ST EDWARD'S
OXFORD

14+ Entrance Assessment

2013

Science

1 hour

Candidate Name: …….

PHYSICS

1. (a) A microphone and oscilloscope are used to show the sound wave pattern of a musical instrument.

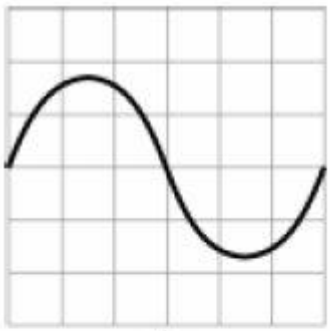


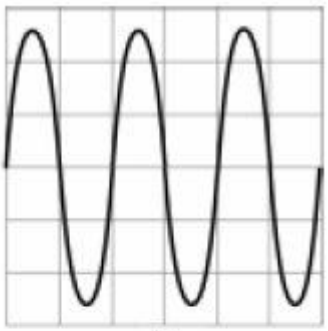
(i) What does the musical instrument make the surrounding air do?

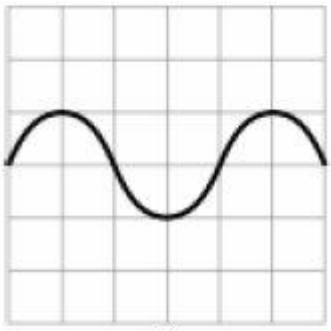
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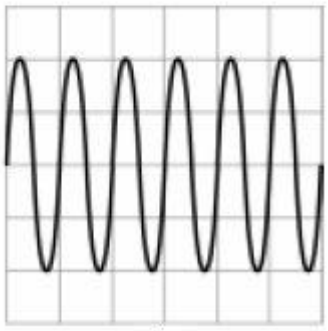
(1)

(ii) Four different sound wave patterns are shown. They are all drawn to the same scale.









Which one of the sound wave patterns, **A**, **B**, **C** or **D** has:

1. the largest amplitude .....

2. the lowest frequency? .....

(2)

(b) Complete the sentences by choosing the correct word from the box.

Each word may be used once or not at all.

higher	louder	lower	quieter

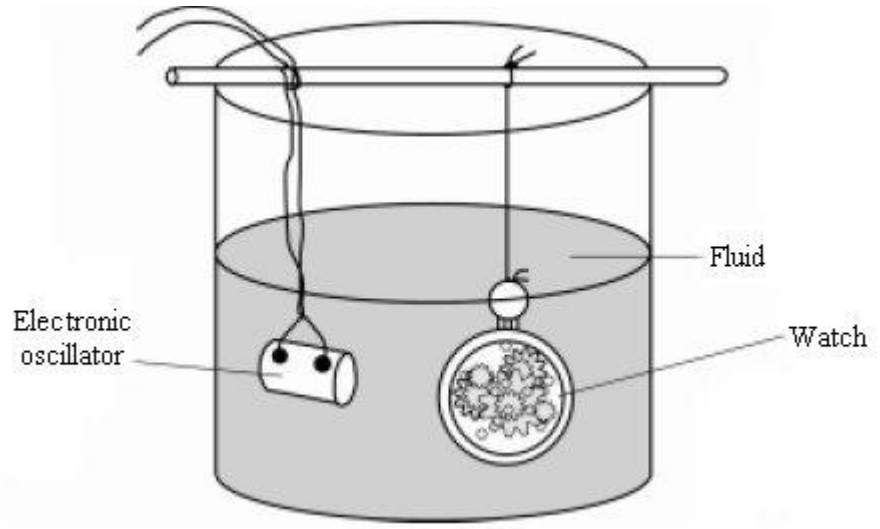
(i) A musical note with a low frequency has a ..... pitch than one with a high frequency.

(1)

(ii) A musical note with a large amplitude sounds.....than one with a small amplitude.

(1)

(c) The diagram shows how ultrasound waves can be used to clean a watch.



Suggest how this method cleans the watch.

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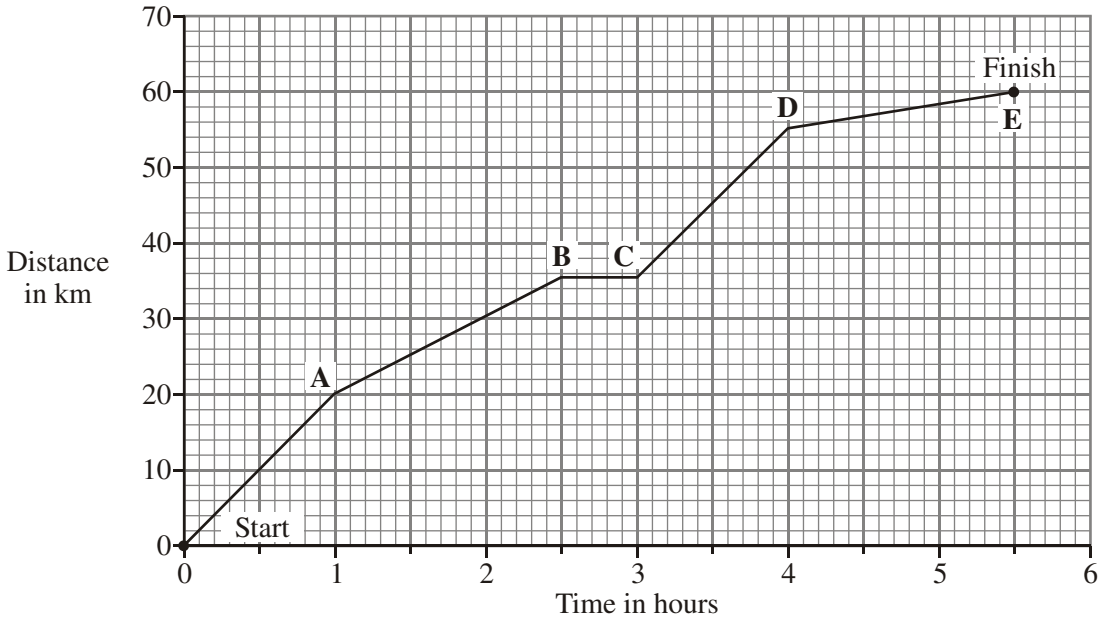
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(1)

(Total 6 marks)

2. A horse and rider take part in a long distance race. The graph shows how far the horse and rider travel during the race.



(a) What was the distance of the race?

distance = ... km

(1)

(b) How long did it take the horse and rider to complete the race?

.....

(1)

(c) What distance did the horse and rider travel in the first 2 hours of the race?

distance = ... km

(1)

(d) How long did the horse and rider stop and rest during the race?

.....

(1)

(e) Not counting the time it was resting, between which two points was the horse moving the slowest?

..... and .....

Give a reason for your answer.

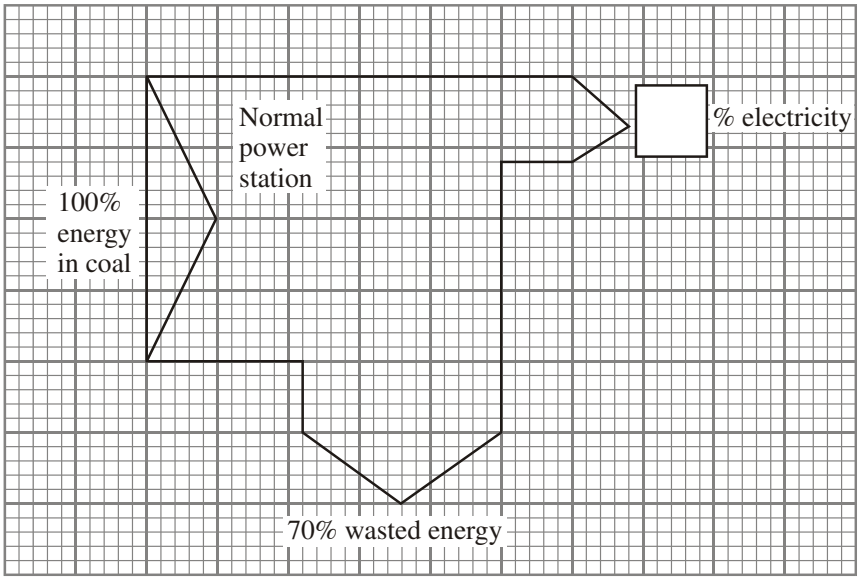
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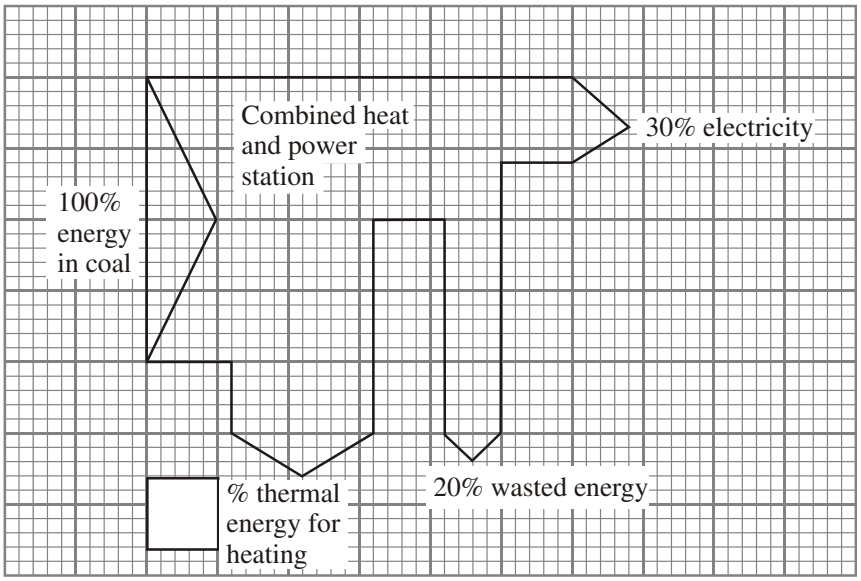
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(1)

(Total 5 marks)

3. Power stations are usually not very efficient. A lot of energy is wasted as thermal energy. The diagrams show the percentage of energy transferred by two coal-burning power stations.





(a) Write the **two** missing figures in the boxes on the diagrams.

(2)

(b) Which power station is the most efficient **overall**, the normal power station or the combined heat and power station? Give reasons for your answer.

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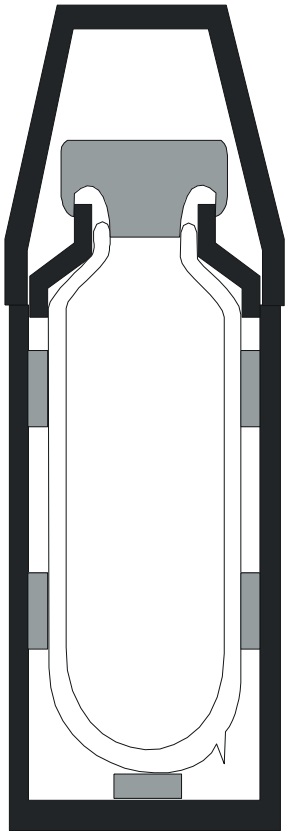
(2)

(c) Some heat energy released from burning coal on an open fire is emitted by radiation. Tick (✓) the main type of electromagnetic radiation emitted by hot coal.

Type of electromagnetic radiation	**Tick (✓)**
gamma	
infra red	
ultraviolet	
X-ray	

(1)
(Total 5 marks)

4. The diagram below shows a vacuum flask.



(a) Give **two** features of the flask which reduce heat loss by conduction.

1. .....

2. .....

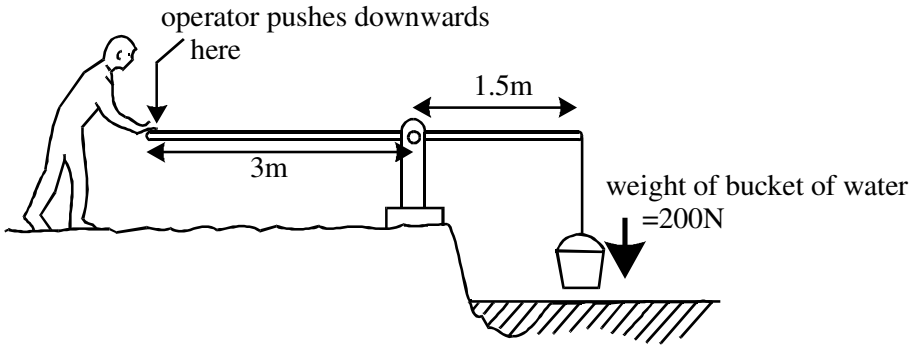
(2)

(b) Give **one** feature of the flask which reduces heat loss by radiation.

.....

(1)
(Total 3 marks)

5. The diagram shows a simple machine for lifting water from a river.



(a) Calculate the turning force (moment) of the bucket of water.

(Show your working.)

.....

.....

.....

Answer ..... Nm (newton metre)

(2)

(b) What can you say about the size of downwards force the operator must use to balance the moment of the bucket of water?

(Explain your answer, using numbers if you can.)

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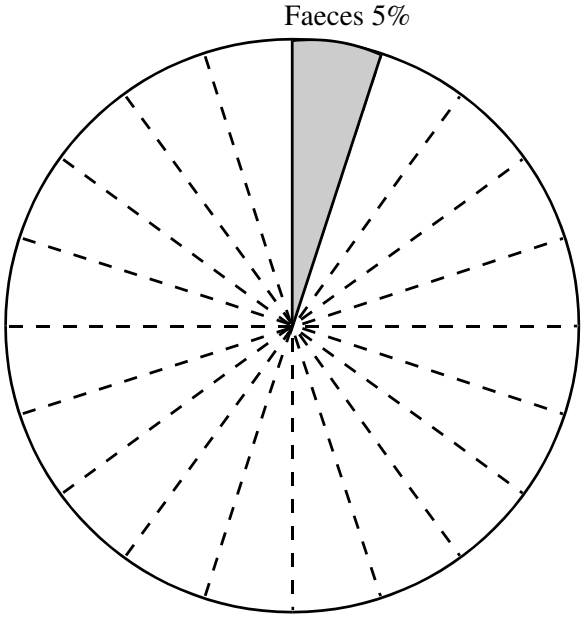
(4)
(Total 6 marks)

BIOLOGY

1. The table below shows how the body loses water.

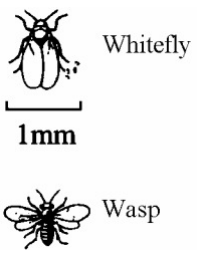
HOW WATER IS LOST	% (PERCENTAGE)
Breathing	10
Faeces	5
Sweat	45
Urine	40

Complete the diagram by showing the water loss for breathing, sweat and urine.



(Total 3 marks)

2. Whitefly are pests and harm plants in glasshouses.
A small wasp can be used to control the whitefly.



The wasp can only lay its eggs in the larvae of whiteflies.
The wasp larva eats the body of the whitefly larva.
It then changes into a new wasp and flies off.

(a) Choose words from the list to complete the sentences below.

decomposer **predator** **prey** **producer**

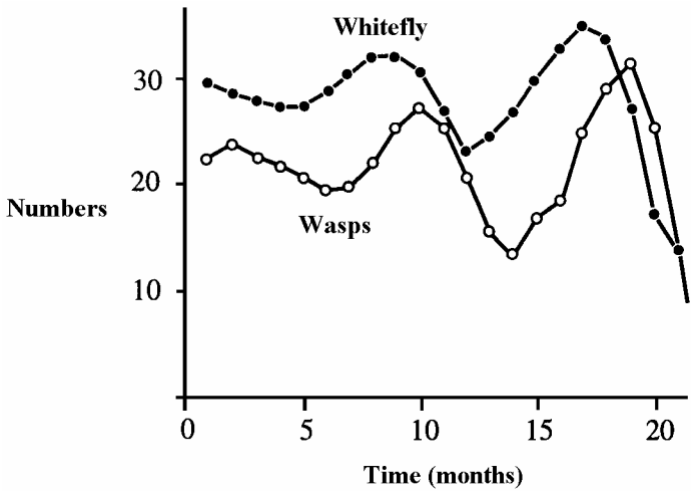
The wasp larva feeds on the whitefly larva.

The wasp is a .....

The whitefly is known as the wasp's .....

(2)

(b) The graph shows how the numbers of whitefly and wasps change over several months.



What happens to the number of wasps between 15 and 20 months?

.....

Why do you think this happens? .....

.....

.....

.....

(4)

(c) What would happen to the wasps if there were no larvae in which to lay their eggs?

.....

(1)
(Total 7 marks)

3. A young athlete trains and this makes her heart work harder. The table shows part of her training record.

Time measured in weeks from the start of training	0	8	16	24	32	40
Resting pulse rate measured in pulses per minute	75	69	66	63	61	60

(i) Give **two** changes to her heart resulting from this training.

1 .....

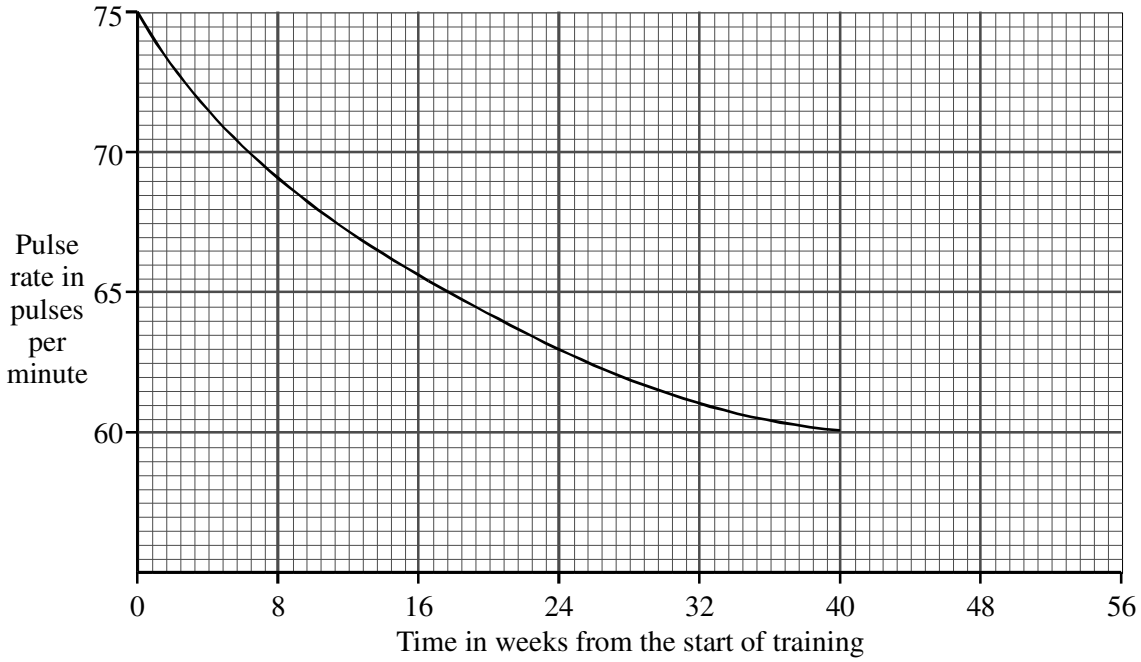
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2 .....

.....

(2)

(ii) The graph shows a smooth curve drawn to match the data from her training record.



Use the graph:

(A) to estimate her resting pulse rate, in pulses per minute, after 18 weeks of training;

.....

(1)

(B) to predict her resting pulse rate, in pulses per minute, if she continues her training until the end of the year.

.....

(1)
(Total 4 marks)

4. (a) 'Life expectancy' is the age to which a person can expect to live.

The table shows the life expectancy, in years, of smokers and of people who have never smoked.

Life expectancy at age	Females who have never smoked	Female smokers	Males who have never smoked	Male smokers
25 – 29	87.6	80.7	79.7	72.2
30 – 34	87.7	80.9	80.1	72.7
35 – 39	87.9	81.1	80.3	73.3
40 – 44	88.1	81.3	80.7	73.8
45 – 49	88.3	81.6	81.1	74.5
50 – 54	88.6	82.0	81.4	75.2
55 – 59	89.0	83.0	82.0	76.4
60 – 64	89.5	84.2	83.0	78.1
65 – 69	90.4	85.4	84.3	79.9
70 – 74	91.5	87.3	85.7	82.4

(i) A woman is 43. She has never smoked.

To what age can she expect to live?

.....

(1)

(ii) What happens to our life expectancy as we get older?

.....

.....

(1)

(iii) Describe, in as much detail as you can, the effect of smoking on the life expectancy of male smokers.

.....

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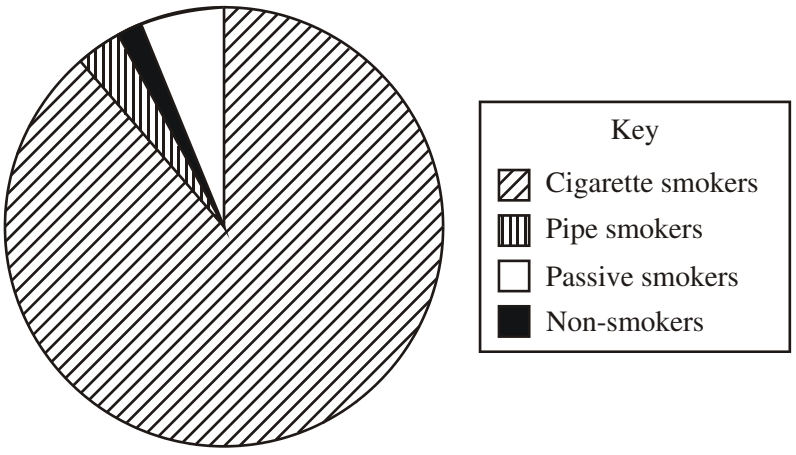
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(2)

(b) The pie chart shows the smoking habits of people who get lung cancer.

'Passive smokers' are people who do not smoke, but who live or work with people who do smoke.

People Who Get Lung Cancer



Some people say that this data proves that smoking causes lung cancer.

Others say that it provides evidence for a link between smoking and lung cancer.

Which group is right? Explain the reasons for your answer.

.....

.....

.....

.....

(2)
(Total 6 marks)

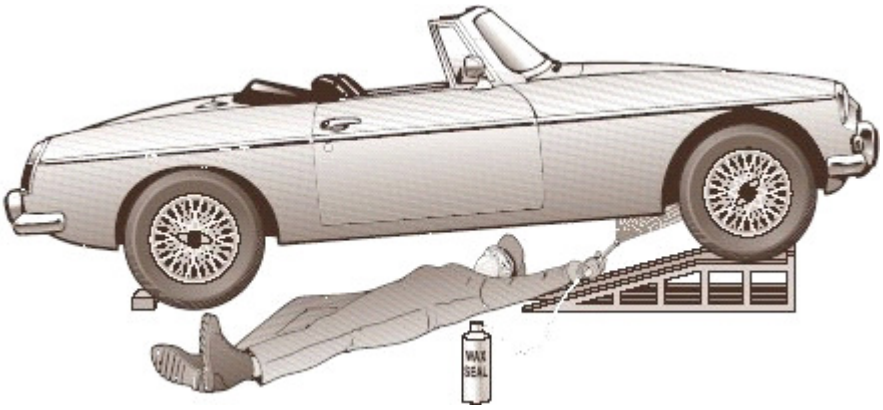
CHEMISTRY

1. Jill bought a can of Wax Seal to spray the parts underneath her car.



Wax Seal helps to prevent these parts rusting.

It is a mixture of wax and a liquid called white spirit.



(a) (i) The body of Jill's car is made from steel. Steel contains iron.

Give **two** substances that are needed for iron to rust.

1. .....

1 mark

2. .....

1 mark

(ii) How does Wax Seal help to protect the car from rusting?

.....

.....

1 mark

(iii) Wax Seal can also be used on the upper parts of a car.

What else protects parts such as the doors from rusting?

.....

1 mark

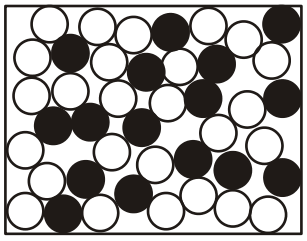
(b) The metal parts of a car may corrode.

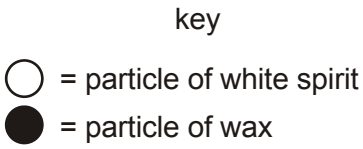
What type of air pollution could cause corrosion?

.....

1 mark

(c) The diagram below shows the mixture of particles of wax and white spirit in Wax Seal.





not to scale

After Jill sprays the car, the white spirit evaporates leaving a layer of solid wax on the surface.

(i) In the box below, draw **eight** circles, ○, to show the arrangement of particles in a gas.

particles in a **gas**

1 mark

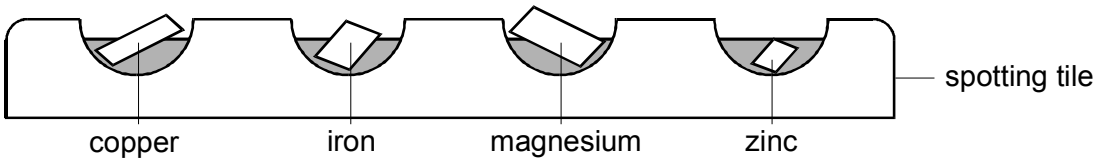
(ii) In the box below, draw **eight** circles, ●, to show the arrangement of particles in a solid.

particles in a **solid**

1 mark

maximum 7 marks

2. Aisha placed small samples off four different metals on a spotting tile.
She added drops of copper sulphate solution to each metal.



Aisha repeated the experiment with fresh samples of the four metals and solutions of different salts. She recorded some of her results in a table.

✓ shows that a reaction took place

X shows that no reaction took place.

metals / solutions	copper	iron	magnesium	zinc
copper sulphate	×	✓	✓	
iron sulphate	×	×	✓	✓
magnesium sulphate	×		×	
zinc sulphate	×	×	✓	×

(a) The four metals have different reactivities.

(i) Use the information in the table to put the four metals in a reactivity series.

most reactive metal .....

.....

.....

least reactive metal .....

1 mark

(ii) Use the reactivity series to complete the table by writing in ✓ or **X** in the **three** empty boxes.

2 marks

(b) Copper reacts with silver nitrate solution.

(i) Complete the word equation for the reaction:

copper + silver nitrate → ..... + ...

2 marks

(ii) Platinum does **not** react with silver nitrate.
Put the metals platinum, copper and silver in the correct order according to their reactivity.

most reactive .....

.....

least reactive .....

1 mark

(c) In many houses the hot water pipes are made from copper and the boiler is made from iron.
Which of these metals will corrode first? Explain your answer.

.....

.....

1 mark

Maximum 7 marks

3. The table gives the numbers of protons, neutrons and electrons in some atoms and ions of elements. The letters used in the table are **not** the chemical symbols of the elements.

atom or ion	protons	neutrons	electrons
J	16	16	16
L	10	10	10
M	11	12	11
Q	12	14	10
R	17	20	17
X	9	10	10
Z	17	18	17

Use this information to answer the following questions.
Each letter can be used once, more than once or not at all.

(a) Give the letters of:

(i) **two** atoms of the same element; ..... and .....

(ii) a positive ion; .....

(iii) a negative ion; .....

(iv) an atom or ion which has a mass number of 20; .....

(v) an atom of a very reactive metal; .....

5 marks

(b) How many electrons does an atom with an atomic number of 12 have?

.....

1 mark

(c) (i) **X** is an ion. In which group of the periodic table is the element from which **X** is formed?

.....

1 mark

(ii) From the table above, give the letter of another atom which reacts in a similar way to the element from which ion **X** is formed.

.....

1 mark

Maximum 8 marks