OCR
RECOGNISING ACHIEVEMENT

H

GENERAL CERTIFICATE OF SECONDARY EDUCATION

GATEWAY SCIENCE

SCIENCE B

Unit 2 Modules B2 C2 P2 (Higher Tier)

B622/02

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)

Monday 18 January 2010
Morning

Duration: 1 hour

OCE/24370

B622202

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

MODIFIED LANGUAGE

INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

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 **28** pages. Any blank pages are indicated.

DC (LEO/SHW) ML10084 24370

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

Answer **all** the questions.

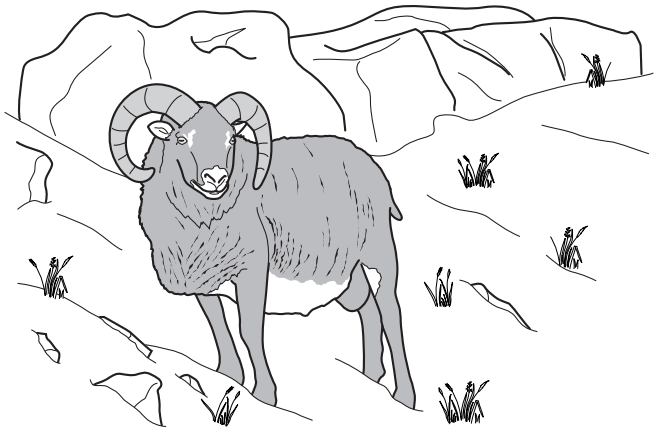
Section A – Module B2

1 Read the information carefully.

Hirta is a small island in the north of Scotland.

The island is cold and is covered in rocky hills.

Many sheep live on the island.



Scientists have studied these sheep over many years.

Usually only the largest sheep survive the winter.

Now the scientists are finding that the average mass of sheep on the island is going down.

(a) Suggest why the largest sheep are more likely to survive the winter.

.....

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

(b) Smaller sheep are now surviving the winter.

This may be because the average temperature of the Earth is increasing.

Complete these sentences about this increase in temperature.

The increase in the average temperature of the Earth

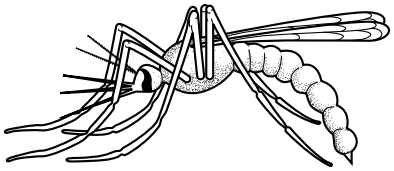
is called …… .

It is caused by the increased release of the gas……..… into the air.

[2]

[Total: 3]

2 Mosquitoes are small organisms that feed on blood.



Culex pipiens is the scientific name for a type of mosquito.

This type of mosquito feeds on the blood of live birds.

(a) (i) Birds are vertebrates but mosquitoes are invertebrates.

What do all vertebrates have that invertebrates lack?

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

(ii) The mosquito is a **parasite**.

What is meant by the term parasite?

.....

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

(b) Tunnels for underground trains were dug under London many years ago.

A group of *Culex pipiens* mosquitoes were trapped in the tunnels. They have lived there ever since.

Another group of the mosquitoes still lives above ground.

Complete these sentences about the two groups of mosquitoes by using words from the list.

classes **communities** **habitats** **populations**

The mosquitoes that live together in the tunnels and the mosquitoes that live above ground are now separate …… of mosquitoes.

The two groups of mosquitoes have developed slightly different features because they have adapted to live in different …… . **[2]**

(c) **(i)** Scientists have recently trapped some mosquitoes from the tunnels.

They mated them with *Culex pipiens* mosquitoes from above ground.

After studying the offspring, the scientists decided to give the mosquitoes living in the tunnels a new scientific name, *Culex molestus*.

Suggest why the scientists have given the mosquitoes a new scientific name.

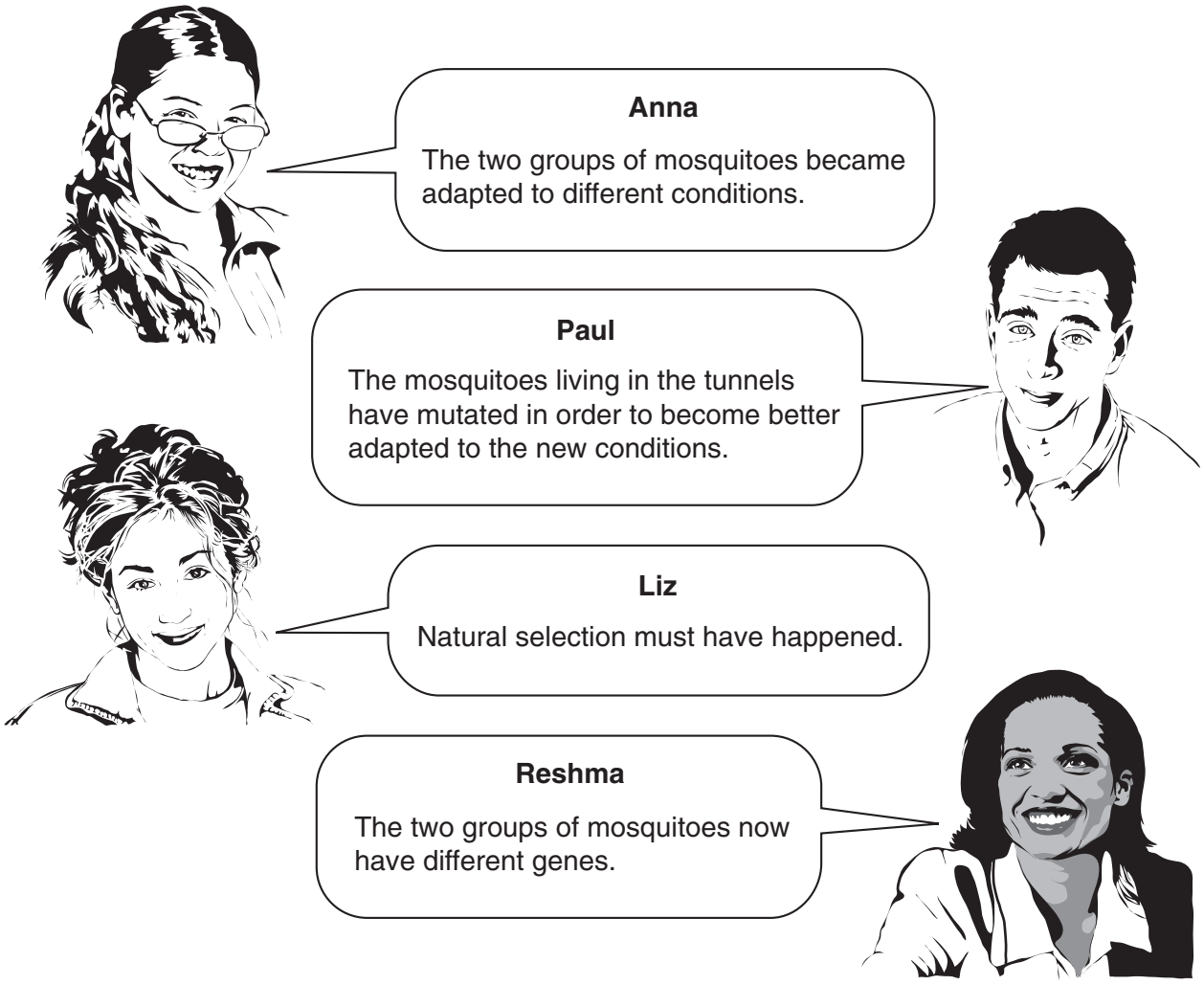
.....

.....

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

Turn over for the remainder of question 2

(ii) Four people gave explanations for the differences in the mosquitoes.



Write down the name of the person whose explanation is **wrong**.

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

[Total: 7]

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Question 3 begins on page 8.

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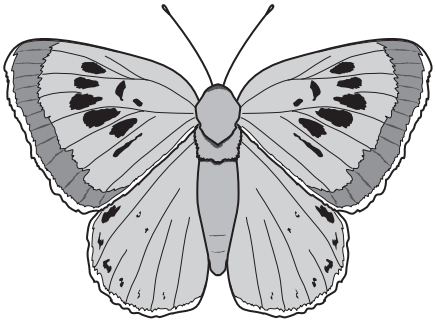
3 The Large Blue is a butterfly which lives in certain areas of England.

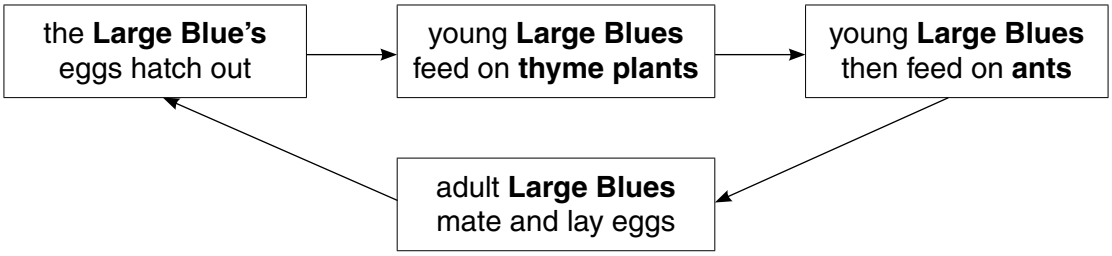
These areas contain patches of bare ground where ants live.



By 1974 the Large Blue had become an endangered species.

(a) Scientists tried to find out why the Large Blue had become endangered.

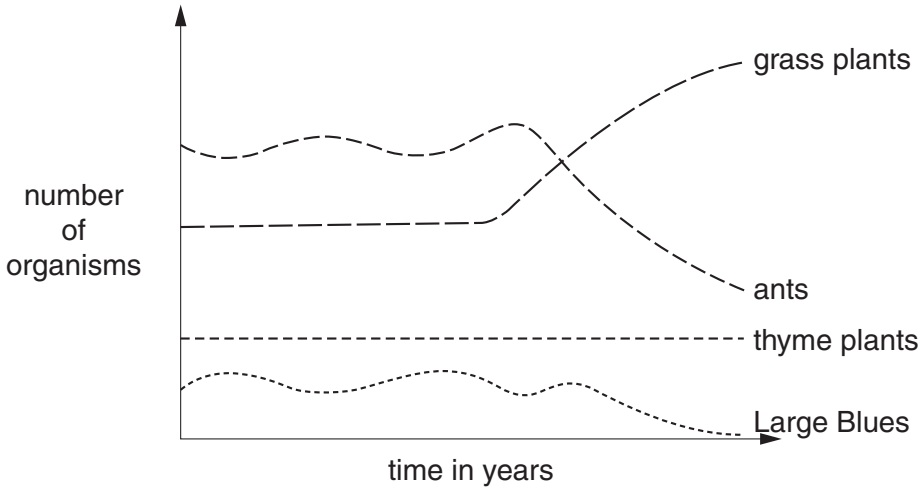
They looked at the Large Blue's life cycle.



The scientists counted the number of Large Blues, thyme plants, grass plants and ants in an area.

The scientists counted the organisms regularly over several years.

The graph shows their results.



Suggest what caused the Large Blue to become endangered.

Use information from the **life cycle** and the **graph** to help you.

.....

.....

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

(b) There is now a conservation plan to save the Large Blue.

Many people think that it is important to save animals such as the Large Blue.

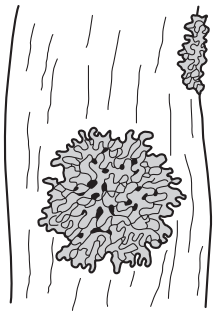
Write down **one** reason why they might think this.

.....

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

[Total: 3]

4 Lichens are organisms that usually live on walls and tree trunks.



They consist of fungi that have small organisms called algae living inside them.

(a) Explain why fungi are **not** classified as plants.

.....

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

(b) The algae in the lichen make food by photosynthesis.

Complete the balanced symbol equation for photosynthesis.

$6CO_2$ + ... → $C_6H_{12}O_6$ + ... **[2]**

(c) Lichens can be described as crusty, leafy or bushy according to their shape.

The table shows the percentage of each type found on trees.

Trees were sampled at different distances downwind from a factory.

type of lichen	percentage of each tree trunk covered by lichen		
	2 km from factory	10 km from factory	20 km from factory
crusty	5	20	30
leafy	0	10	35
bushy	0	0	25

(i) Lichens are often called **indicator species**.

Use the information in the table to explain what this means.

.....

.....

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

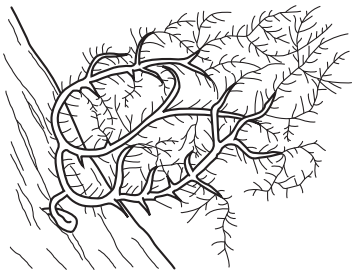
(ii) Look at the table.

What is the main difference between the distributions of crusty lichens and bushy lichens?

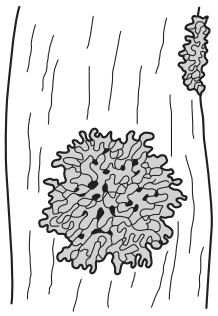
.....

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

(iii) These diagrams show a bushy lichen and a crusty lichen.



a bushy lichen



a crusty lichen

Use these diagrams to explain the different distribution of the lichens shown in the table.

.....

.....

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

[Total: 7]

Section B – Module C2

5 Look at the picture of a car.

(a) Steel is an alloy of iron.

Steel is used instead of iron to make the car body.

Explain why.

.....

.....

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

(b) Alloys are mixtures containing metals.

Four alloys are listed below.

Draw straight lines to match each **alloy** to the **metals** it contains.

One has been done for you.

alloy	metals
solder	copper and zinc
brass	lead and tin
nitinol	nickel and titanium
amalgam	mercury

[2]

(c) Nitinol is an alloy of nickel and titanium.

This alloy has 'shape memory property'.

The alloy is used to make spectacle frames.

Explain how the shape memory property of the alloy is useful for making spectacle frames.

.....

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

[Total: 5]

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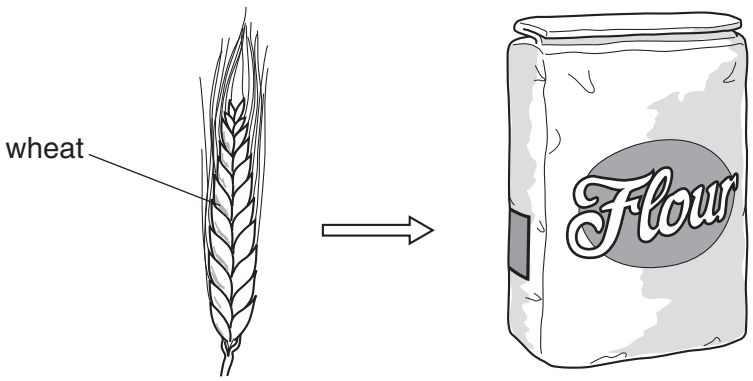
6 Large grains (lumps) of wheat are changed into a fine powder.

The fine powder is called flour.



(a) Between 1987 and 1997 there were 129 explosions in flour mills in America.

An explosion is a very fast chemical reaction.

Describe what is made during an explosion.

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

(b) Flour and wheat react with oxygen.

Powdered flour reacts more quickly than lumps of wheat.

Explain why.

Use ideas about collisions between particles.

.....

.....

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

[Total: 3]

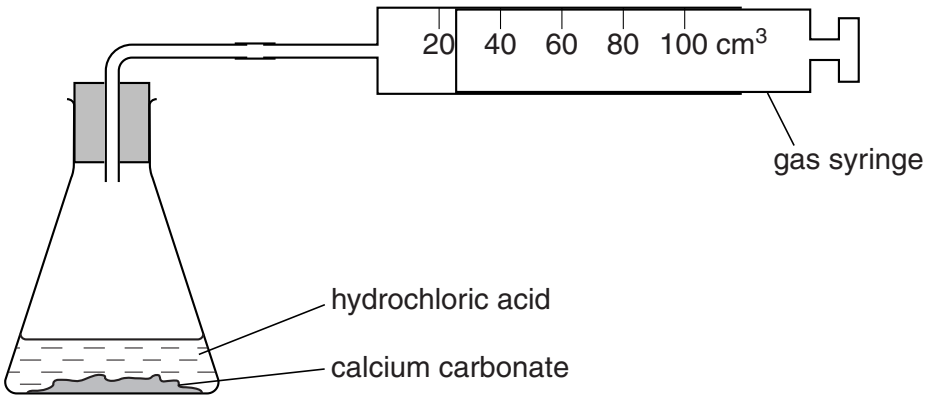
7 Ryan and Naomi investigate the reaction between 1.0 g of calcium carbonate and hydrochloric acid.

Calcium chloride, carbon dioxide and water are made in this reaction.

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

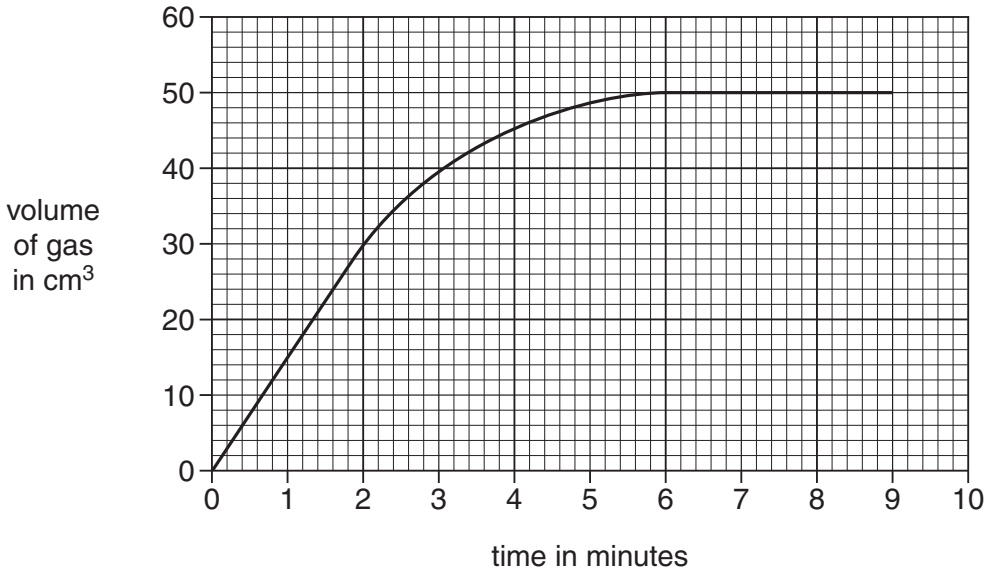
..... → ..... **[1]**

(b) The diagram shows the apparatus they use.



Look at the graph.

It shows their results from the experiment.



(i) Calculate the rate of this reaction during the first two minutes of the experiment.

.....

.....

answer ..... cm^3/min **[2]**

(ii) Ryan and Naomi use a **more** concentrated solution of hydrochloric acid in a second experiment.

The rate of reaction in the second experiment is higher.

Explain why. Use ideas about collisions between particles.

.....

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

[Total: 4]

8 This question is about copper.

(a) Copper, Cu, is extracted by heating copper carbonate, $CuCO_3$, with carbon, C.

Carbon dioxide is also made.

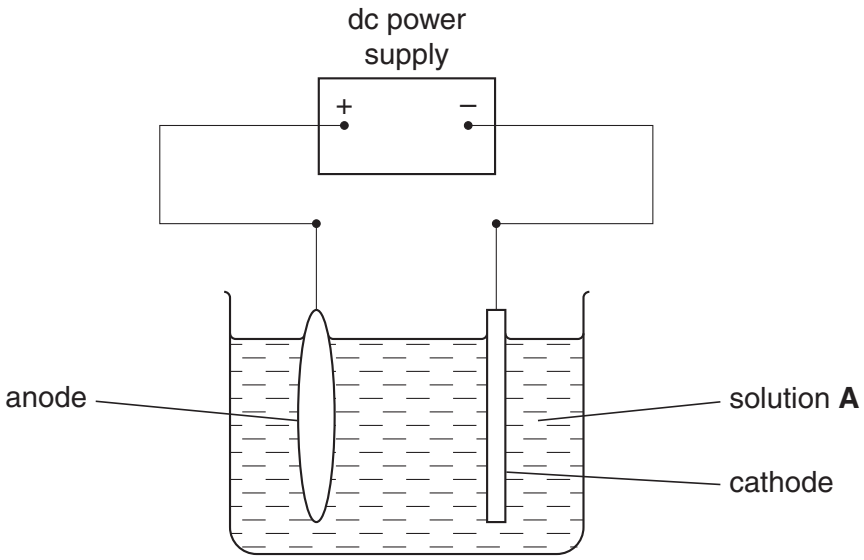
Write a balanced **symbol** equation for this reaction.

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

(b) The copper that is made is impure.

Look at the diagram.

It shows the apparatus used to purify copper.



The process used to purify copper is electrolysis.

Complete these sentences.

The name of solution **A** is ..... .

The anode is made of ..... .

The cathode is made of ..... .

[3]

[Total: 5]

9 This question is about the Earth.

The Earth has three layers. These layers are the crust, the mantle and the core.

(a) What is the name given to the crust and outer part of the mantle?

Choose from the list.

continental plate

lava

lithosphere

magma

oceanic plate

surface

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

(b) The Earth's crust is made of tectonic plates.

These plates **float** on the mantle.

Explain why these plates float on the mantle.

The data in the table may help you.

rock type	average density in kg/m^3
tectonic plate	2660
mantle	5518

.....

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

(c) Granite is a rock made when magma cools.

Granite contains large crystals.

Explain why. Use ideas about the **rate of cooling** of the magma.

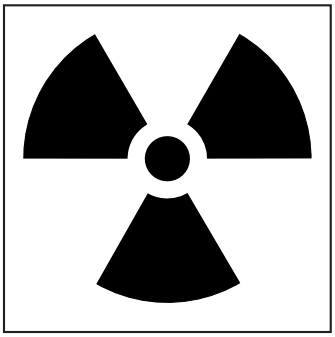
.....

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

[Total: 3]

Section C – Module P2

10 This question is about nuclear radiation.



(a) The three types of radiation will penetrate (go through) different materials.

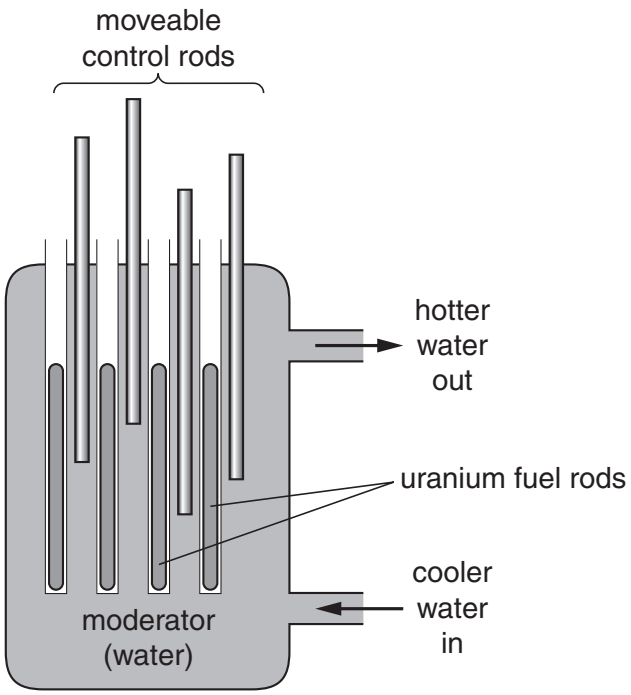
Complete the table for each type of radiation.

type of nuclear radiation	does it penetrate a sheet of paper?	does it penetrate 1 mm of aluminium?	does it penetrate several mm of lead?
alpha	.....	.....	no
beta	yes	.....	.....
.....	yes	.....	yes

[3]

(b) Nuclear power stations generate electrical energy.

(i) Nuclear power stations use fuel rods.



Complete the sentences.

Fuel rods release energy in the form of ..... .

The fuel rods produce a waste material called ..... .

[2]

(ii) The power station has an efficiency of 0.4 (40%).

The electrical power output is 1200 MW.

Calculate the power **wasted** in the power station.

The equations on page 2 may help you.

.....

.....

.....

answer ..... MW **[3]**

Turn over for the remainder of question 10

(c) Nuclear fuels and fossil fuels are used to generate electricity.

Write about the **advantages** and **disadvantages** of using nuclear power.

.....

.....

.....

.....

.....

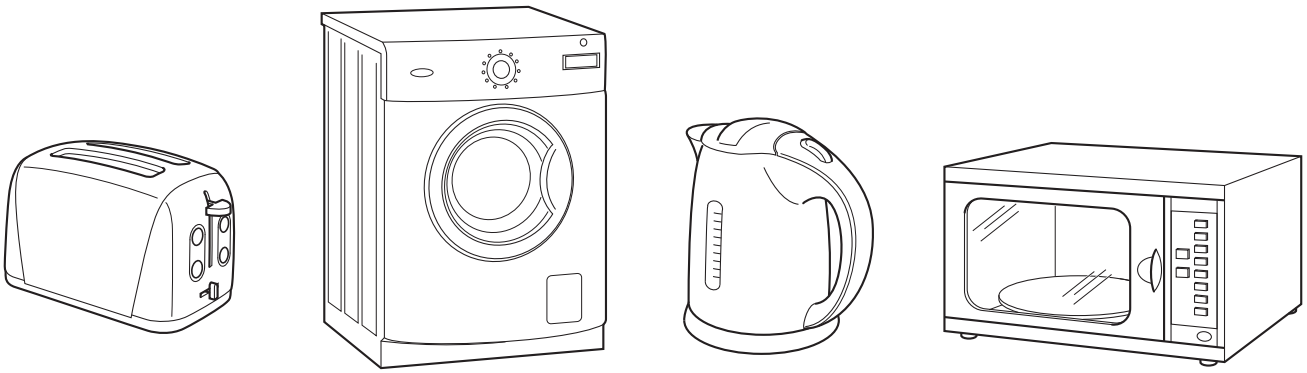
.....

.....

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

[Total: 11]

11 Look at the information about using some electrical appliances.



appliance	power in kW	time used in hours
toaster	1.5	0.1
washing machine	3.0	2.0
kettle	2.5	0.2
microwave oven	2.0	0.3

(a) The kettle is used for 0.2 hours.

Calculate the number of kilowatt hours used by the kettle.

The equations on page 2 may help you.

.....

.....

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

(b) One kWh of electricity costs 12p.

Calculate the cost of using the kettle for 0.2 hours.

.....

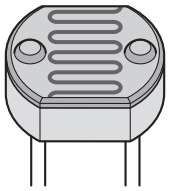
.....

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

[Total: 2]

12 This question is about the Sun.

(a) A photocell collects energy from the Sun.



Photocells are useful in remote locations.

(i) Write down one other **advantage** of using photocells.

.....

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

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

.....

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

(b) The Sun produces solar flares.

These can affect satellites.

Sometimes these flares reach the Earth.

Describe what could happen if a solar flare reaches the Earth.

.....

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

(c) Stars are different sizes.

(i) The Sun is a **medium-weight** star.

It will change into a red giant near the end of its life.

What forms **next**?

Choose from the list.

black hole

neutron star

planetary nebula

supernova

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

(ii) A **heavy-weight** star also changes into a red giant near the end of its life.

What happens **next**?

Choose from the list.

does not change

planetary nebula

supernova

white dwarf

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

[Total: 5]

13 The Big Bang theory describes that

- all galaxies are moving away from us
- distant galaxies are moving away quicker.

Scientists can use the Big Bang theory to calculate the age of the Universe.

Explain how they do this. Use ideas about **red-shift**.

.....

.....

.....

.....

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

[Total: 2]

END OF QUESTION PAPER

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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.