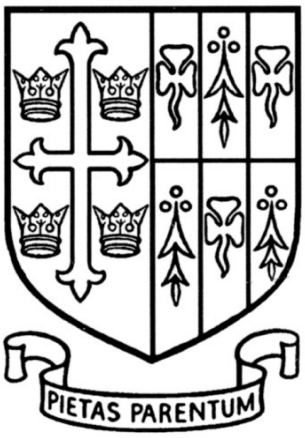
ST EDWARD'S
OXFORD



14+ Entrance Assessment

2017

Science

1 hour

Candidate Name: …….

THE PERIODIC TABLE

Period	Group 1	2											3	4	5	6	7	0
1							1 H Hydrogen 1											4 He Helium 2
2	7 Li Lithium 3	9 Be Beryllium 4											11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10
3	23 Na Sodium 11	24 Mg Magnesium 12											27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulfur 16	35.5 Cl Chlorine 17	40 Ar Argon 18
4	39 K Potassium 19	40 Ca Calcium 20	45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	63.5 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36
5	86 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	99 Tc Technetium 43	101 Ru Ruthenium 44	103 Rh Rhodium 45	106 Pd Palladium 46	108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54
6	133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57	179 Hf Hafnium 72	181 Ta Tantalum 73	184 W Tungsten 74	186 Re Rhenium 75	190 Os Osmium 76	192 Ir Iridium 77	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	210 Po Polonium 84	210 At Astatine 85	222 Rn Radon 86
7	223 Fr Francium 87	226 Ra Radium 88	227 Ac Actinium 89															

Key

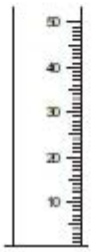
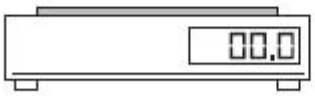
Relative atomic mass
Symbol
Name
Atomic number

1. A student was asked to find the mass of salt dissolved in 100 cm^3 of sea water.
She was given the following instructions.

Step **A** Weigh an empty evaporating basin
Step **B** Transfer 50 cm^3 of sea water into the basin
Step **C** Heat the sea water in the basin until all the water has evaporated
Step **D** Allow the basin and residue to cool
Step **E** Weigh the basin and residue of salt

(a) During the experiment, the student used several pieces of apparatus.
Some of them are shown in the table.
Complete the table.

(6)

Image of apparatus	Name of apparatus	One step in which the apparatus was used
	evaporating basin	**C**
	.....	.....
.....	tripod	.....
	.....	.....

(b) State, with a reason, **one** safety precaution that the student should take when doing this experiment.

(2)

Precaution

.....

Reason

.....

.....

.....

(c) The student obtained the following results.

mass of basin and salt (step **E**) = 81.50 g

mass of empty basin (step **A**) = 78.60 g

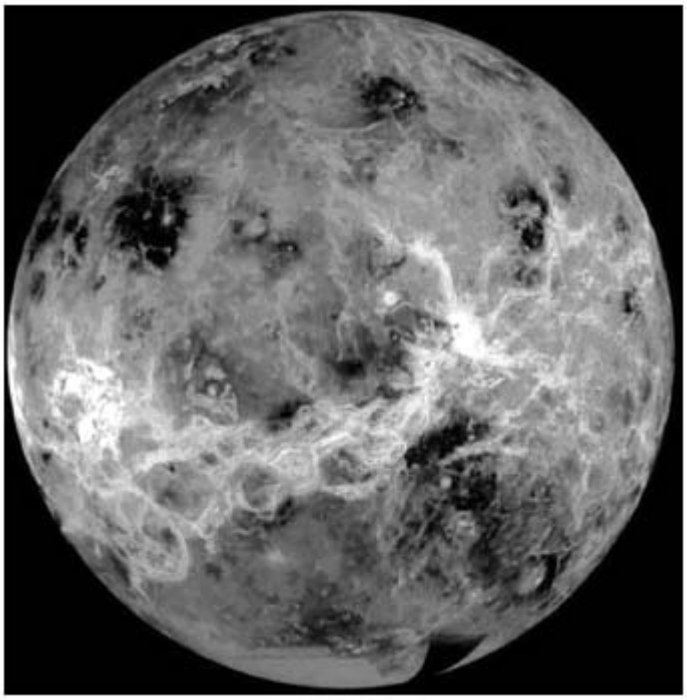
Calculate the mass of salt dissolved **in 100 cm^3** of sea water.

(1)

Mass of salt = ... g

(Total for Question = 9 marks)

2. The photograph shows the planet Venus.



Although Venus is similar in size to the Earth, it is very different in other ways.

The temperature at the surface of Venus is about 470 °C. The atmospheric pressure is 90 times that of the Earth.

The clouds in the atmosphere of Venus are made up of droplets of sulfuric acid.

The table lists some properties of metals that could be used to make a space probe to land on Venus.

Metal	Melting point in °C	Relative density	Reaction with sulfuric acid
copper	1083	8.9	no reaction
lead	328	11.3	no reaction
magnesium	650	1.7	fizzes vigorously
nickel	1453	8.9	fizzes slowly
titanium	1675	4.5	no reaction
zinc	420	7.1	fizzes quite vigorously

The probe needs to be launched with enough energy to escape the Earth's gravity. To make this easier, the mass of the probe needs to be as low as possible. The probe also needs to withstand the conditions on the surface of Venus.

Use the information in the table to answer parts (a) to (c).

(a) (i) Which metal in the table could be used to make a probe with the lowest density?

(1)

.....

(ii) Why would this metal be unsuitable for making a probe to land on Venus?

(1)

.....

.....

(b) Very small amounts of lead can be used in electrical circuits.
Why would lead **not** be suitable for use in the electrical circuits of a probe to land on Venus?

(1)

.....

.....

(c) Choose a metal from the table that would be the **most** suitable for making a probe to land on Venus. Give **two** reasons for your choice.

(3)

Metal

.....

Reasons

1 .....

.....

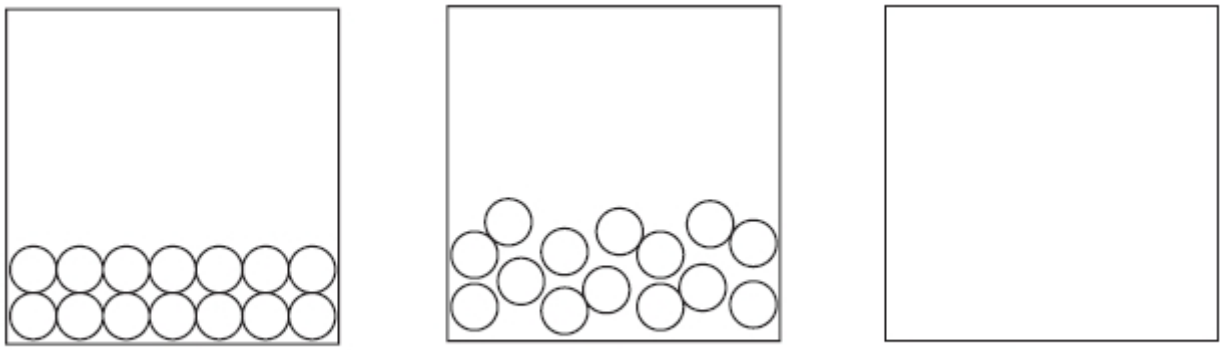
2 .....

.....

(Total for question = 6 marks)

3.This question is about the states of matter.

(a) The diagram shows the three states of matter for a substance.



Each circle represents a molecule of the substance.

(i) Complete the diagram by drawing six circles to represent molecules in the gas state.

(1)

(ii) Which statement is correct about the movement or arrangement of the molecules of this substance?

(1)

☒ **A** They move randomly in the solid state.

☒ **B** They move randomly in the liquid state.

☒ **C** They are arranged in fixed positions in the liquid state.

☒ **D** They are arranged in fixed positions in the gas state.

(iii) Which term is used for a solid changing to a liquid?

(1)

☒ **A** boiling

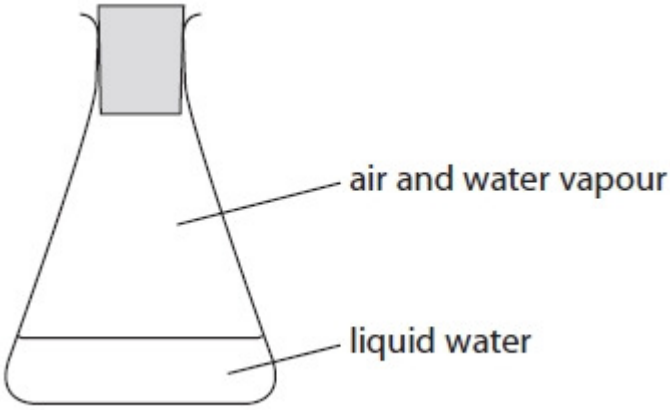
☒ **B** condensing

☒ **C** freezing

☒ **D** melting

(b) Some cold water is poured into a conical flask and a bung inserted.

The diagram shows the flask after a few minutes.



(i) What is occurring in the flask?

(1)

☒ **A** boiling and condensing

☒ **B** condensing and evaporating

☒ **C** evaporating and freezing

☒ **D** freezing and melting

(ii) Which formula represents a substance that is **not** present in the flask?

(1)

☒ **A** H_2O

☒ **B** H_2

☒ **C** N_2

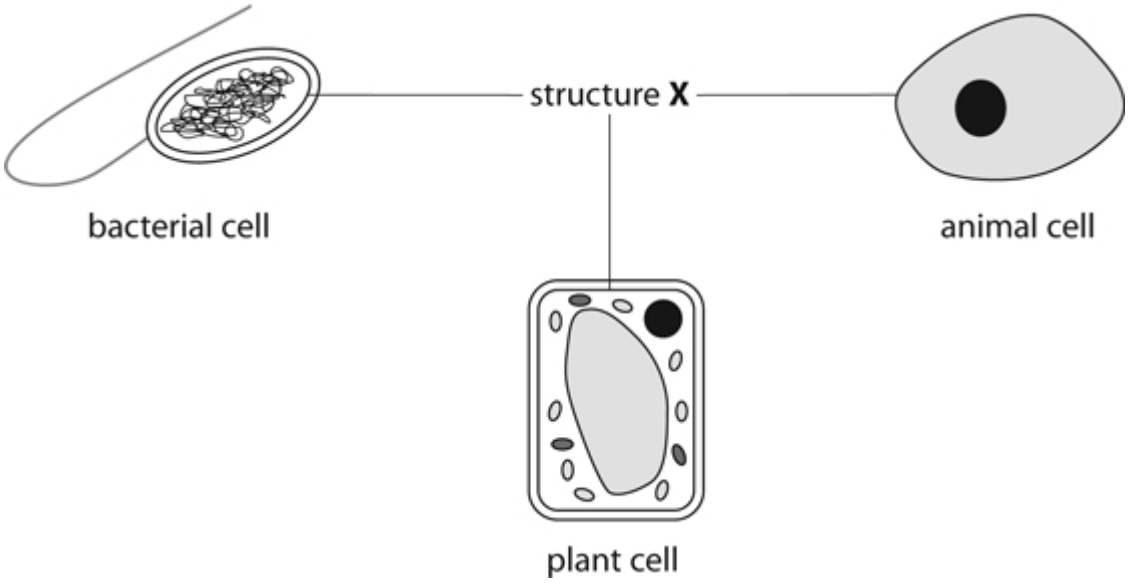
☒ **D** CO_2

(Total for question = 5 marks)

4.

The diagrams show a bacterial cell, a plant cell and an animal cell.

Structure **X** is found in all three cells.



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

Structure **X** is the

(1)

☒ **A** cell membrane

☒ **B** cell wall

☒ **C** cytoplasm

☒ **D** nucleus

(ii) Many bacteria have one or more flagella whereas most animal cells have no flagella.

State **one** other difference between a bacterial cell and an animal cell.

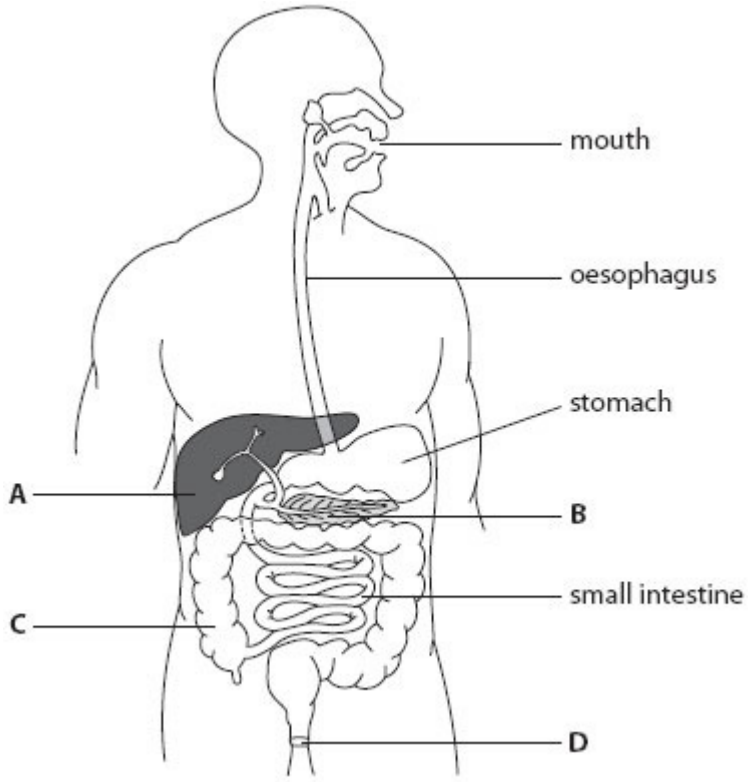
(1)

.....

(Total for Question is 2 marks)

5.

(a) The diagram shows part of the human digestive system.



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

The pancreas in the diagram is labelled

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(Total for Question is 1 mark)

6.

Pectinase is an enzyme that is used to extract juice from apples.

In an investigation, 1 cm^3 of pectinase was added to 1 kg of chopped apples.

After 20 minutes, the volume of juice produced was measured.

This was repeated using different volumes of pectinase.

The table shows the results of this investigation.

volume of pectinase added / cm^3	volume of apple juice produced / cm^3
1	180
2	212
3	
4	269
5	300

(a) (i) Estimate the volume of apple juice that should be produced when 3cm^3 of pectinase was added.

(1)

.....cm^3

(ii) The maximum volume of apple juice that can be produced from 1 kg of apples is 500 cm^3.
Calculate the percentage of apple juice produced when 5 cm3 of pectinase was added.

(2)

..... %

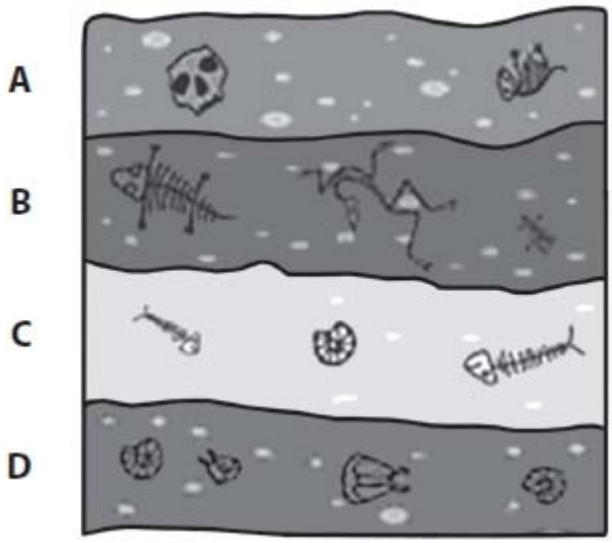
(iii) Suggest **one** way of increasing the volume of apple juice produced when 5 cm^3 of pectinase is added to 1 kg of chopped apples.

(1)

.....

..... **(Total for Question is 4 marks)**

7. The diagram shows fossils in different layers of rock.



(i) Which layer of rock is most likely to contain the oldest fossils?

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

(1)

- ☒ **A**
- ☒ **B**
- ☒ **C**
- ☒ **D**

(ii) Use one word from the box to complete the sentence. **(1)**

replication	probiotics
evolution	osmosis

The fossil record provides evidence for .....

(Total for question = 2 marks)

8. A student investigated the growth of tomato plants over a two-month period.

(i) In one investigation, three tomato plants were grown without fertiliser.

The increase in the height of each plant, after two months, is shown in the table.

Increase in height of tomato plants / cm		
plant 1	plant 2	plant 3
9.8	10.5	10.0

Calculate the average increase in the height of these plants.

(1)

answer = ... cm

(ii) In a second investigation, another three tomato plants each had a different fertiliser, **A**, **B** or **C**, added to their soil.

The mean increase in the height of each plant, after two months, is shown in the table.

	Fertiliser		
	A	**B**	**C**
increase in height of tomato plant / cm	20.4	14.6	10.6

Describe the effect of these fertilisers on the height of the tomato plants.

(2)

.....

.....

.....

.....

(iii) The student thought that fertilisers might also affect the growth of tomato plants in other ways.

Suggest **one** other measurement of the plant the student could make to test this idea.

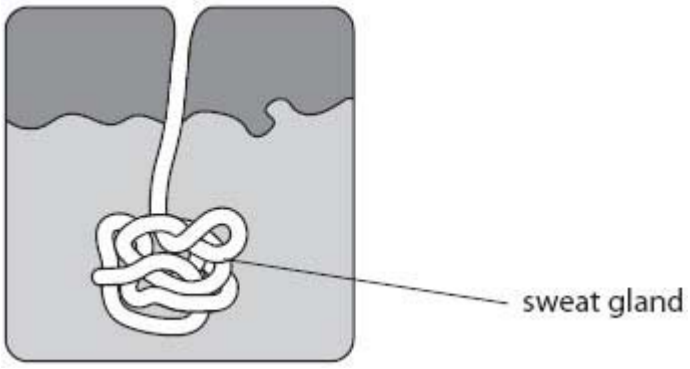
(1)

. . . . . .

(Total for Question is 4 marks)

9.

The diagram shows a sweat gland in a section of skin.



Explain how the sweat gland helps to cool the body.

(2)

.....

.....

.....

.....

(Total for Question is 2 marks)

10.

In the space below, explain as much as you can about **PHOTOSYNTHESIS**.

(Maximum for Question is 5 marks, but candidates are encouraged to write as much as they can)

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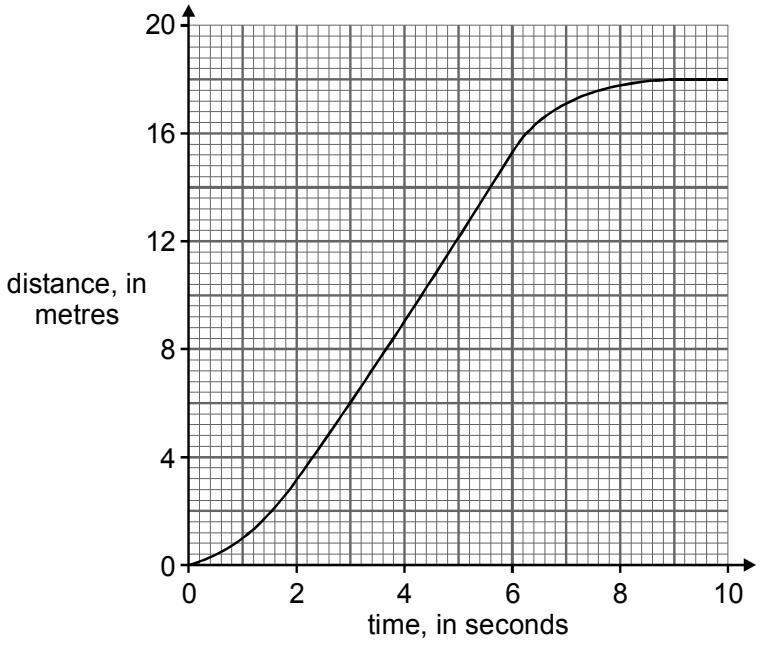
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(Total for Question is 5 marks)

11. A remote-controlled car was timed over a period of 10 seconds.
A graph of **distance** against **time** is shown below.



(a) Describe the motion of the car between:

(i) 2 seconds and 6 seconds;

.....

1 mark

(ii) 9 seconds and 10 seconds.

.....

1 mark

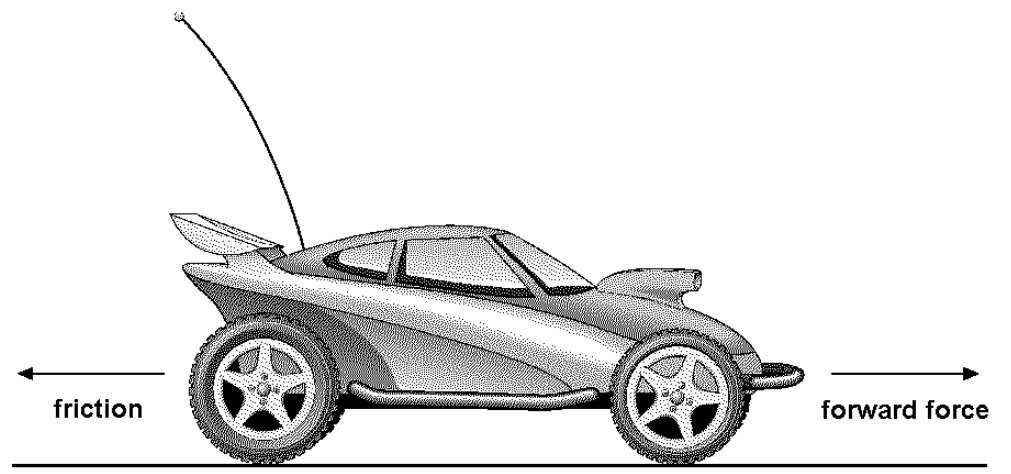
(b) Calculate the average speed of the car between 0 and 10 seconds.
Give the unit.

.....

.....

2 marks

(c) The diagram below shows **two** of the forces acting on the car when it is moving.



(i) When the motor was switched off, the car slowed down and then stopped.

While the car was slowing down, which of the following was true? Tick the correct box.

Friction was zero and the forward force was greater than zero.	☐
The forward force was zero and friction was greater than zero.	☐
Friction was zero and the forward force was zero.	☐
The forward force and friction were both greater than zero.	☐

1 mark

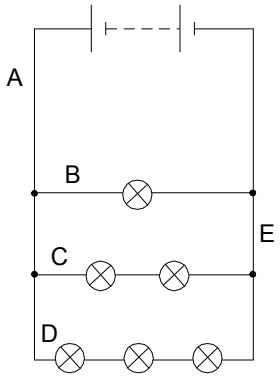
(ii) Use the graph to find the time when the car started to slow down.

The car started to slow down after ..... s.

1 mark

(TOTAL: 6 marks)

12. (a) An electrical current is a flow of charge. The diagram shows a circuit containing six identical bulbs.



In which part of the circuit, A, B, C, D or E, is there:

(i) the greatest flow of charge? .....

(ii) the least flow of charge? .....

2 marks

(b) Sulphur is an electrical insulator, but it can be made to conduct electricity if a very bright light shines on it.

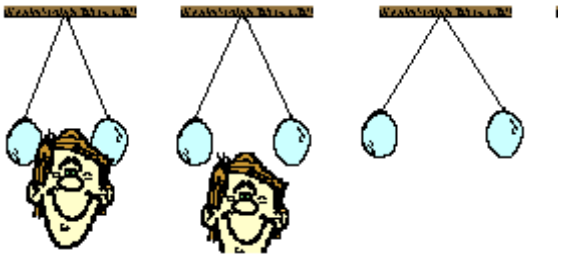
(i) A slab of sulphur is rubbed with a piece of woollen cloth.
Explain how this gives the sulphur a negative electrical charge.

.....

.....

1 mark

(c) When your rub your hair against a pair of balloons, the following may occur.



Explain why the balloons in the final image are apart?

.....

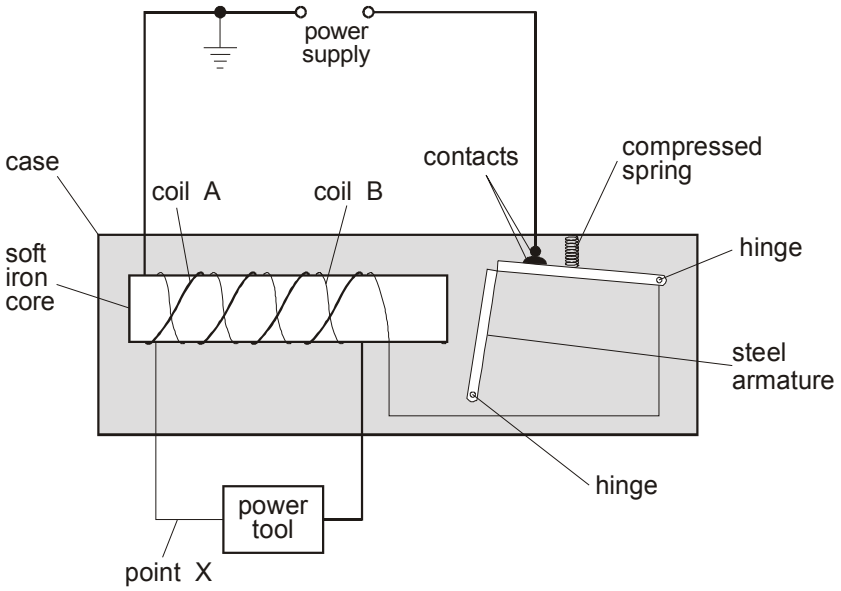
.....

2 mark

(TOTAL: 5 marks)

13. The simplified diagram shows a device which protects people from being electrocuted when using power tools such as hedge cutters. The wire in one part of the circuit is shown darker to make the circuit clearer.

When the armature is attracted towards the soft iron core, the contacts are pushed apart and break the circuit.



(a) Why does the steel armature move towards the soft iron core when the power supply is turned on?

.....

.....

.....

2 mark

(b) A gardener accidentally cuts the wire at point X. Current from the power supply starts to flow through the gardener to earth.

What effect will this have on the armature? Explain your answer.

.....

.....

.....

.....

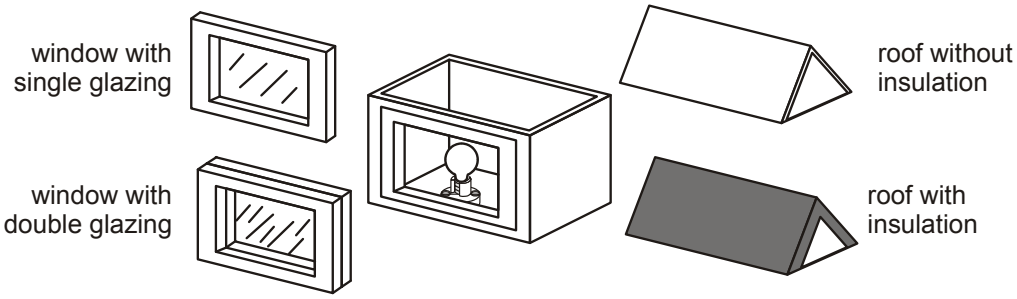
2 marks

(TOTAL: 4 marks)

14. Some pupils investigate whether double glazing or roof insulation is more efficient at reducing heat loss from houses.

They have a model house which can have these features:

- window with single glazing
- window with double glazing
- roof without insulation
- roof with insulation.



(a) A temperature sensor and a small lamp are placed inside the house. The lamp is used as a heat source.
When the model house reaches a given temperature, **the lamp is switched off**.
A datalogger then records temperature regularly over time.

(i) What can the combination of single glazing and **no** roof insulation tell pupils that is relevant to their investigation?

.....

.....

1 mark

(ii) Which **two** combinations **must** they use to find the more efficient way of preventing heat loss in their model house?

..... and .....

..... and .....

1 mark

(b) The pupils predicted that the roof insulation will be more effective than double glazing at reducing heat loss.

What evidence would support this prediction?

.....

.....

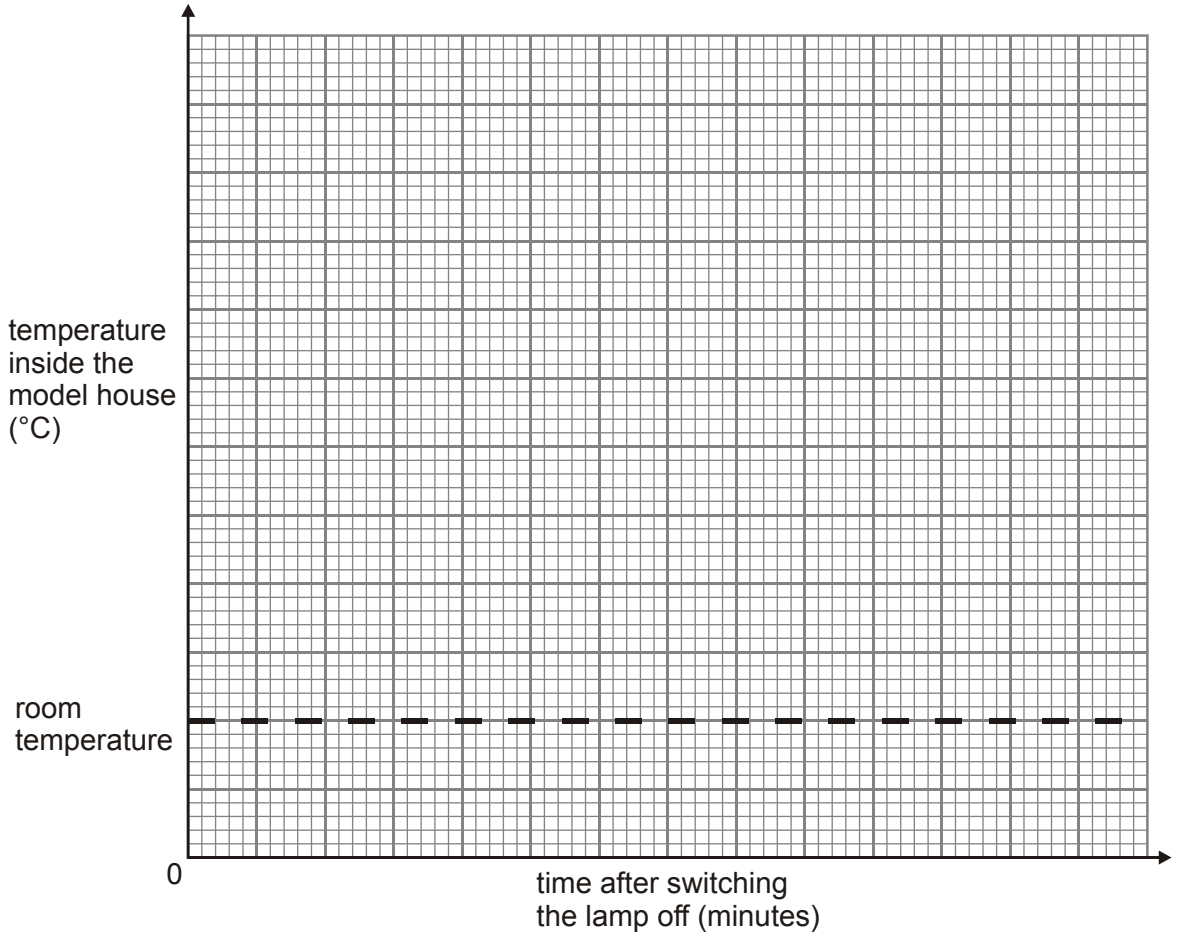
.....

1 mark

(c) On the grid below, sketch the shape of the two graphs you would expect to see on the datalogger if the pupils' prediction is correct.

You do **not** need to add scales to the axes.

Use a solid line (———) to show the graph for double glazed windows.
Use a dotted line (-------) to show the graph for roof insulation.



2 marks

(TOTAL: 5 marks)