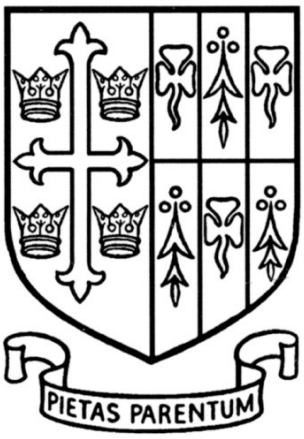
ST EDWARD'S
OXFORD



14+ Entrance Assessment

2016

Science

1 hour

Candidate Name: …….

THE PERIODIC TABLE

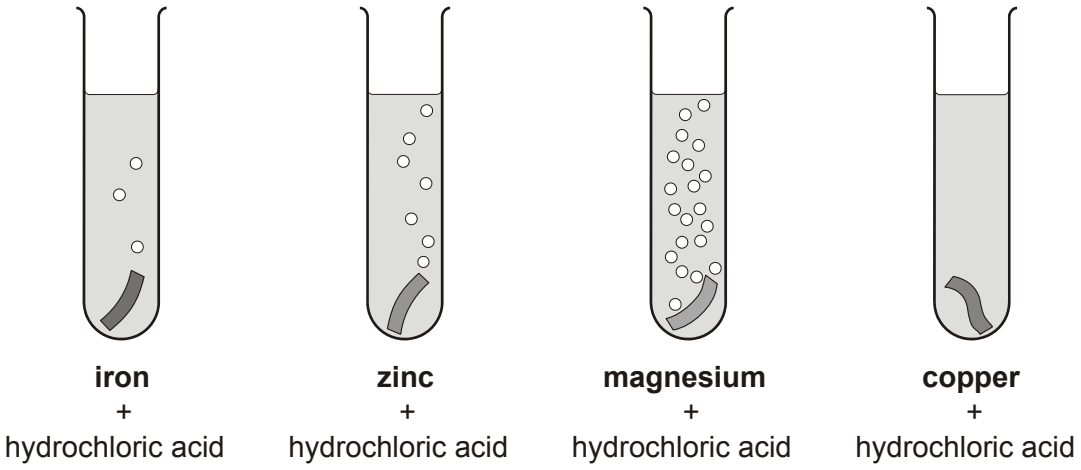
Period	1	2					Group						3	4	5	6	7	0
1							1 H Hydrogen 1											4 He Helium 2
2	7 Li Lithium 3	9 Be Beryllium 4											11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10
3	23 Na Sodium 11	24 Mg Magnesium 12											27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulphur 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 Indium 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) Ruth put a piece of a different metal in each of four test tubes.

She poured 10 cm^3 of hydrochloric acid onto each metal.



Look at the diagrams above.

(i) How do these show if a metal reacts with the acid?

.....

1 mark

(ii) **On the lines below**, put the **four** metals in the order of how strongly they react with the acid.

most reactive .....

.....

.....

least reactive .....

1 mark

(b) Choose the name of a metal from the box below to answer each question.

copper	**iron**	**magnesium**	**zinc**

(i) Which metal from the box is used for electrical wires?

.....

1 mark

(ii) Which metal from the box goes rusty?

.....

1 mark

maximum 4 marks

2. An alloy is a mixture of elements.
The table shows the mass of each element present in 100 g of five different alloys, **bronze, solder, steel, stainless steel** and **brass.**

alloy	**mass of each element in 100 g of alloy**							
	lead (g)	tin (g)	copper (g)	zinc (g)	carbon (g)	iron (g)	chromium (g)	nickel (g)
bronze		4	95	1				
solder	62	38						
steel					1	99		
stainless steel						70	20	10
brass			67	33				

(a) Which **alloy** in the table above contains an element which is a non-metal?

.....

1 mark

(b) Which **two alloys** in the table contain only **two metals**?

..... and .....

1 mark

(c) Another alloy called nichrome contains only the elements chromium and nickel.
100 g of nichrome contains 20 g of chromium.

How much nickel does it contain?

…… g

1 mark

(d) Before 1992, two-pence coins were made of bronze.
Steel rusts but bronze does **not** rust.

(i) Why does bronze **not** rust?
Use information in the table above to help you.

.....

.....

1 mark

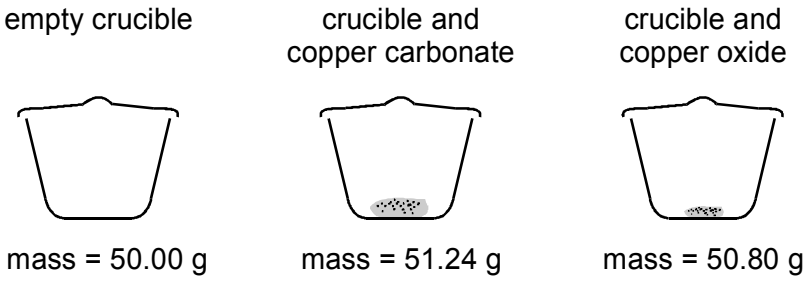
(ii) Rusting requires water and a gas from the air.
Give the name of this gas.

.....

1 mark

maximum 5 marks

3. Two pupils heated some copper carbonate in a crucible. They recorded the mass of the crucible and contents before and after heating.



The word equation for this reaction is:

copper carbonate copper oxide + carbon dioxide

(i) What mass of carbon dioxide is given off in this reaction?
Give the unit.

.....

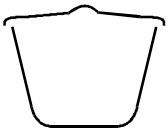
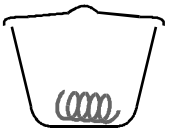
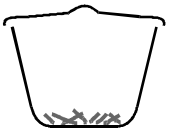
1 mark

(ii) What is the name of this type of chemical reaction?
Tick the correct box.

combustion	☐
oxidation	☐
reduction	☐
thermal decomposition	☐

1 mark

(b) The pupils then heated some magnesium in another crucible. They worked carefully and did not lose any of the magnesium oxide which formed.
They recorded the mass of the crucible and contents before and after heating.

empty crucible	crucible and magnesium	crucible and magnesium oxide
		
mass = 50.00 g	mass = 50.12 g	mass = 50.20 g

(i) Write a word equation for the reaction.

.....

1 mark

(ii) Why does the mass of the contents of the crucible increase in this reaction?

.....

.....

1 mark

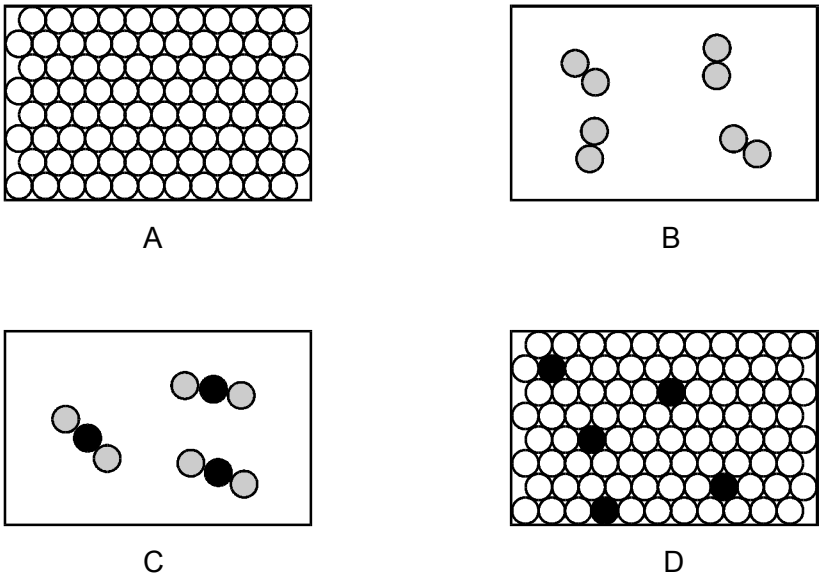
(iii) What is this type of chemical reaction called?

.....

1 mark

Maximum 5 marks

4. The diagrams represent the arrangement of atoms or molecules in four different substances, A, B, C and D.



not to scale

Each of the circles, ○, ◌ and ● represents an atom of a different element.

(a) (i) Which substance is a compound?

…….

1 mark

(ii) Which substance is a mixture?

…….

1 mark

(iii) Which **two** substances are elements?

……. and …….

1 mark

(iv) Which **two** substances could be good thermal conductors?

……. and …….

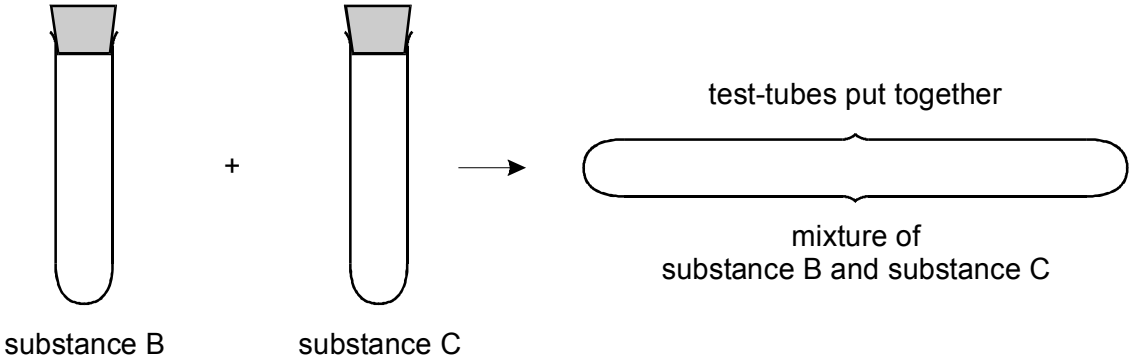
1 mark

(v) Which substance could be carbon dioxide?

……

1 mark

(b) The following experiment was set up. Test-tubes containing substances B and C were placed together as shown. The substances did **not** react.
They were left for five minutes.

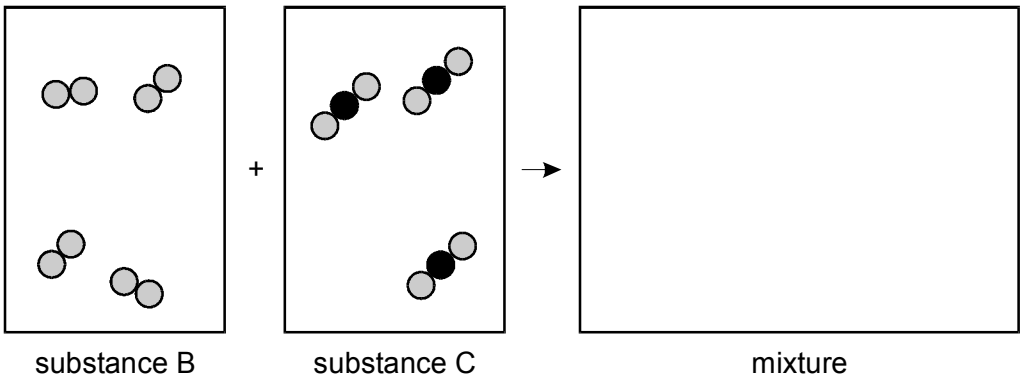


(i) How many molecules are there in the mixture compared to the total number in substances B and C?

……

1 mark

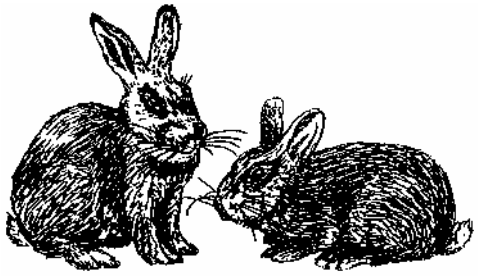
(ii) Complete the diagram which is a model of this experiment.



1 mark

Maximum 7 marks

5. These young rabbits look like their parents. This is because information about characteristics such as fur colour is passed from parents to their young.



Choose words from this list to complete the sentences below.

body **chromosomes** **clones** **cytoplasm**

genes **nucleus** **sex**

Information is passed from parents to their young in ..... cells.

Each characteristic, e.g. fur colour, is controlled by ..... .

The structures which carry information for a large number of characteristics are

called ..... .

The part of the cell which contains these structures is called the

..... .

(Total 4 marks)

6. Blood contains plasma, platelets, red cells and white cells. Each has one or more important functions.

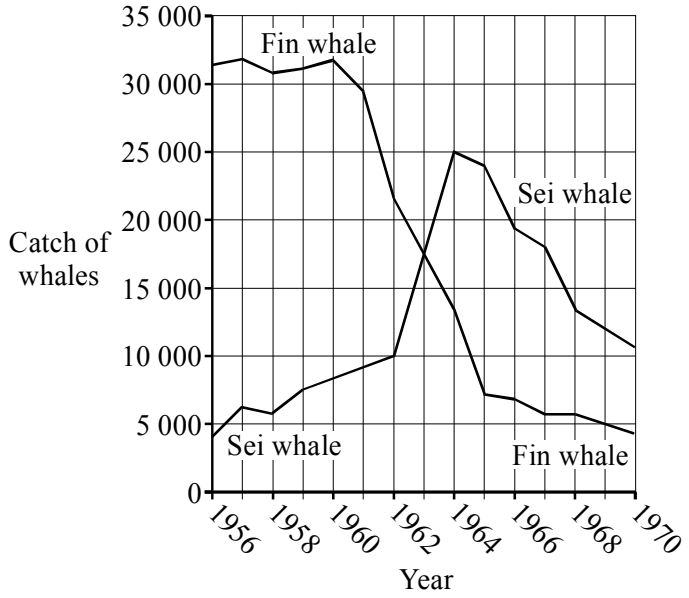
In the table below draw a line from each part to its function.

One part has two functions. Draw lines from this part to both functions.

Name of part of blood	Function of part of blood
red cell	fights bacteria
platelet	carries dissolved hormones
plasma	carries dissolved urea
white cell	transports oxygen around the body
	helps blood to clot

(Total 5 marks)

7. During the last hundred years many species of whales have been over-hunted. This has led to a dramatic decrease in their numbers. The graph shows the catches of two of these species, Fin whales and Sei whales, between 1956 and 1970.



(a) When did over-hunting begin to affect the Fin whale population?

..... **(1)**

(b) Complete the sentence.

When a species is over-hunted many adults are killed. The population numbers fall dramatically because the death rate is far greater than the .....

(1)

(c) (i) In what **year** were the catches of Fin whales and Sei whales the same?

..... **(1)**

(ii) Between 1963 and 1964 how did the catches of Fin whales and Sei whales alter?

Fin whales: .....

Sei whales: .....

(1)

(d) Suggest why the catches of Sei whales increased between 1956 and 1964.

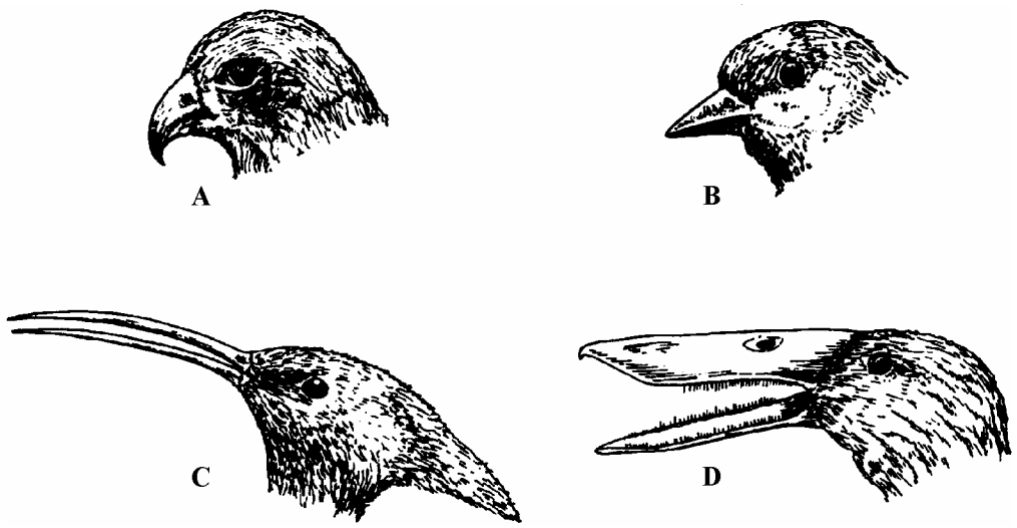
.....

.....

(1)

(Total 5 marks)

8. The drawings show the heads of four birds, not drawn to scale. The birds feed in different ways.



Which of the birds, A, B, C or D, is best adapted for:

1. tearing flesh .....
2. finding insects in cracks in the ground .....
3. sieving small animals from mud? .....

(Total 3 marks)

9. Plants are grown in glasshouses to protect them from the weather or extend the growing season.

Plants make food by photosynthesis.

$$6CO_2 + 6H_2O \xrightarrow[\text{light}]{\text{energy from}} \underset{\text{glucose}}{C_6H_{12}O_6} + 6O_2$$

In winter, when days are shorter, glasshouses are heated to keep the enzyme reactions in plants at optimum rates.

What else should a grower do to make sure that the plants are photosynthesising at the optimum rate? Give a reason for your answer.

.....

.....

.....

.....

.....

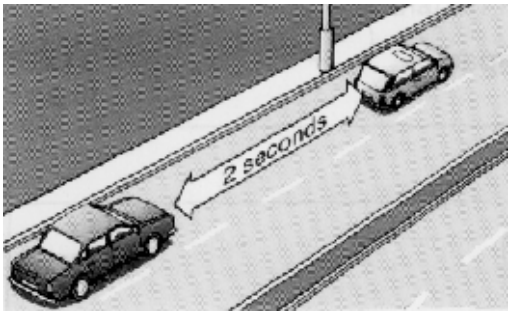
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(Total 3 marks)

10. (a) The 'two second rule' is a rule for car drivers. The rule is as follows:

'Leave enough space between you and the vehicle in front so that you can pull up safely if it suddenly slows down or stops… A two second time gap may be sufficient… Use stationary objects (eg lamp-posts) to help you keep a two second gap.'

(The Highway Code, 1993)



(i) The traffic is moving at 20 m/s, and a driver is keeping to the 'two second rule'.
What is the distance between the driver and the car in front?

.....

.....

1 mark

(ii) The traffic increases its speed to 25 m/s, but the driver stays the same distance from the car in front.
She sees the car in front pass a lamp post.
How long will it take her to reach the same lamp post?

.....

.....

Answer: …….. seconds

1 mark

(b) The driver decides to check her speedometer while driving along a motorway. She measures how long it takes her to travel 6 km. It takes her exactly 4 minutes. What was her speed in **km/h**? Show your working.

.....

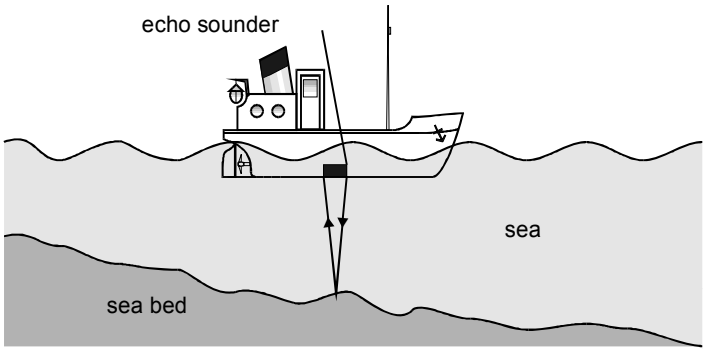
.....

..... km/h

2 marks

(TOTAL: 4 marks)

11. The diagram shows a boat using an echo sounder. It sends a pulse of sound waves which is reflected from the sea bottom. The reflected sound waves are detected by a sensitive microphone.



The time between sending and receiving the pulse is 0.005 s. The device calculates the depth of the sea, using the speed of sound in sea water, which is 1500 m/s.

(a) Calculate the depth of the sea. Show your working.

.....

.....

.....

2 marks

(b) The boat moves into very deep water. Explain why the reflected pulse is too weak to be detected.

.....

.....

1 mark

(c) The boat's 'echo sounder' could **not** be used in an aeroplane to measure its height above the ground unless it had been modified.

Explain why the device will **not** give correct heights above the ground.

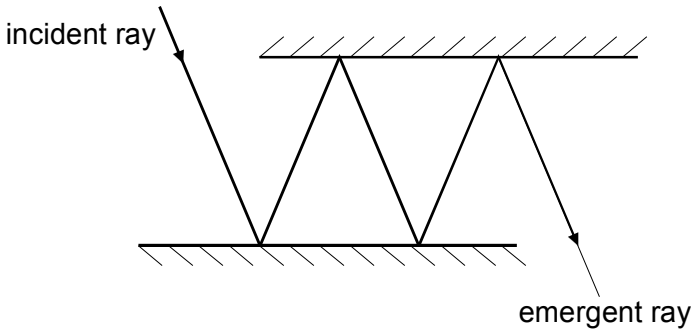
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.....

1 mark

(TOTAL: 4 marks)

12. (a) The diagram shows a ray of light reflecting several times between two parallel mirrors.



(i) What relationship is there between the angle of incidence for the **first** reflection and the angle of reflection for the **last** reflection?

.....

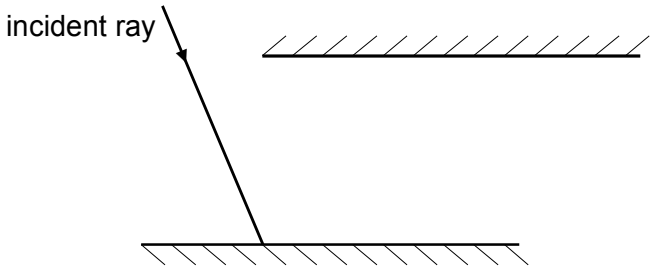
1 mark

(ii) Draw on the diagram above the following, for the first reflection:

- The angle of incidence
- The angle of reflection

1 mark

(b) In the diagram below, the angle of incidence has changed, but the mirrors are in the same positions.



Draw the path of the ray and state below how many total reflections take place before the ray leaves the last mirror.

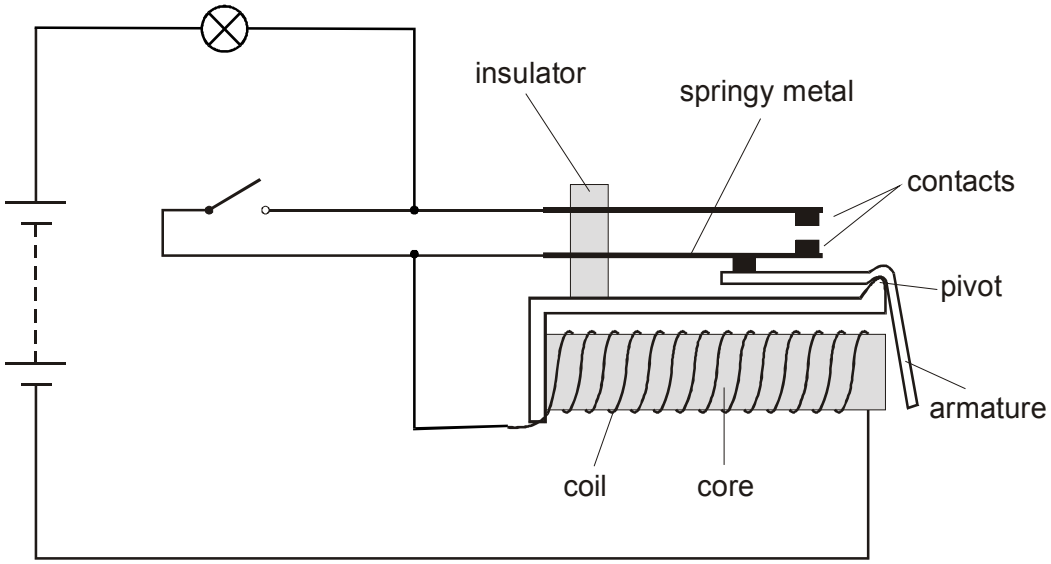
.....

.....

2 marks

(TOTAL: 4 marks)

13. The diagram shows an electromagnetic relay. The relay is connected in a circuit with a battery, a lamp and a switch.



(a) (i) Give the name of a suitable material to use for the core of the electromagnet.

.....

1 mark

(ii) Give the name of a suitable material to use for the armature.

.....

1 mark

(b) (i) Explain why the contacts come together when the switch is closed.

.....

.....

.....

.....

.....

3 marks

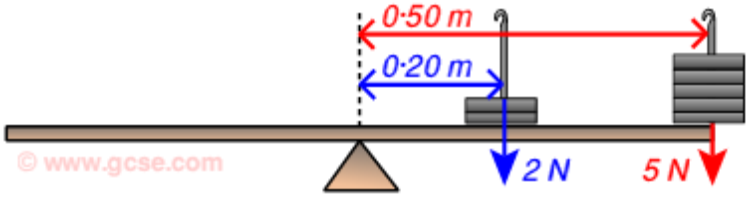
(TOTAL: 5 marks)

14. A moment is defined as being the turning force around a pivot.

Mathematically:a moment = (perpendicular distance from the pivot) X (force applied)

In the example below, the moment of the first set of masses is:

Moment = 0.20m X 2N = 0.4



(a) (i) What units should be added to the answer above of '0.4'?

.....

1 mark

(ii) Calculate the moment for the larger stack of masses, providing the correct final unit.

.....

.....

.....

.....

.....