ST EDWARD'S
OXFORD

13+ Entrance Examination

For Entry in

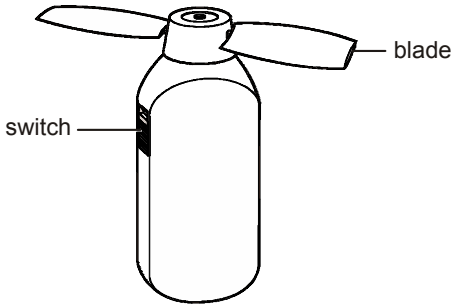
September 2016

Science

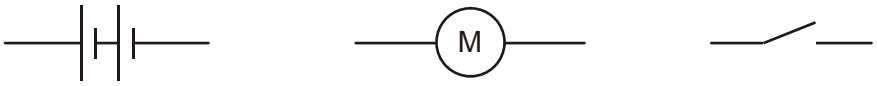
1 hour

Candidate Name: ……

1. Susan has a small fan to keep herself cool.
When she switches it on, a motor turns the blades to blow air.



(a) The diagrams below show the symbols for a battery, a motor and a switch.



battery motor switch

In the space below, draw a series circuit diagram for the fan using these symbols.

1 mark

(b) (i) Which part provides energy for the circuit?

.....

1 mark

(ii) Some of this energy is used to turn the blades.
The rest of the energy is wasted.

Complete the sentence below. Choose words from the list.

chemical **heat** **light** **sound**

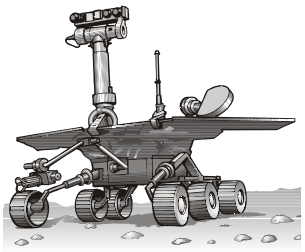
1 mark

When the blades are turning, energy is wasted as

..... energy and ..... energy.

1 mark

Total: 4 marks



2. 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^2.

Calculate the pressure exerted by the buggy on the surface of Mars.

Give the unit.

.....

.....

2 marks

TOTAL: 6 marks

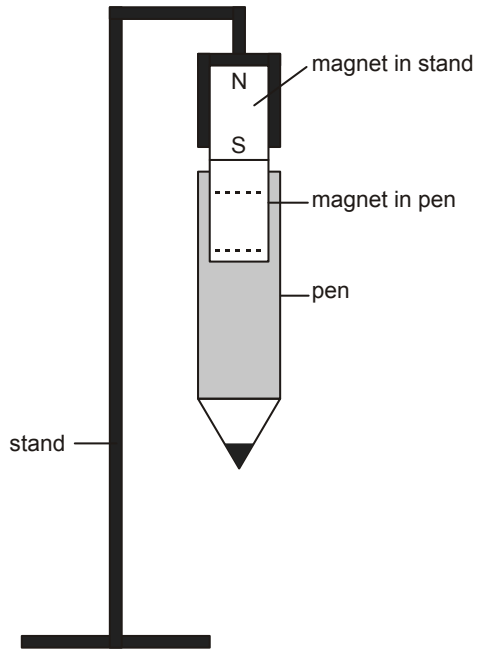
3. The diagram below shows a pen.

The pen is held up by two magnets, one in the stand and the other in the pen.

(a) **On the dotted lines to the right**, label the North pole and the South pole of the magnet in the pen.

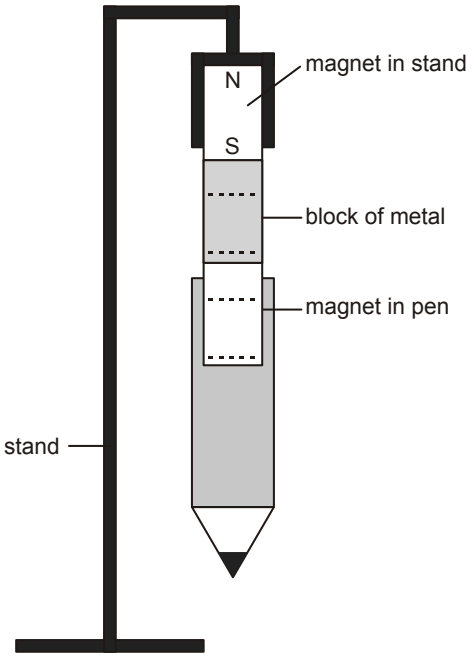
Use the letters N and S.

1 mark



(b) John put a block of metal between the two magnets as shown below.

The block of metal became a magnet.



(i) **On the dotted lines to the left**, label the North poles and the South poles of both the block of metal **and** the magnet.

Use the letters N and S.

1 mark

(ii) What metal could the block be made of?

.....

1 mark

(c) John repeated the experiment using a piece of wood instead of a block of metal.
The pen did **not** stay up.
Give the reason for this.

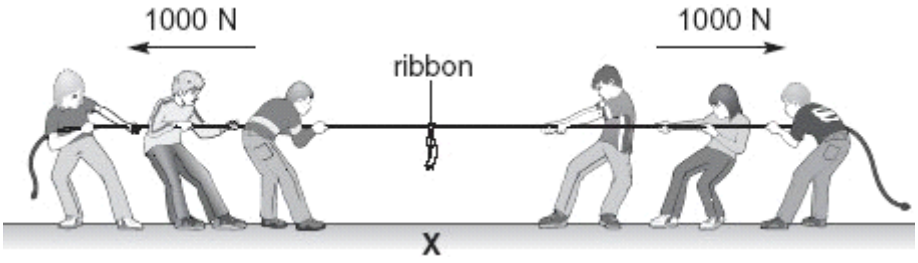
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1 mark

TOTAL: 4 marks

4. The drawings in parts (a), (b) and (c) show two teams of pupils in a tug-of-war.
There is a ribbon tied to the middle of the rope.

(a) The sizes and directions of the forces of each team are shown.



team A **team B**

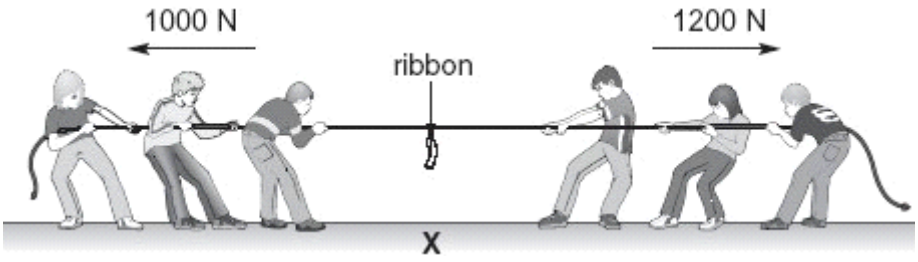
The ribbon stays above point X on the ground.
Give the reason for this.

.....

.....

1 mark

(b) The teams then pull with the forces shown below.

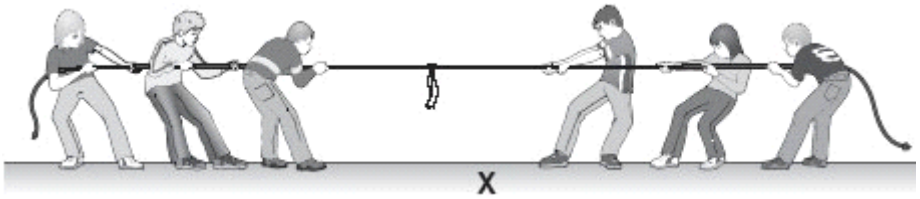


team A **team B**

Draw an arrow on the rope to show the direction in which the ribbon will move.

1 mark

(c) Later, the ribbon was to the left of point X as shown below.



team A **team B**

Why did the ribbon move towards the left?

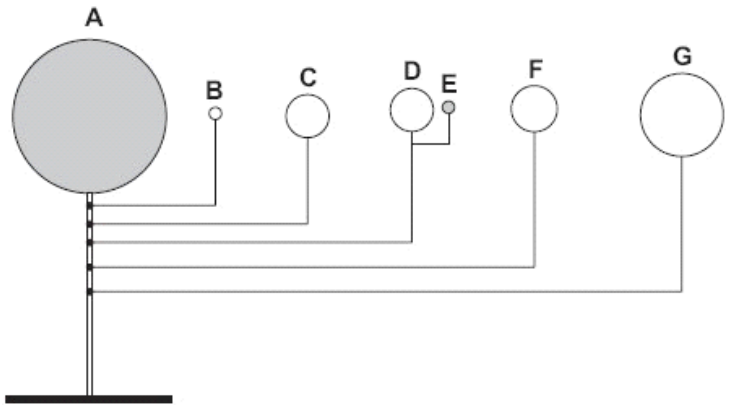
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1 mark

TOTAL: 3 marks

5. (a) Alfie made a model of part of the solar system.
He used metal balls for the Sun, the Moon and the planets.



E goes around D.

B, C, D, F and G go around A.

Give the letter that is used to label:

(i) The model Sun;

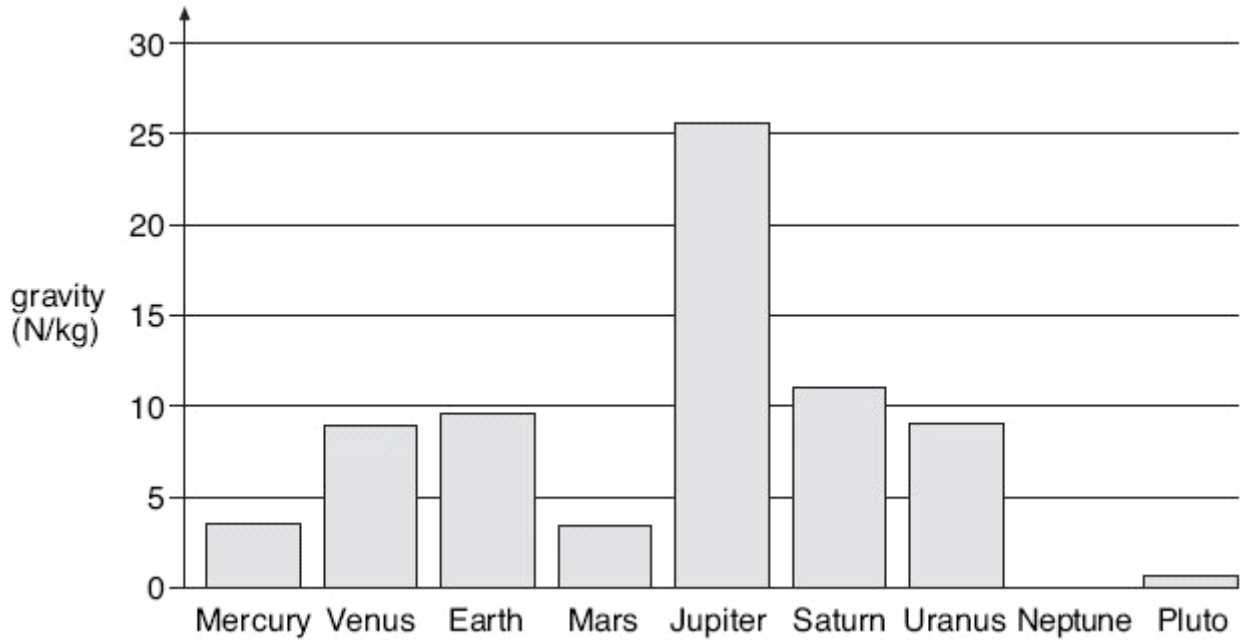
.....

(ii) The model Earth and Moon;

..... and .....

2 marks

(b) The bar chart shows the force of gravity on eight of the planets.



(i) The gravity on Neptune is 12 N/kg.

On the chart above, draw a bar for the planet Neptune.
Use a ruler.

1 mark

(ii) Give the name of a planet where you would weigh more than you weigh on Earth.

.....

1 mark

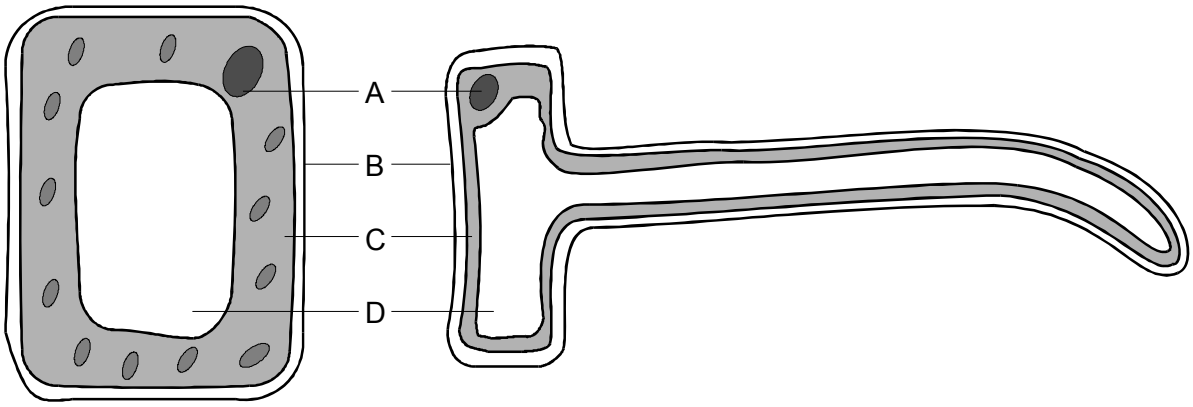
(iii) On which planet would a spaceship need the largest force to take off?

.....

1 mark

TOTAL: 5 marks

6. The diagrams show two plant cells.



not to scale

(a) In which part of a plant would these cells be found?

cell X ? ……

cell Y ? ……

(b) Give the name of part B. 1 mark

……

(c) (i) Give the letter which labels the nucleus. 1 mark

……

(ii) What is the function of the nucleus? 1 mark

……..

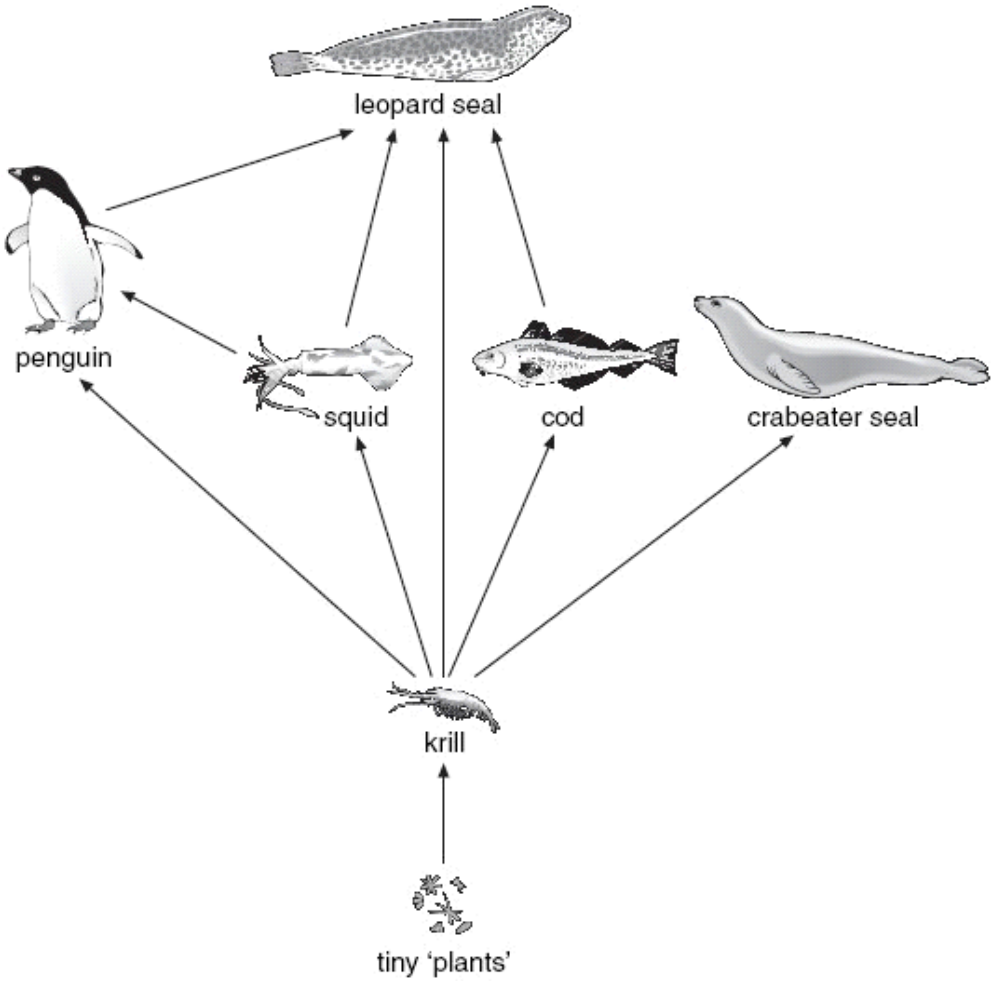
(d) (i) How can you tell from the diagram that photosynthesis **cannot** take place in cell Y? 1 mark

……

……

Maximum 6 mark

7. The drawing below shows part of a food web in the sea around Antarctica.



not to scale

(a) **From the food web**, give the names of **two** animals that **only** eat krill.

1. …… 1 mark

2. ……

(b) (i) Choose a word from the following list that describes the plants in a food web? Put a cross in the appropriate box.

producers	☐	predators	☐
herbivores	☐	carnivores	☐

1 mark

(ii) Krill are small animals that eat tiny plants.

Choose a word from the following list word describes krill in the food web?

producers	☐	predators	☐
herbivores	☐	carnivores	☐

1 mark

(c) Look at the food web. Leopard seals also eat krill. A decrease in the number of krill will affect the crabeater seals sooner than it affects leopard seals. Give the reason for this. 1 mark

……

……

Maximum 4 marks

8. Carbohydrate, fat and protein are three types of nutrient.

(a) Give the names of **two** other types of nutrient needed for a balanced diet. 2 marks

……

……

A balanced diet contains a variety of foods. Some food groups are shown in the table. They are labelled A to D.

			percentage of each substance in the dry mass	
food group	**example**	**carbohydrate %**	**fat %**	**protein %**
A meat and fish	liver	5	23	72
	beef	2	45	53
	cod	21	26	53
B dairy products	milk	42	33	25
	ice-cream	55	34	11
	yoghurt	68	11	21
C nuts	peanuts	9	58	33
	almonds	5	68	27
	coconut	8	83	9
D cereals and vegetables	wheat	84	2	14
	corn	86	3	11
	potatoes	90	1	9

(b) Which food group contains the highest percentage of the nutrient used by the body for growth and repair? Put a cross in the appropriate box.

Choose from the following:

A ☐ B ☐ C ☐ D ☐

1 mark

(c) Fibre is not digested but helps the digestion process.
Which food group contains the most fibre? Put a cross in the appropriate box.

Choose from the following:

A ☐ B ☐ C ☐ D ☐

1 mark

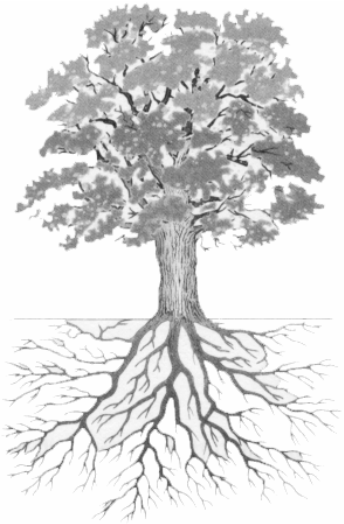
(d) Use the information in the table to suggest why milk is better for babies than ice-cream. 1 mark

……

……

Maximum 5 marks

9. The diagram shows an oak tree in summer.



(a) By the time winter comes, the oak tree has lost its leaves. Explain why this stops the growth of an oak tree. 1 mark

……

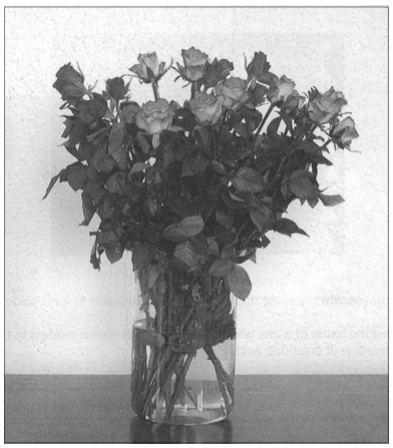
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Maximum 1 mark

10. 'Wilting roses are a thing of the past.'

Scientists at the University of Leeds have found a way to modify the genes of flowering plants.
They claim that flowers from modified plants remain fresh in a vase of water for up to six months longer than flowers from unmodified plants.



Plan an investigation you could carry out in the school laboratory to test the claim that flowers from modified plants last for much longer than flowers from unmodified plants.

You will be provided with flowers from modified plants and from unmodified plants.

In your plan give:

1. The **one** variable you will change as you carry out your investigation;
   (This is the independent variable.)
2. The variable you will measure;
   (This is the dependent variable.)
3. **one** of the variables you should control to ensure a fair test;
4. The time scale for the investigation.

……

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……

Maximum 4 marks

11. 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.

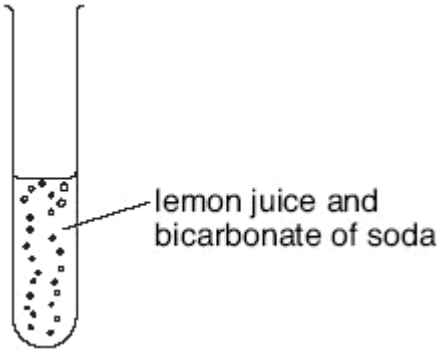
(i) Ramy added the indicator to the alkaline solution.

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.

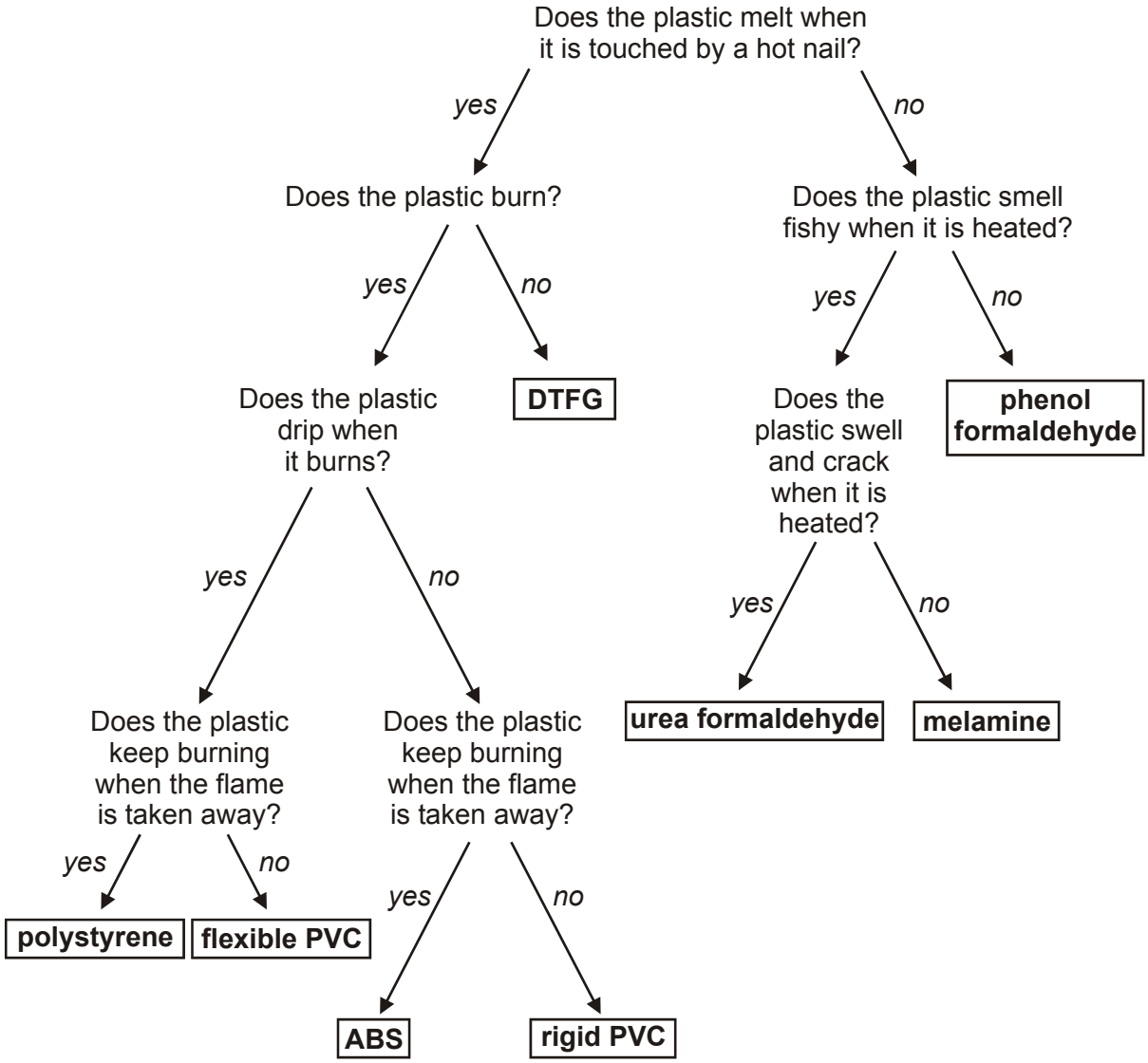
What is the name of the reaction between an acid and an alkali?
Tick the correct box.

condensation	☐
crystallisation	☐
evaporation	☐
neutralisation	☐

1 mark

maximum 5 marks

12. The following key can be used by scientists to identify plastics.



(a) Use the key to identify plastics A and B.

(i) Plastic A does not melt when it is touched with a hot nail. It gives off a fishy smell when it is heated but does not crack.

Plastic A is .....

1 mark

(ii) Plastic B melts when it is touched with a hot nail. It burns without dripping. It keeps burning even when the flame is taken away.

Plastic B is .....

1 mark

(b) The tests in the key should always be done in a fume cupboard.

Give **two** reasons why burning a plastic is dangerous.

1. .....

.....

2. .....

.....

2 marks

Maximum 4 marks

13. Some pupils made an electric cell using two different metals and a lemon.
They put strips of copper and zinc into a lemon and connected them to the terminals of an electric clock.



(a) Look at the photograph.

What evidence is there that they have made an electric cell?

.....

1 mark

(b) The pupils had pieces of copper, zinc, iron and magnesium and some lemons. They wanted to find out which pair of metals made the cell with the biggest voltage.

What equipment should they use to measure the voltage of their cells?

.....

1 mark

(c) In their investigation they used different pairs of metals.

Give **one** factor that they should keep the same.

.....

1 mark

(d) The pupils measured the voltage produced by different pairs of metals.
Their results are recorded below.

	voltage produced by each pair of metals (volts)			
	magnesium	**zinc**	**iron**	**copper**
copper	**1.7**	**0.9**	**0.8**	**0**
iron	**1.3**	**0.1**	**0**	**–**
zinc	**0.8**	**0**	**–**	**–**
magnesium	**0**	**–**	**–**	**–**

Which pair of metals made the cell with the biggest voltage?

..... and .....

1 mark

(e) Look at the results in the table above.

Why should the pupils **not** use pairs of the same type of metal for the clock?

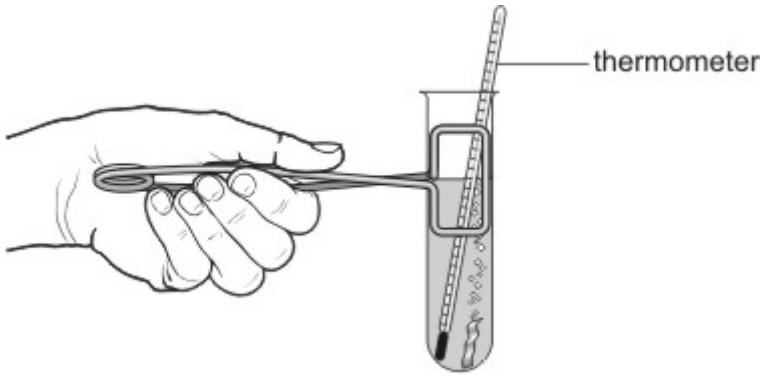
.....

.....

1 mark

maximum 5 marks

14. Harry mixed zinc with copper sulphate solution in a test-tube.
A displacement reaction took place and the temperature increased.



(a) The word equation for the reaction is shown below.

zinc + copper sulphate zinc sulphate + copper

Why is this reaction called a displacement reaction?

.....

.....

1 mark

(b) Harry repeated the experiment with two other metals.
He wanted to calculate the temperature rise each time.
His results are shown below.

metal added to copper sulphate	temperature at the start (°C)	highest temperature reached (°C)	rise in temperature (°C)
zinc	20.0	36.5	16.5
iron	25.5	38.5	13.0
magnesium	19.5	87.5	68.0

Harry used different starting temperatures.
Explain why this did **not** affect his results.

.....

.....

1 mark

(c) Part of the reactivity series of metals is shown below.

most reactive	sodium
	calcium
	magnesium
	aluminium
	zinc
	iron
	lead
least reactive	copper

Use the reactivity series above to answer all the questions below.

(i) Why was the highest rise in temperature obtained with magnesium and copper sulphate?

.....

.....

1 mark

(ii) Why was the rise in temperature obtained with zinc and copper sulphate **not** much higher than the rise in temperature obtained with iron and copper sulphate?

.....

.....

1 mark

(iii) In which of the following mixtures would there be a rise in temperature? Write **yes** or **no** in each blank box.

mixture	**Would there be a rise in temperature?**
aluminium + sodium chloride	
calcium + zinc sulphate	
lead + zinc chloride	
magnesium + iron chloride	

2 marks

maximum 6 marks