165 cm tall.



(a) (i) Estimate the height of the bear.

(2)

answer = ..... cm

(ii) Which process occurs in animal cells that results in growth?

(1)

.....

....

(b) Explain why scientists can only make predictions about the size and shape of animals when working from fossil evidence.

(3)

.....

.....

.....

.....

.....

.....

**(Total for question = 6 marks)**

5.

Two students, X and Y, investigated how exercise affected breathing rate.

They recorded their breathing rate at rest.

Their breathing rate was then measured each minute during 5 minutes of exercise.

The results of the investigation are shown in the table.

exercise time / minutes	breathing rate / breaths per minute	
	student X	student Y
0 (at rest)	11	12
1	14	17
2	17	24
3	23	27
4	26	32
5	28	35

(a) The breathing rate of student X increased by 17 breaths per minute during the investigation.

Calculate the increase in the breathing rate of student Y from rest to 5 minutes of exercise.

(1)

..... breaths per minute

(b) Suggest a reason for the difference in the overall increase in the breathing rate between students X and Y.

(1)

.....

.....

(c) Explain why the breathing rate of the students changed during the exercise.

(1)

.....

.....

.....

.....

.....

.....

(d) Complete the sentence by putting a cross (☒) in the box next to your answer.

During the exercise gases pass into and out of the blood by

(1)

- A active transport
- B diffusion
- C osmosis
- D transpiration

(e) Which substance supplies the energy used by muscles during exercise?

Place a cross (☒) in the box next to your answer.

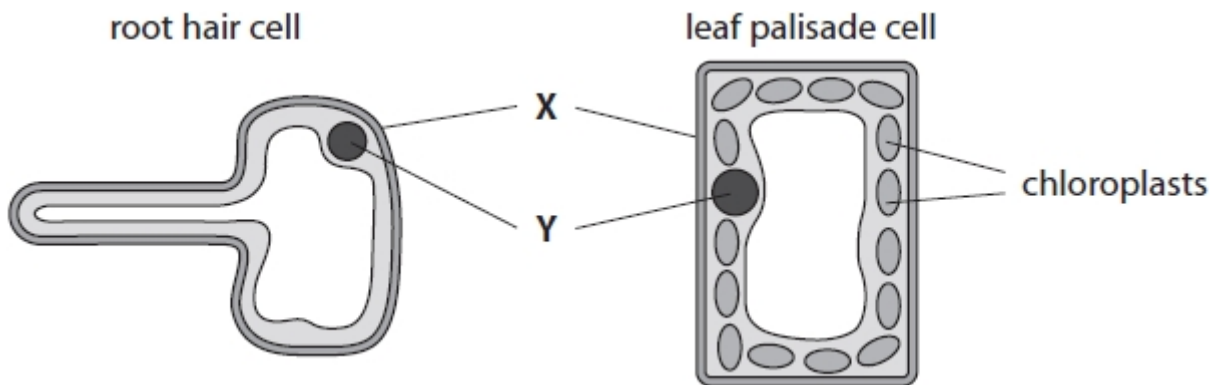
(1)

- A water
- B oxygen
- C glucose
- D lactic acid

(Total for question = 5 marks)

6.

The diagrams show a root hair cell and a leaf palisade cell.



(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

The part labelled X is the

(1)

- A nucleus
- B cell wall
- C cytoplasm
- D vacuole

(ii) Describe the role of part Y.

(2)

.....

.....

.....

.....

(iii) Draw one straight line from each type of cell to the function of that cell.

(2)

**Type of cell**

**Function**

root hair cell ●

leaf palisade cell ●

● photosynthesis

● transports mineral ions to the leaves

● absorbs water from the soil

● transports sugar to the roots

● prevents transpiration

**(Total for question = 5 marks)**

7.

(i) The kingdom Animalia includes vertebrates and invertebrates.

Complete the sentence by putting a cross (☒) in the box next to your answer.  
Vertebrates have

(1)

- A a supporting rod running the length of their body
- B cells that contain chloroplasts
- C the ability to feed saprophytically
- D the ability to feed autotrophically

(ii) There are several groups of vertebrate.

Which group absorbs oxygen using gills?  
Put a cross (☒) in the box next to your answer.

(1)

- A birds
- B fish
- C mammals
- D reptiles

**(Total for question = 2 marks)**

8.

Living cells need a constant supply of oxygen and nutrients.

Describe how oxygen is transported around the body by the blood.

(2)

.....

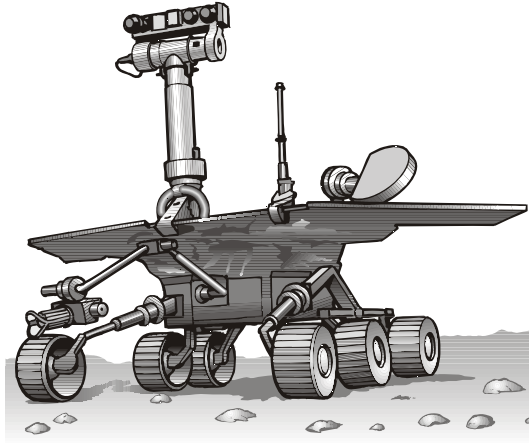
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**Total for question = 2 marks)**

9 The drawing below shows a space buggy on the surface of Mars.



- (a) The distance between Earth and Mars is 192 000 000 km.  
It took a spacecraft 200 days to take the buggy from Earth to Mars.  
Calculate the speed at which the spacecraft travelled.  
Give the unit.

.....  
.....

2 marks

- (b) The weight of the buggy was 105 N on Earth and 40 N on Mars.  
Why was the weight of the buggy less on Mars than on Earth?

.....  
.....

1 mark

- (c) The buggy uses solar panels to generate electrical energy.  
The solar panels generate less electrical energy on Mars than on Earth.  
Give a reason why.

.....  
.....

1 mark

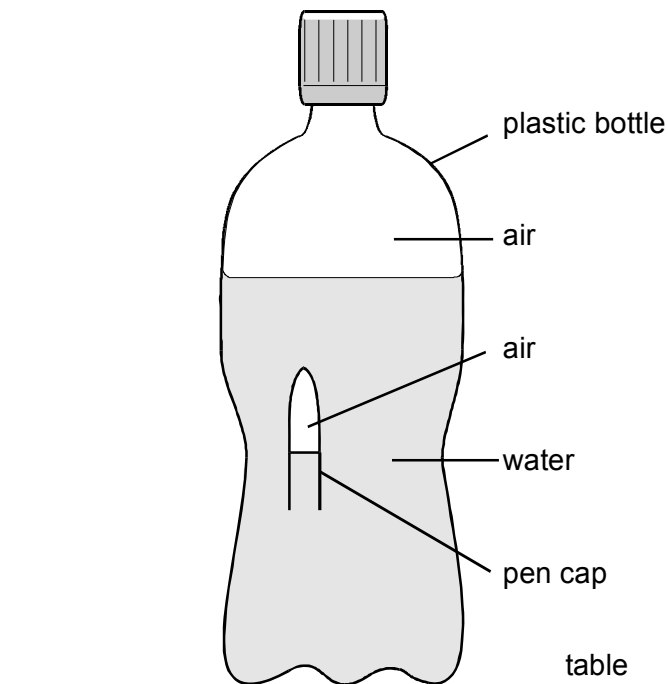


- (d) The weight of the buggy was 40 N on Mars.  
When the buggy landed on Mars it rested on an area of 0.025 m<sup>2</sup>.  
Calculate the pressure exerted by the buggy on the surface of Mars.  
Give the unit.

.....  
.....

2 marks  
maximum 6 marks

10. A pen cap floats in a plastic lemonade bottle three-quarters full of water.  
If you squeeze the bottle the pen cap sinks to the bottom.  
If you then let go of the bottle, the pen cap floats to the surface.



(a) When the bottle is squeezed what, if anything, happens to:

(i) the distance between the air molecules inside the bottle?

.....

1 mark

(ii) the distance between the water molecules inside the bottle?

.....

1 mark

(iii) the pressure of the air trapped inside the pen cap?

.....

1 mark

(iv) the volume of the air trapped inside the pen cap?

.....

1 mark

(b) Explain why the pen cap sinks when you squeeze the bottle.

.....

.....

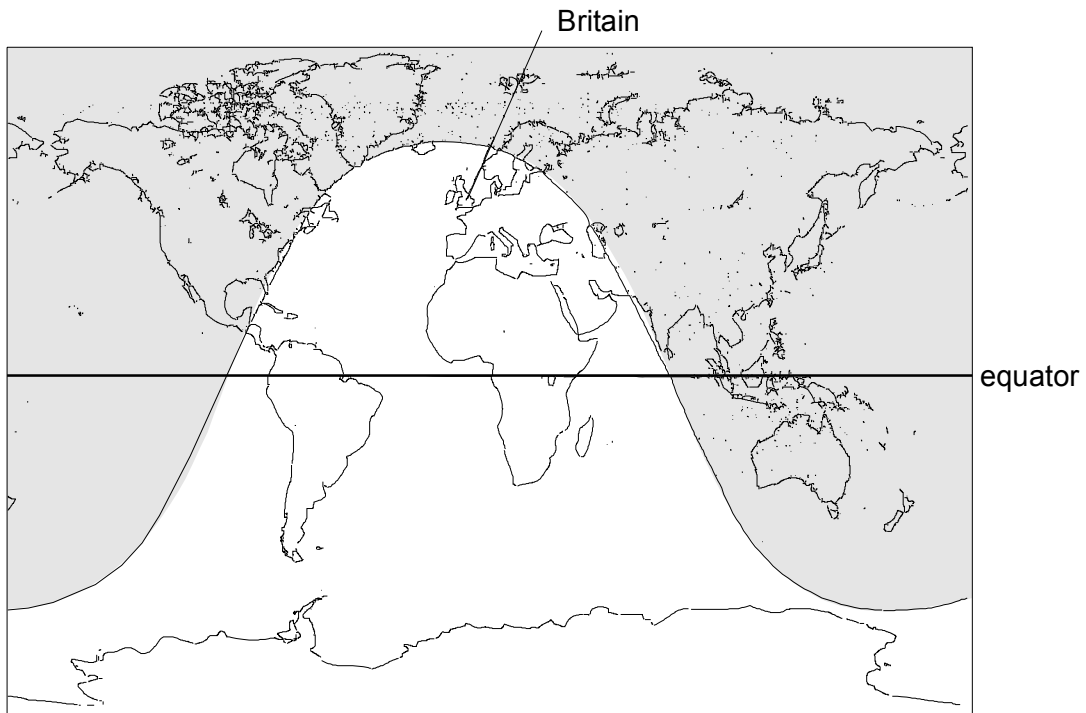
.....

.....

2 marks

Maximum 6 marks

11. (a) The diagram shows a map of the world.



The shaded areas show where it is night-time at one moment in the year.

- (i) At the time shown on the map, what season is it in Britain?  
Give a reason for your answer.

.....  
.....

1 mark

- (ii) At the time shown on the map, approximately what is the time in Britain?

.....

1 mark

(b) The map below shows a different pattern of night and day.



The pattern of night and day shown on the map occurs in only **two** months of the year. Which months are these?

- 1. ....
- 2. ....

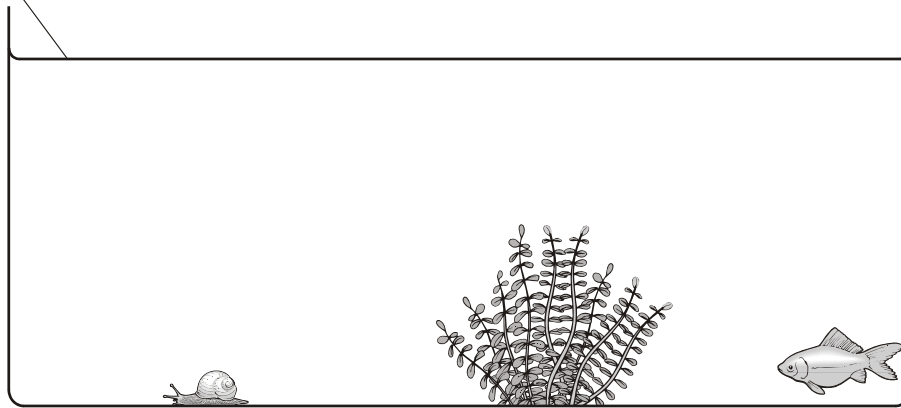
2 marks  
Maximum 4 marks

12. (a) The diagram below shows a fish tank.

The surface of the water acts like a mirror.

The fish can see the snail reflected in the surface of the water.

surface  
of water  
(mirror)

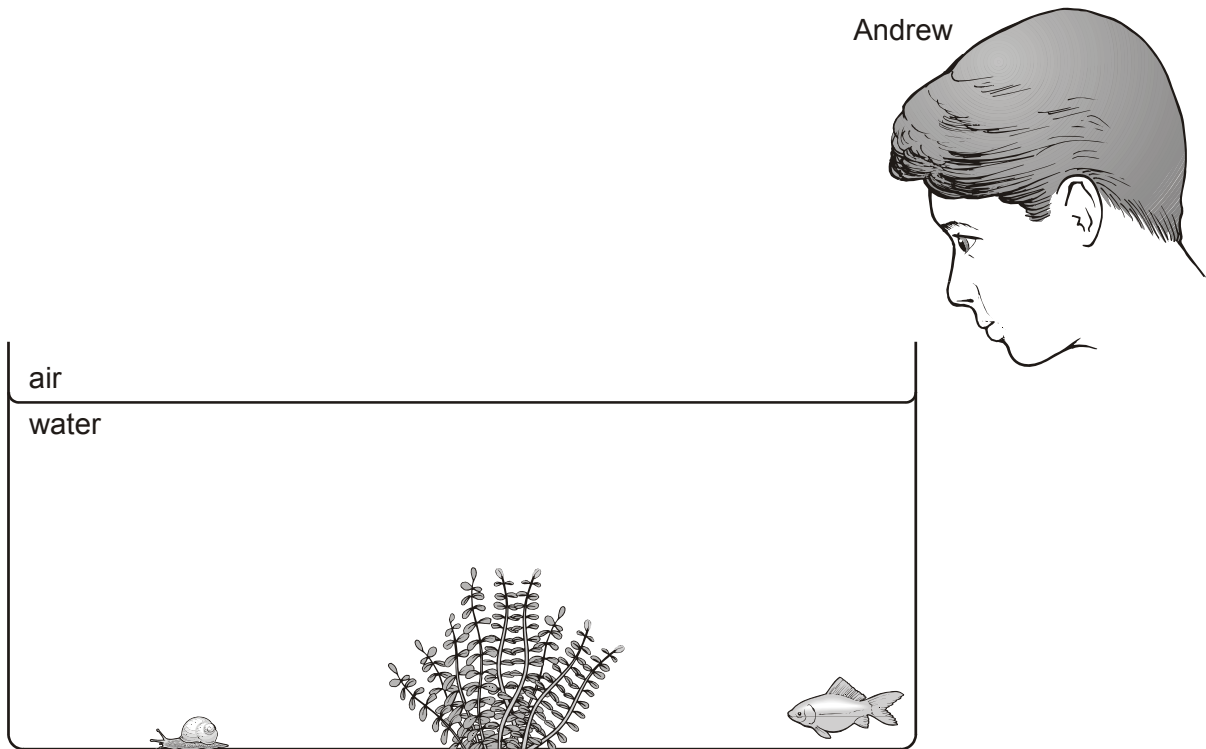


Draw a ray of light which passes from the snail, and reflects from the surface, to show how the fish can see the snail. Use a ruler.

Put arrows on the ray of light.

3 marks

(b) Andrew is looking at the snail.



When a ray of light passes from water to air it changes direction.

(i) Draw a ray of light from the snail to Andrew to show how Andrew can see the snail. Use a ruler.

Put arrows on the ray of light.

2 marks

(ii) What is the name given to this change in the direction of a ray of light?

.....

1 mark

maximum 6 marks