The King's School, Canterbury

Entrance Examinations (13+)

2009

Science

One Hour

This paper contains 11 questions on biology, chemistry and physics. Attempt as many questions as you can.

There are 72 marks available.

You should show each step in your working and all rough work should be done on this paper.

You may use a calculator.

Name:_____

Present School:_____

Total:	**/72**	**%**

1. <u>Underline</u> the word or phrase which best completes each of the following sentences.

(a) Plants use carbon dioxide and water in photosynthesis to make

fats **protein** **sugars** **minerals**

(b) A prehistoric food chain is: Tree Fern → Triceratops → Tyrannosaurus rex.

Triceratops is a

producer **herbivore** **predator** **carnivore**

(c) Egg cells in a mammal are made in the

uterus **ovaries** **liver** **intestines**

(d) Plant leaves can be tested for starch using

Benedict's solution **the Biuret test** **alcohol** **iodine solution**

(e) Equal volumes of four samples of water were heated to evaporate them completely. The one which left the greatest amount of solid residue was

distilled water **rain water** **sea water** **tap water**

(f) An example of an acid is

vinegar **limewater** **salt water** **baking soda**

(g) A substance not found naturally but made from a raw material is

coal **polythene** **sand** **wood**

(h) The test for oxygen gas is

it burns with a squeaky pop **it extinguishes a burning splint**

it relights a glowing splint **it turns limewater cloudy**

(i) Speed can be measured in

cm/s **cm^2/s** **s/cm** **cm/s^2**

(j) A moving car is said to have

potential energy **kinetic energy** **electrical energy** **thermal energy**

(k) An example of a non-renewable energy resource is:

wave **hydroelectric** **wind** **coal**

(l) Compared with sound light travels

a little faster **a little more slowly** **much faster** **much more slowly**

maximum 12 marks

2. The drawings show six living things.
They spend all or part of the time in water.

tadpole
A

trout
B

duck
C

crocodile
D

water vole
E

frog
F

not to scale

Look at the drawings.

(a) (i) Give the letter of **one** living thing that uses gills to take in oxygen.

.....

1 mark

(ii) Give the letter of **one** living thing that is covered in scales.

.....

1 mark

(b) Use a word from the list below to fill the gap in the sentence.

lungs **legs** **eyes** **backbones**

The trout, duck, crocodile, water vole and frog are all called vertebrates because they have .....

1 mark

(c) The trout spends all of its time in water.

Give **one** way the trout is suited for moving in water.

.....

.....

1 mark

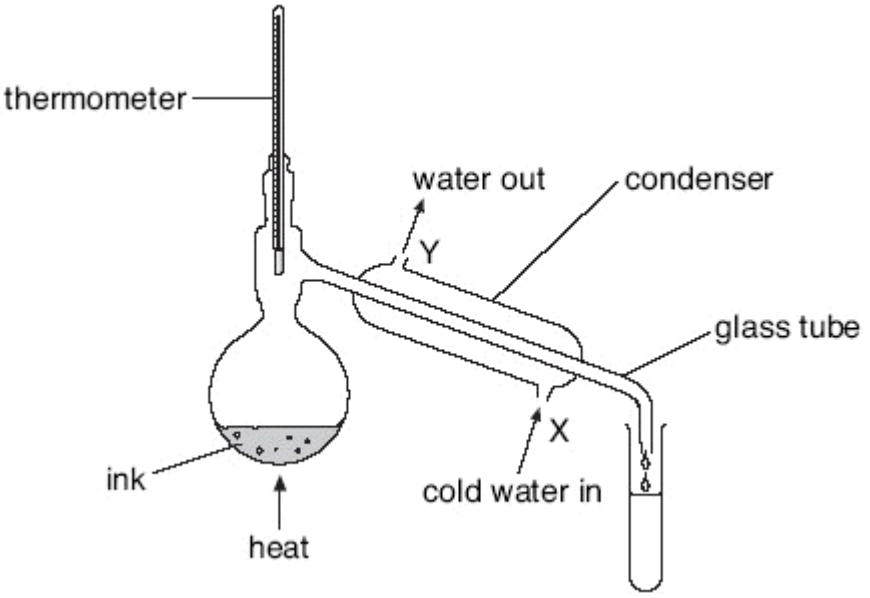
(d) Draw a line from each animal below to the group it belongs to.
Draw only **three** lines.

animal	**group**
frog	reptiles
crocodile	mammals
water vole	amphibians

2 marks

maximum 6 marks

3. Rema used the apparatus below to distil 100 cm^3 of water-soluble ink.



apparatus A

not to scale

(a) Which processes occur during distillation?
Tick the correct box.

condensation then evaporation	☐
evaporation then condensation	☐
melting then boiling	☐
melting then evaporation	☐

1 mark

(b) Give the name of the colourless liquid that collects in the test-tube.

.....

1 mark

(c) What would the temperature reading be on the thermometer when the ink has been boiling for two minutes?

.....°C

1 mark

(d) (i) Water at 15°C enters the condenser at X.
Predict the temperature of the water when it leaves the condenser at Y.

.....°C

Explain this change of temperature.

.....

.....

1 mark

(ii) Give **two** ways in which the water vapour changes as it passes down the glass tube in the condenser.

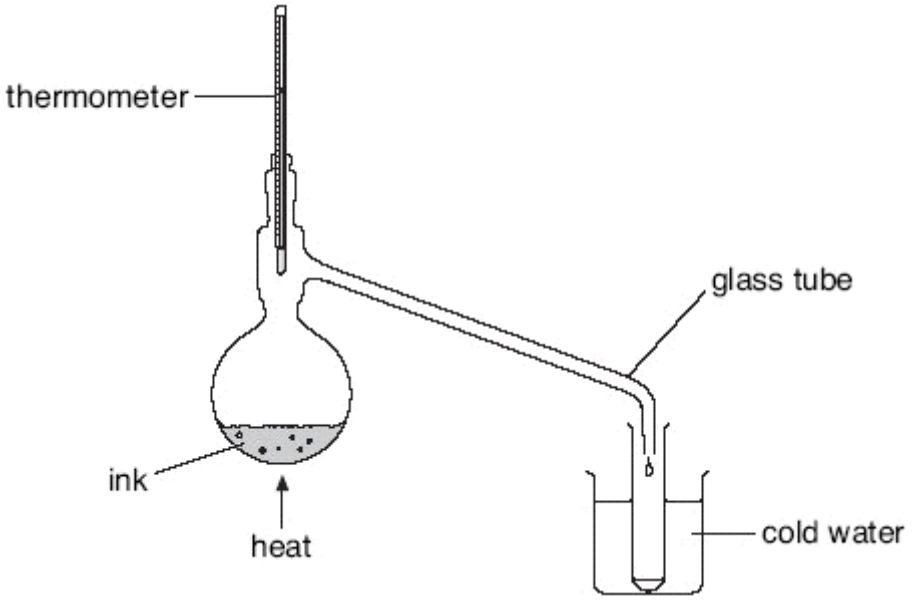
1. .....

1 mark

2. .....

1 mark

(e) Peter used the apparatus below to distil 100 cm^3 of water-soluble ink.



apparatus B

not to scale

Why is the condenser in **apparatus A** better than the glass tube and beaker of water in **apparatus B**?

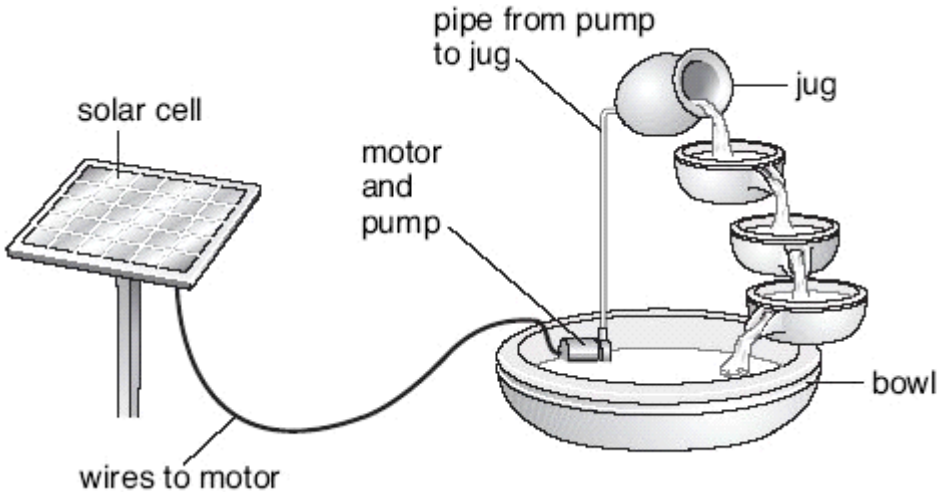
.....

.....

1 mark

maximum 7 marks

4. The drawing below shows a garden water feature. It is solar-powered.



The solar cell absorbs energy from the Sun.
The solar cell is connected to a motor in the bowl.
The motor drives a pump.
Water is pumped up to the jug and it flows back down to the bowl.

(a) Use the information above to help you to complete the following sentences. Choose words from the list.

chemical	**electrical**	**gravitational potential**	**kinetic**
light	**sound**	**thermal**	

(i) The useful energy change in the solar cell is from

light to ..... energy.

1 mark

(ii) The useful energy change in the motor is from

electrical energy to ..... energy.

1 mark

(iii) As the water flows from the jug to the bowl ..... energy is

changed into ..... energy.

2 marks

(b) Give **one** advantage and **one** disadvantage of using a solar cell to power the water feature.

advantage .....

.....

1 mark

disadvantage .....

.....

1 mark

maximum 6 marks

5. The drawings below show four living things found in a wood.

owl

oak tree

blackbird

caterpillar

not to scale

- Caterpillars eat oak leaves.
- Owls eat blackbirds.
- Blackbirds eat caterpillars.

(a) (i) Complete the food chain for these four living things.

oak tree → ..... → ..... → .....

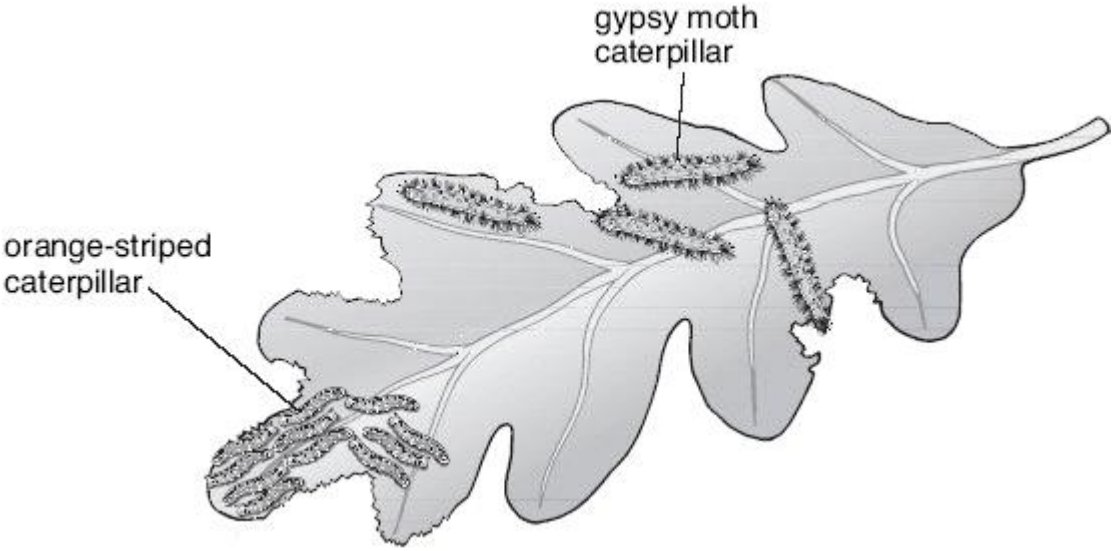
1 mark

(ii) Why is an oak tree called a producer?
Tick the correct box.

It loses its leaves in autumn.	☐	It makes food by photosynthesis.	☐
Its flowers are tiny.	☐	Its leaves will **not** rot.	☐

1 mark

(b) On one oak tree, there were two types of caterpillar.



not to scale

All the caterpillars were eating the leaves.
The number of gypsy moth caterpillars increased.

What happened to the number of orange-striped caterpillars?

.....

1 mark

Explain your answer.

.....

.....

1 mark

(c) There are **no** caterpillars on the oak tree in winter.

Suggest a reason for this.

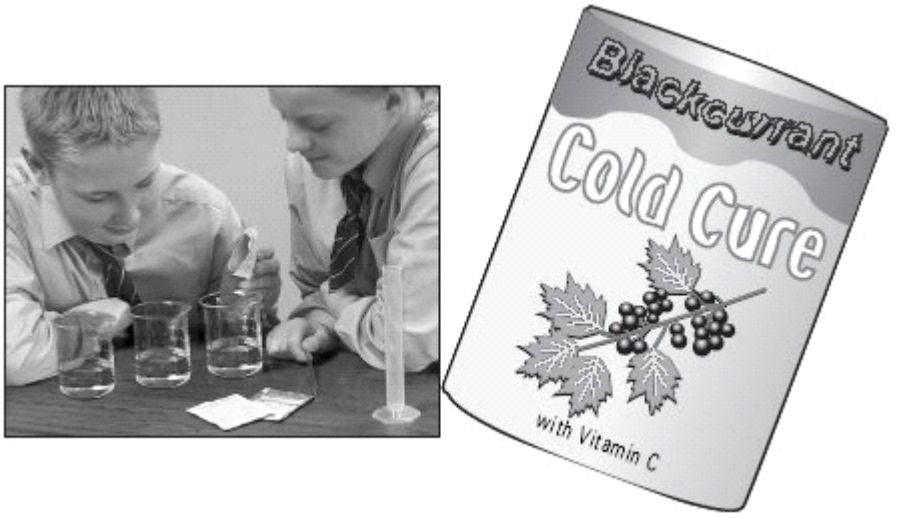
.....

.....

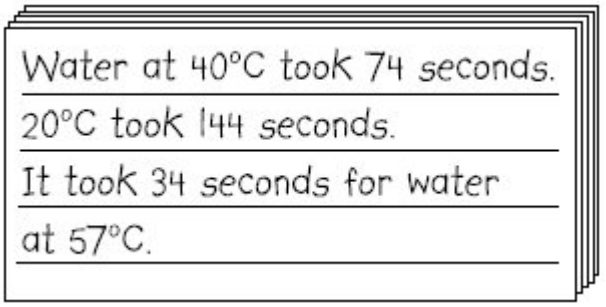
1 mark

maximum 5 marks

6. Emma and Philip wanted to see if changing the temperature of the water affected the time taken for a cold cure powder to dissolve in water.



Philip recorded their results.



(a) (i) Write the heading for the first column in the table below.

..... (°C)	**time to dissolve (s)**

(ii) Write their results correctly in the table above.

3 marks

(b) Give the names of **two** pieces of measuring equipment they would need.

1. .....

1 mark

2. .....

1 mark

(c) Why did they put the same amount of water in each beaker?

.....

.....

1 mark

(d) Emma wrote, ‘My investigation was good’, as her conclusion.

Philip said this was **not** a scientific conclusion.

Explain why Emma’s conclusion is **not** scientific.

.....

.....

1 mark

(e) Look at their results above.

Write a scientific conclusion for their investigation.

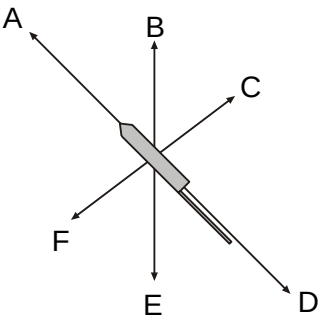
.....

.....

1 mark

maximum 8 marks

7. The diagram shows a firework rocket.



(a) Three forces act as the rocket flies through the air.
Which arrows show the directions of these three forces?

....

3 marks

(b) When there is no fuel left, the rocket falls to the ground.

(i) Give the name of the force which pulls it down.

.....

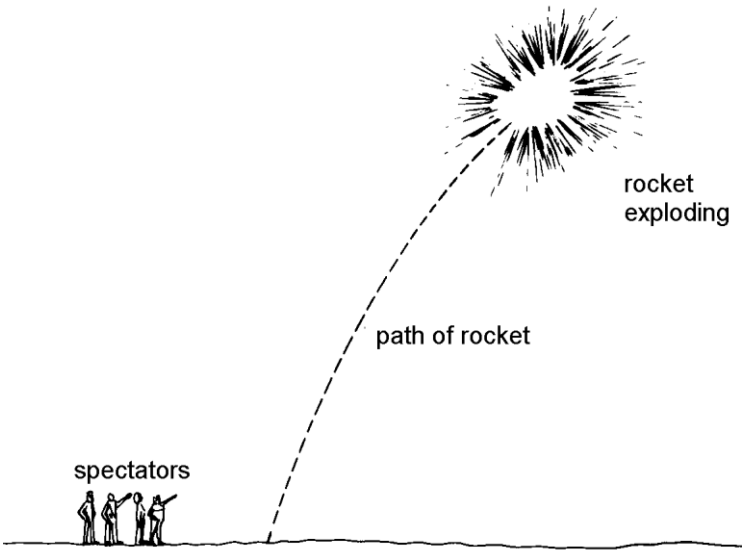
1 mark

(ii) Give the name of the force which acts against the motion of the rocket.

.....

1 mark

(c) Another rocket was sent high into the air. It exploded with a loud bang and a bright flash of light.



Put a tick in the box by the correct statement.

the bright flash of light was seen first	☐
the loud bang was heard first	☐
the flash of light was seen and the bang was heard at the same time	☐

1 mark

Give a reason for your answer.

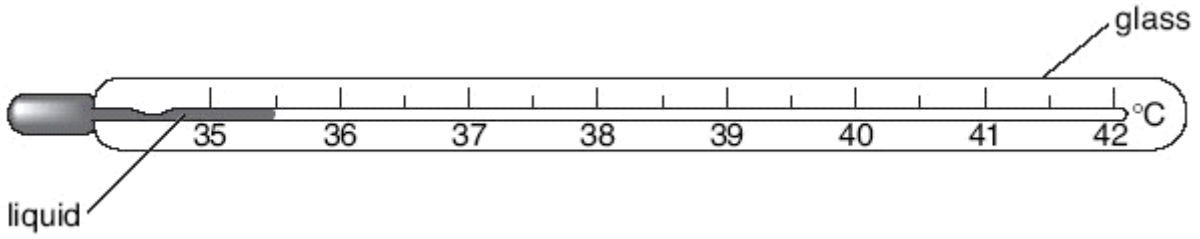
.....

.....

1 mark

Maximum 7 marks

8. The thermometer drawn below can be used to measure the temperature of the human body.



(a) (i) What is the lowest temperature **this** thermometer can measure?

.....°C

1 mark

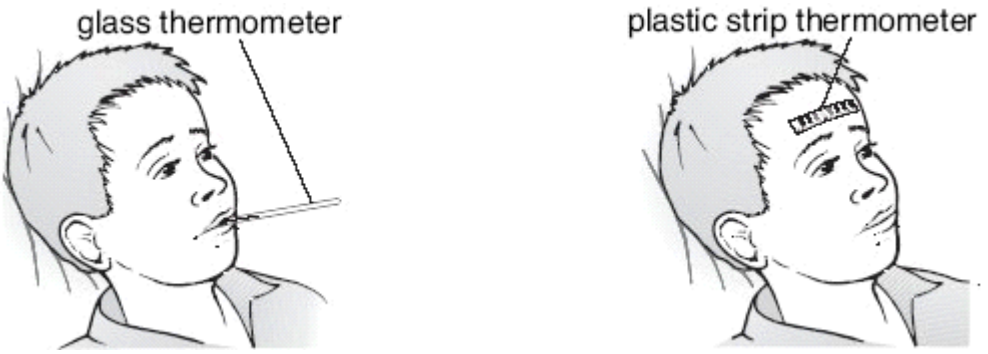
(ii) What is the normal temperature of the human body?
Tick the correct box.

37ºC	☐	39ºC	☐	41ºC	☐

1 mark

(iii) When we are ill our temperature may go up.

A nurse can measure a child's temperature with two different thermometers as shown below.



Give **one** reason why it is safer to use a plastic strip thermometer than a glass thermometer.

.....

.....

1 mark

(b) Viruses are micro-organisms that can make us ill.

Give the name of **one** other type of micro-organism that can make us ill.

.....

1 mark

(c) Alcohol and mercury are two liquids that can be used in glass thermometers. The table gives information about these liquids.

liquid	**boiling point (°C)**	**colour**
alcohol	78	colourless
mercury	357	shiny grey

(i) A red dye is added to the colourless alcohol used in thermometers. Suggest a reason for this.

.....

.....

1 mark

(ii) Choose words from the list below to fill the gaps in the sentences.

gas **liquid** **solid**

When alcohol and mercury boil they both change from a liquid to

a.....

1 mark

A thermometer containing mercury can be used to measure the temperature of an oven at 150°C because mercury is a ..... at 150°C.

1 mark

Maximum 7 marks

9. Table 1 below shows the colour of universal indicator in acidic, neutral and alkaline solutions.

	acidic ←			**neutral**	**alkaline** →		
colour of indicator	red	orange	yellow	green	blue	dark blue	purple

table 1

Ramy tested different liquids with the indicator solution.
His results are shown in table 2 below.

liquid	**colour of indicator solution**
Milk	green
lemonade	orange
water	green
fruit juice	red
washing-up liquid	blue

table 2

(a) Use Ramy's results to answer the following questions.

(i) Give the name of **one** acidic liquid in **table 2**.

.....

1 mark

(ii) Give the name of **one** neutral liquid in **table 2**.

.....

1 mark

(b) Ramy dissolved some bicarbonate of soda in distilled water.
This produced an alkaline solution.

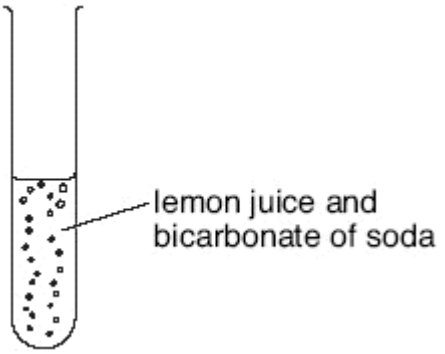
(i) Ramy added the indicator to the alkaline solution.

Suggest what colour the indicator became.
Use **table 1** to help you.

.....

1 mark

(ii) Ramy added lemon juice to the solution of bicarbonate of soda.



How could he tell that a gas was produced?

.....

1 mark

(c) Ramy mixed an acid with an alkali and tested the mixture with the indicator solution.
The indicator solution turned green.

What is the name of the reaction between an acid and an alkali?
Tick the correct box.

condensation ☐

crystallisation ☐

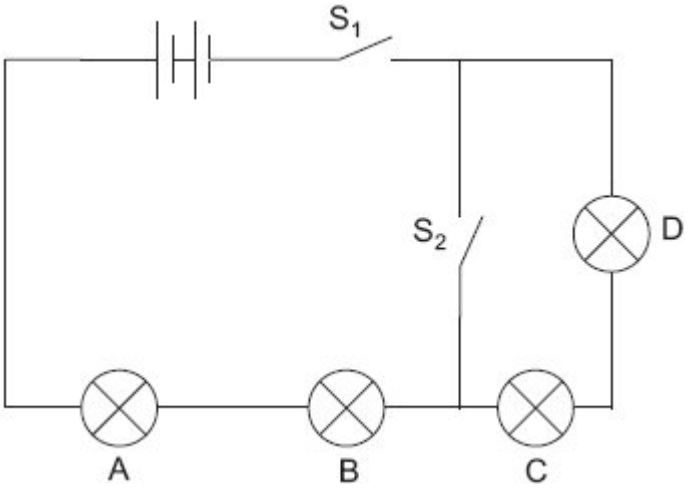
evaporation ☐

neutralisation ☐

1 mark

maximum 5 marks

10. Lorna built the circuit drawn below. All the bulbs are identical.

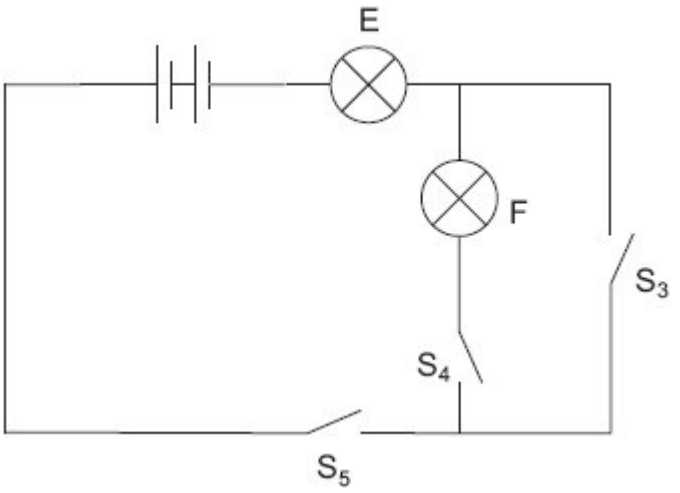


(a) Complete the table below by writing **on** or **off** for each bulb.

switch		**bulb**			
S_1	**S_2**			**A**	**B**
open	open			off	off
open	closed				
closed	open				
closed	closed				

3 marks

(b) Lorna then built a different circuit as shown below.



How could Lorna get both bulbs to light at the same time in this circuit?

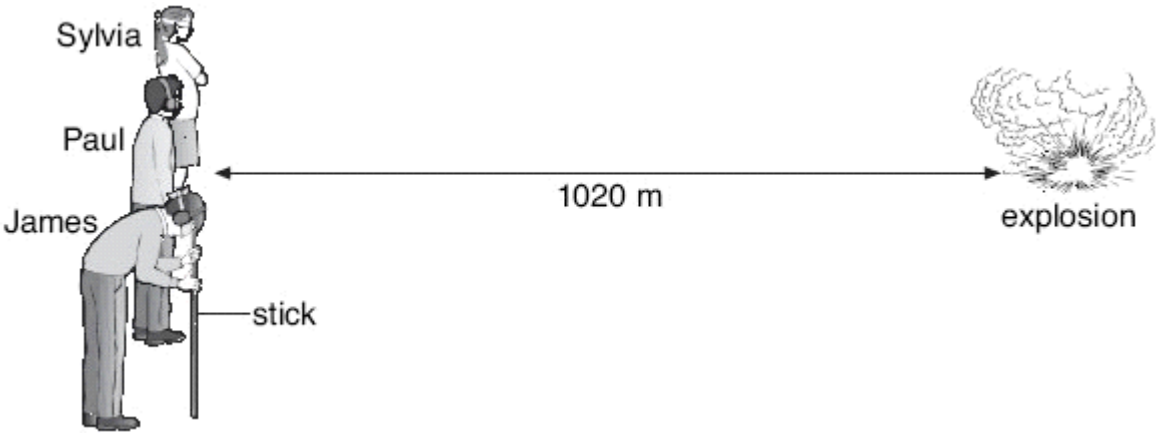
.....

.....

1 mark

maximum 4 marks

11. Three pupils took part in an investigation into the speed of sound.
All three pupils stood 1020 m from an explosion.



- Sylvia wore a blindfold.
- Paul wore ear defenders.
- James wore a blindfold **and** ear defenders. He rested his head on a wooden stick pushed into the ground so that he could feel vibrations.

The explosion produced sound and light at the same time.
The table shows the speed of sound in two different materials.

material	**Speed of sound (m/s)**
air	340
soil	3200

(a) Use all the information above to help you answer parts (i) and (ii) below.

(i) In which order would the pupils notice the explosion?

first .....

second .....

third .....

1 mark

(ii) From the information given, calculate the time it would take for the sound to travel through the air to Sylvia.

.....

..... **s**

1 mark

(b) Another pupil, Nasah, stood 2000 m away from the explosion.

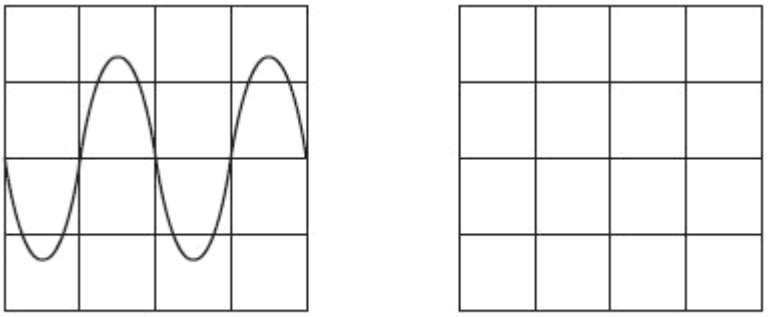
(i) The sound heard by Nasah was quieter than the sound heard by Sylvia.
The further sound travels the quieter it becomes.
Give the reason for this.

.....

.....

1 mark

(ii) The oscilloscope trace below represents the sound Sylvia heard.



The sound Nasah heard was quieter but the pitch was the same.

On the right-hand grid, draw the trace to show the pattern of the sound Nasah heard.

2 marks

maximum 5 marks

END OF EXAMINATION