THIS IS A LEGACY SPECIFICATION

OCR
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Monday 30 January 2012 – Afternoon

GCSE GATEWAY SCIENCE
SCIENCE B

B622/02 Unit 2 Modules B2 C2 P2 (Higher Tier)

B620740112

Candidates answer on the Question Paper.
A calculator may be used for this paper.

OCR supplied materials:
None

Other materials required:
- Pencil
- Ruler (cm/mm)

Duration: 1 hour

B622202

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- A list of physics equations is printed on page two.
- The Periodic Table is printed on the back page.
- The total number of marks for this paper is **60**.
- This document consists of **24** pages. Any blank pages are indicated.

EQUATIONS

$$\text{efficiency} = \frac{\text{useful energy output}}{\text{total energy input}}$$

energy = mass × specific heat capacity × temperature change

energy = mass × specific latent heat

fuel energy input = waste energy output + electrical energy output

power = voltage × current

energy supplied = power × time

energy (kilowatt hours) = power (kW) × time (h)

wave speed = frequency × wavelength

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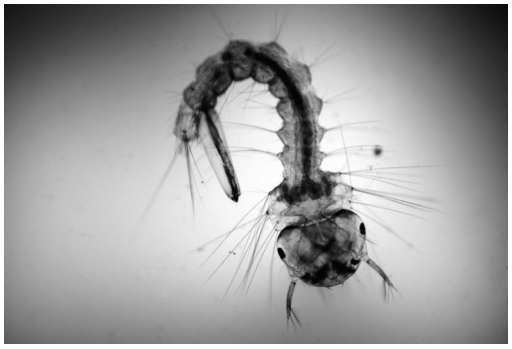
Question 1 begins on page 4.

PLEASE DO NOT WRITE ON THIS PAGE

Answer **all** the questions.

Section A – Module B2

1 Mosquitoes are insects that develop from larvae that live in water.



Sue is investigating how many mosquito larvae live in her local pond.

She puts a quadrat on the surface of the pond and counts the number of mosquito larvae inside the quadrat.

She does this in three different places on the pond's surface.

The table shows her results.

quadrat	number of mosquito larvae
1st	4
2nd	1
3rd	7

(a) (i) The area of each quadrat is 0.25 m^2.

The area of the pond is 8 m^2.

Use this information and Sue's results to estimate the total number of mosquito larvae in the pond.

Show your working.

answer ..... **[2]**

(ii) This might not be a very reliable estimate.

Write down **one** way Sue could improve her results to give a more reliable estimate.

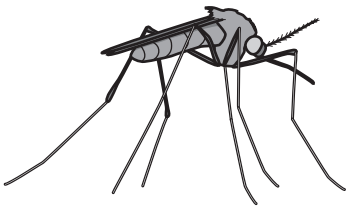
.....

..... **[1]**

(b) The larvae develop into adult mosquitoes.

Look at the pictures.

They show two types of mosquito that live near the pond.



type A

type B

Sue thinks the two types might be the same species because they look very similar.

(i) Describe how Sue could show whether the two types are the same species.

.....

.....

.....

..... **[2]**

(ii) If the two types are two **different** species, explain why they look so similar.

.....

.....

..... **[1]**

(c) Some mosquitoes have been found preserved in amber.

These are the actual bodies of the mosquitoes, not imprints like many fossils.

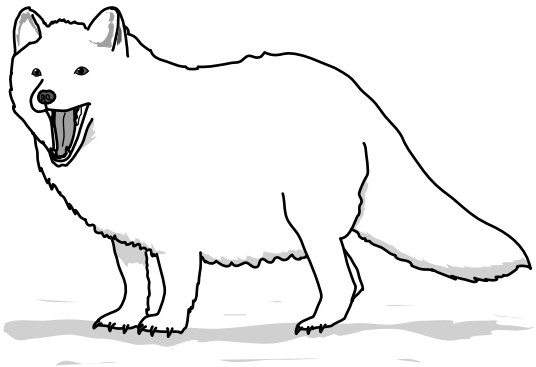
These mosquitoes are millions of years old.

Write down **one other** way that actual animal bodies can be naturally preserved for long periods of time.

..... **[1]**

[Total: 7]

2 The Arctic fox lives in the Arctic.



(a) The Arctic fox is adapted to living in cold Arctic conditions.

Look at the picture of the Arctic fox.

Explain **two** ways that the Arctic fox is adapted to living in the Arctic.

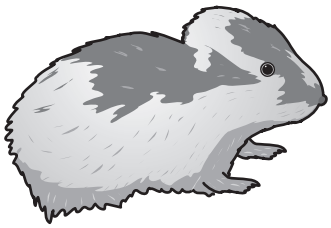
1 .....

.....

2 .....

..... **[2]**

(b) Arctic foxes eat lemmings.



In some years the number of lemmings decreases.

Suggest what effect this has on the number of Arctic foxes.

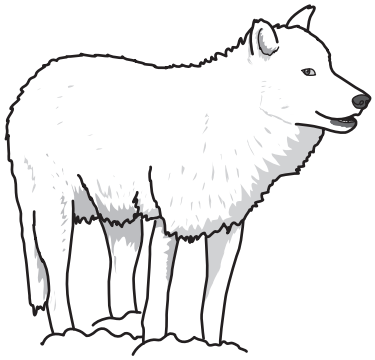
Explain why it has this effect.

effect .....

explanation .....

..... **[2]**

(c) Arctic wolves also live in the Arctic and eat lemmings.



Both Arctic wolves and Arctic foxes survive because, although they have **similar** ecological niches, their niches are **not** exactly the same.

Suggest **one** way their niches may be different.

.....

..... **[1]**

(d) Arctic foxes sometimes get a skin disease called mange.

Mange is caused by parasites called mites.

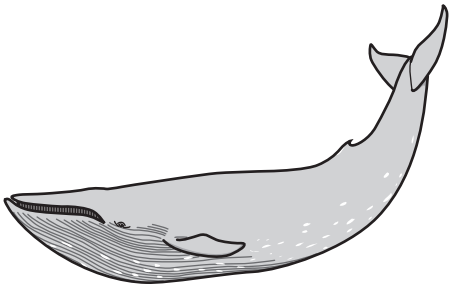
Explain what is meant by the term **parasite**.

.....

..... **[1]**

[Total: 6]

3 The blue whale is the biggest animal alive today.



(a) The population of blue whales has decreased because of hunting.

(i) Write down **one** reason why people hunt whales.

..... **[1]**

(ii) Some people think that all whale hunting should be completely stopped.

Why is it difficult to completely stop all whale hunting?

.....

.....

.....

..... **[2]**

(b) Blue whales eat tiny crustaceans called krill.

Krill eat tiny sea plants called phytoplankton.

Phytoplankton make food by photosynthesis.

Photosynthesis happens more slowly when the phytoplankton are further below the surface of the sea.

This is because of limiting factors.

Suggest **two** limiting factors that slow down photosynthesis below the surface of the sea.

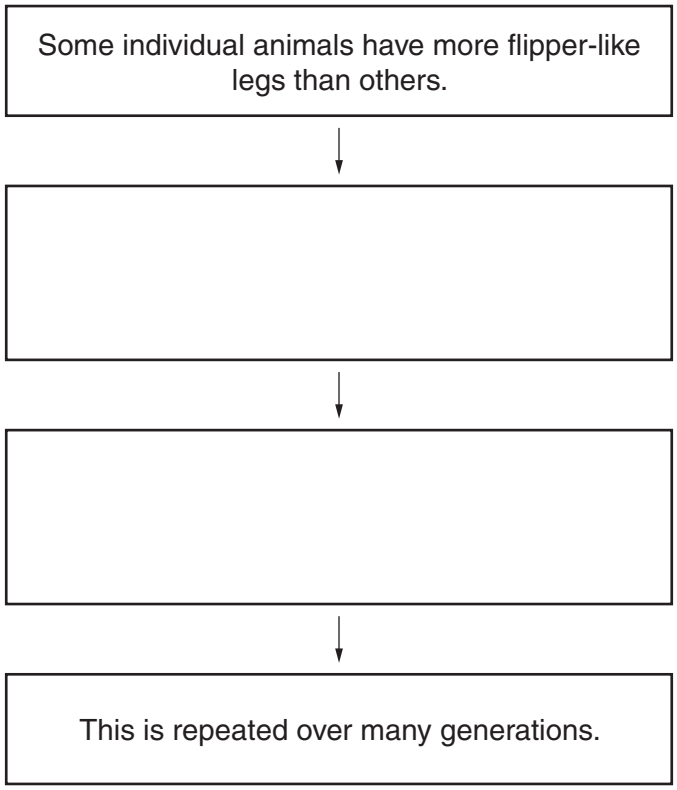
1 .....

2 ..... **[2]**

(c) Scientists think that whales evolved from animals that had legs and could live on land.

These animals spent some of their time in water, like otters or hippos do today.

Complete the flow diagram to show how these animals could have evolved into whales by natural selection.

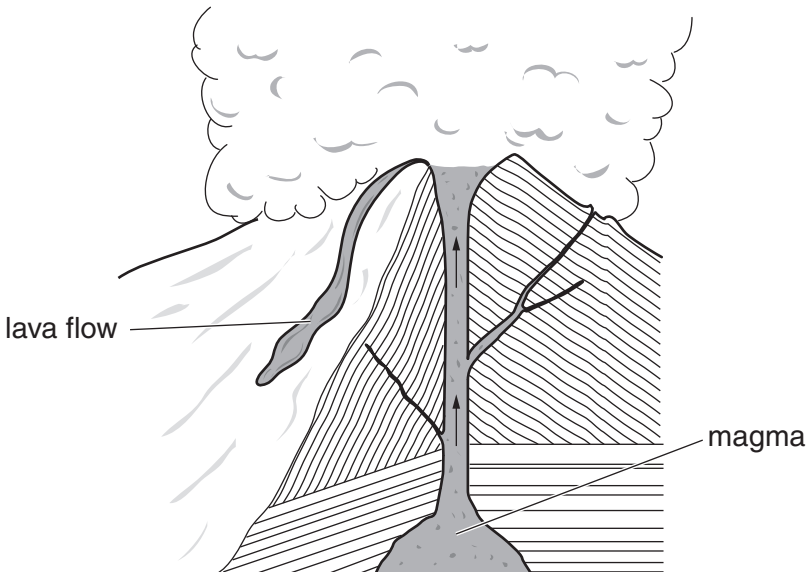


[2]

[Total: 7]

Section B – Module C2

4 This question is about volcanoes.



(a) Look at the diagram of a volcano.

The magma in the mantle can rise up through the Earth's crust.

Explain why.

Use ideas about density.

..... **[1]**

(b) Different types of magma have different compositions.

This causes different types of volcanic eruptions.

The different types of magma make different types of igneous rocks.

Draw lines to match each **type of volcanic eruption** with the correct **type of magma** and **type of rock** made.

You should draw four straight lines.

type of volcanic eruption	type of magma	type of rock
explosive	iron-rich	rhyolite
runny	silica-rich	basalt

[2]

(c) Geologists study volcanoes.

Suggest why.

.....

..... **[1]**

[Total: 4]

5 This question is about the gases in the air.

(a) Complete the table to show the percentage of gases in clean air.

gas	percentage in clean air
.....	78%
.....	21%
carbon dioxide	.....

[2]

(b) Air contains pollutants.

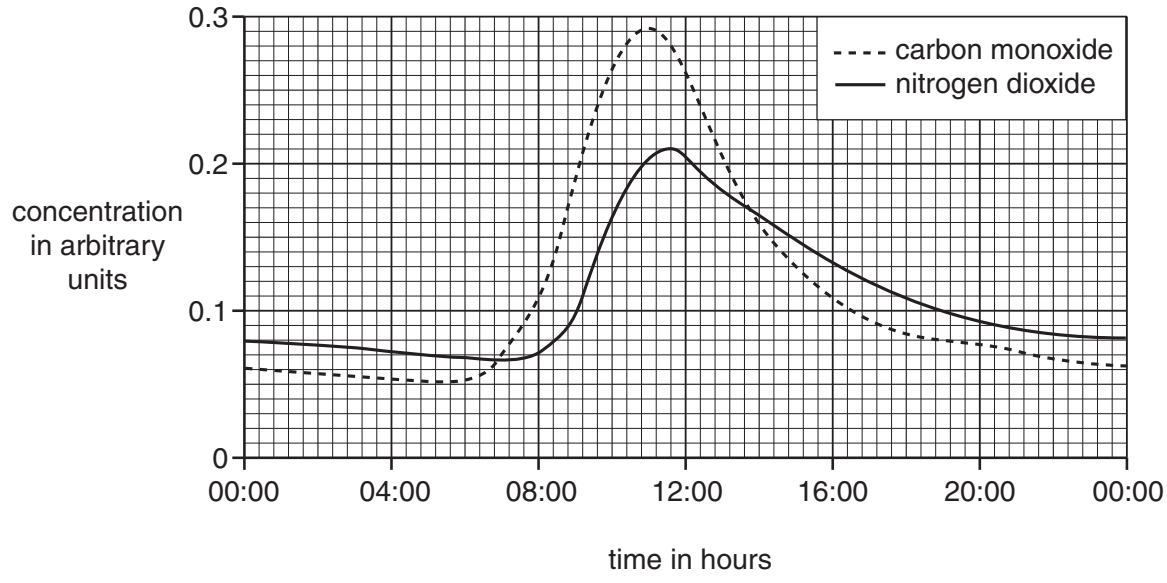
(i) Carbon monoxide is one pollutant given off from the exhaust gases of a car.

How is carbon monoxide made?

..... **[1]**

(ii) Look at the graph.

It shows how the concentrations of some pollutants in the air change over 24 hours.



At what time of day is the concentration of **nitrogen dioxide** the highest?

..... **[1]**

(c) Look at the following sentences.

They describe one possible theory for how the atmosphere evolved.

letter	sentence
A	Formation of water.
B	Carbon cycle now keeps the composition of the atmosphere almost constant.
C	Initial atmosphere of ammonia and carbon dioxide.
D	Increase in oxygen and nitrogen levels.
E	Photosynthetic organisms begin to make oxygen.
F	Degassing from the Earth's crust.

Put the sentences in the correct order.

Some have been done for you.

Order of sentences | **F** | | **A** | | | **B** |

[2]

[Total: 6]

6 Julie and Trevor investigate the reaction between zinc and sulfuric acid.

Zinc sulfate and hydrogen are made.

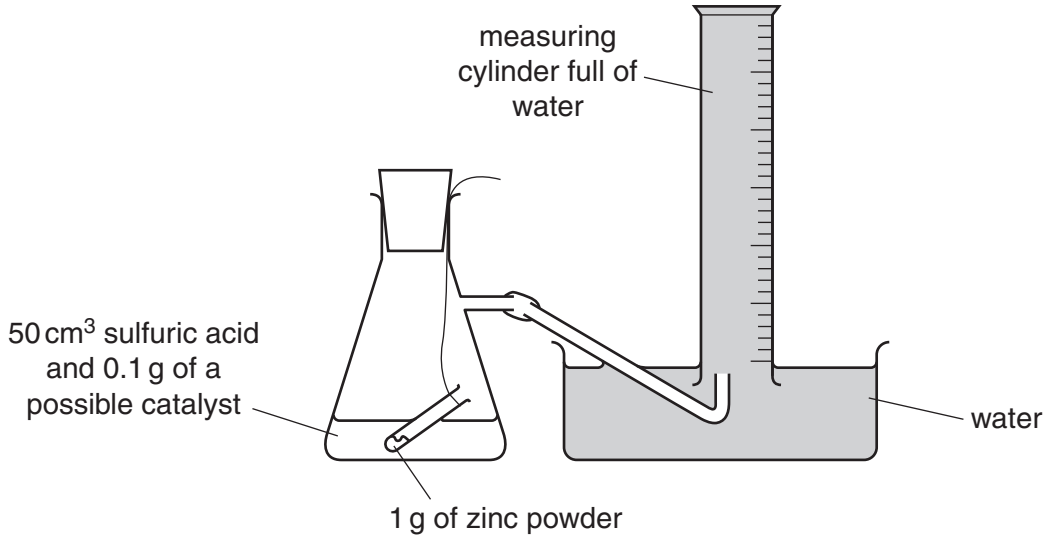
(a) Write a **word** equation for this reaction.

..... **[1]**

(b) Julie and Trevor do several experiments.

They want to find a substance that is a **catalyst** for the reaction.

The diagram shows the apparatus they use.



The flask is shaken to start the reaction.

They record the time taken to collect 50 cm^3 of gas.

Look at the table. It shows Julie and Trevor's results.

possible catalyst used	**appearance of catalyst**	**time to collect 50 cm^3 of gas in seconds**	**other observations**
no catalyst added	–	65	colourless solution made
copper sulfate	blue solid	10	colourless solution made and zinc powder coated with a pink solid
copper powder	red-brown powder	19	red-brown powder remains
copper lumps	red-brown lumps	56	red-brown lumps left behind
sodium chloride	white solid	65	colourless solution made

(i) Copper powder and copper lumps are both catalysts for the reaction.

How can you tell?

Use information from the table.

.....

.....

..... **[2]**

(ii) The reaction goes faster if copper **powder** is used instead of copper **lumps**.

Explain why.

Use ideas about collisions between particles.

.....

.....

..... **[2]**

(iii) Julie and Trevor repeat the experiment with copper sulfate.

This time they use sulfuric acid that is **twice** as concentrated.

Predict the time it will take to collect 50 cm^3 of gas.

..... **[1]**

[Total: 6]

7 James has just fitted a new kitchen in his house.

(a) The table in James' kitchen is made of granite.

Why did James choose granite, instead of marble, for his table?

Use ideas about the hardness of the rocks.

..... **[1]**

(b) The taps in the kitchen are made of stainless steel.

Why did James choose steel, instead of iron, for his taps?

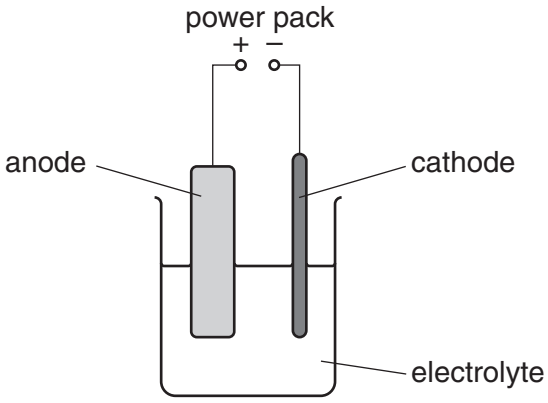
..... **[1]**

(c) The electrical wiring in the kitchen is made of copper.

Copper has to be purified by **electrolysis** before it can be used for electrical wiring.

Look at the diagram.

It shows the apparatus used to purify impure copper.



(i) What are the electrodes made of?

anode .....

cathode ..... **[1]**

(ii) Write about what happens at each electrode.

anode .....

.....

cathode .....

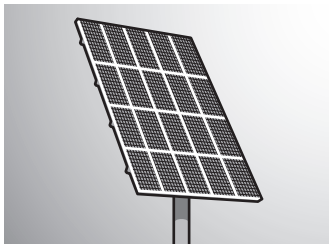
..... **[1]**

[Total: 4]

Section C – Module P2

8 This question is about energy from the Sun.

Photocells use energy from the Sun.



Photocells have advantages and disadvantages as a source of electricity.

(a) Write down **one advantage** of using photocells.

.....

..... **[1]**

(b) Write down **one disadvantage** of using photocells.

.....

..... **[1]**

[Total: 2]

9 This question is about the cost of using electricity.

Nasim cooks a meal in a conventional oven.

It takes 3 hours to cook.

The oven has an average power of 3.5 kW.

(a) Calculate the number of kilowatt hours used to cook the meal.

.....

.....

answer ..... kWh **[1]**

(b) Electricity costs 16 pence per unit (kWh).

Calculate the cost of cooking the meal.

.....

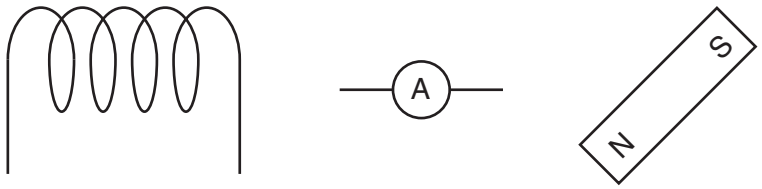
answer ..... pence **[1]**

[Total: 2]

10 This question is about generating electricity.

Molly builds a generator to produce electricity.

She uses a magnet and a coil of wire.



coil of wire magnet

Describe how Molly uses this equipment to generate a current.

In your answer you should

- draw a diagram to show how she uses the equipment
- describe how a current is produced
- describe how she could increase the current produced.

.....

.....

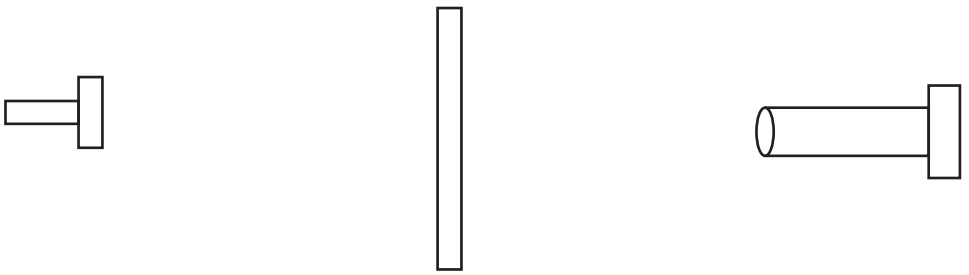
.....

..... **[3]**

[Total: 3]

11 This question is about the properties of nuclear radiation.

Look at the diagram.



radioactive source absorber radiation detector

Oliver records the counts per minute from the detector.

He repeats the experiment with the same radioactive source but with different absorbers.

Look at his results.

absorber	count rate at detector in counts per minute
none	1200
thin paper	1198
3 mm aluminium	36
thick lead	36

Oliver thinks that the radioactive source is giving out beta (β) radiation.

Explain why he is correct.

In your answer write about how Oliver's results show

- it is not alpha (α) or gamma (γ) radiation
- why the count rate never reaches zero.

.....

.....

.....

.....

..... **[3]**

[Total: 3]

12 (a) Some objects in the Universe are close to Earth, others are far away.

Look at this list of distances.

A Earth to the nearest asteroid belt.

B Earth to the nearest star.

C Earth's galaxy (Milky Way) to the nearest other galaxy.

D Earth to the nearest black hole.

E Earth to the nearest planet.

Put the distances in order starting with the **shortest** distance.

Write your answers in the boxes.

One has been done for you.

shortest distance largest distance

		A		

[2]

(b) Asteroids are left over from the formation of the Solar System.

The asteroid belt is between Mars and Jupiter.

The asteroids have not joined together to form a new planet.

Suggest why.

.....

.....

..... **[1]**

(c) There is a small threat of the Earth being hit by a Near Earth Object.

Suggest how we can reduce this threat.

.....

.....

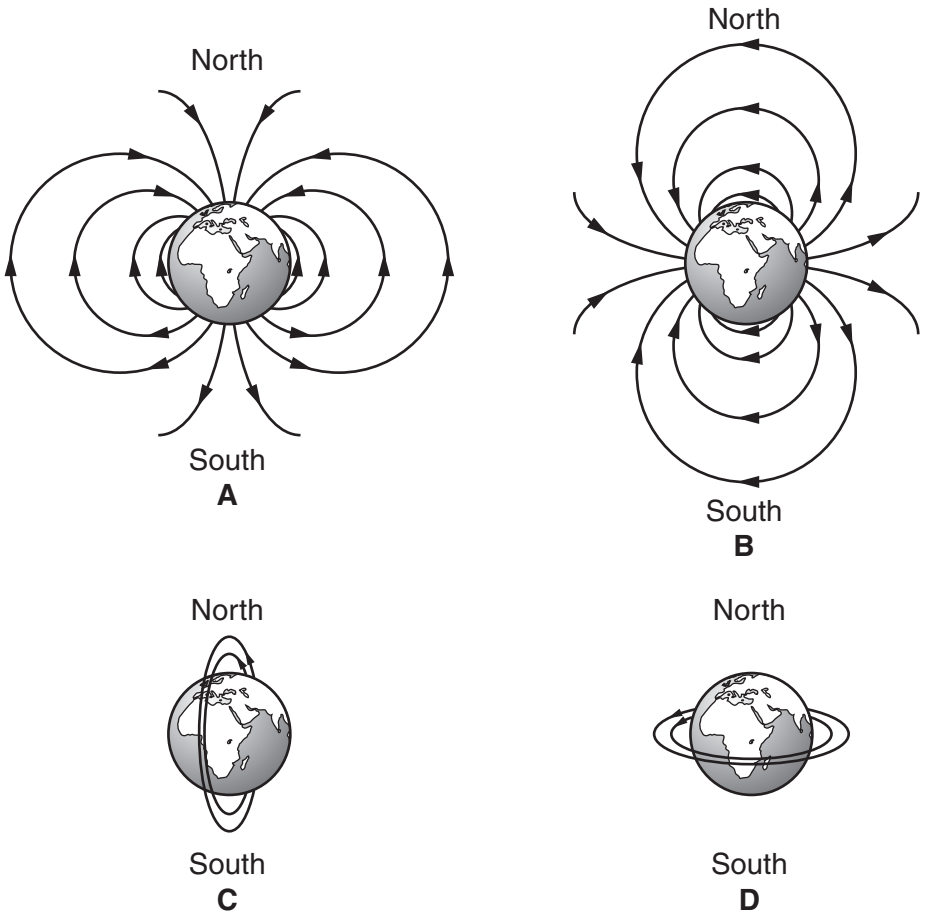
.....

..... **[2]**

[Total: 5]

13 The Earth is surrounded by a magnetic field.

(a) Look at the diagrams of the Earth.



Which diagram shows the correct shape of the Earth's magnetic field?

Choose from **A** **B** **C** **D**

answer ..... **[1]**

(b) The Sun emits **charged particles**.

They enter the Earth's magnetic field.

What effect does the Earth's magnetic field have on these charged particles?

.....

..... **[1]**

[Total: 2]

14 This question is about the Big Bang theory.

(a) Polly looks at the light from different galaxies.

(i) She notices that the light from one of the galaxies is shifted to the red end of the spectrum.

What does this tell you about this galaxy?

..... **[1]**

(ii) She notices that the light from a more distant galaxy has a greater red shift.

Explain why.

.....

..... **[1]**

(b) The Sun is a medium weight star.

What does a medium weight star become at the end of its life?

Choose from

black hole **neutron star** **red giant** **supernova** **white dwarf**

answer ..... **[1]**

[Total: 3]

END OF QUESTION PAPER

The Periodic Table of the Elements

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 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
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
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
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **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
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **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	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111	Elements with atomic numbers 112-116 have been reported but not fully authenticated						

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

**** The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.***

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.