Candidate forename		Candidate surname	

Centre number						Candidate number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GENERAL CERTIFICATE OF SECONDARY EDUCATION

B622/02

GATEWAY SCIENCE

SCIENCE B

Unit 2 Modules B2 C2 P2 (Higher Tier)

WEDNESDAY 15 JUNE 2011: Morning
DURATION: 1 hour

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

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)

READ INSTRUCTIONS OVERLEAF

DC (LEO/SW) 11MEP06119 46324/1

INSTRUCTIONS TO CANDIDATES

- **Write your name, centre number and candidate number in the boxes on the first page. Please write clearly and in capital letters.**
- **Use black ink. Pencil may be used for graphs and diagrams only.**
- **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).**
- **Answer ALL the questions.**

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 three.**
- **The Periodic Table is provided.**
- **The total number of marks for this paper is 60.**

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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Answer ALL the questions.

SECTION A – MODULE B2

1 Polar bears live in the arctic.

They are predators, feeding on seals that live under the ice.

(a) Polar bears have small ears.

How does this help them to live in the arctic?

_____ **[1]**

(b) Scientists are worried that the number of polar bears might be going down.

There have been very few attempts to count the number of polar bears.

You have been provided with a graph on a separate sheet. It shows the results of three studies in one large area of the arctic.

(i) The three studies give different possible ranges for the number of polar bears.

Write down the largest and smallest possible number of polar bears found by any of the studies.

largest number _____

smallest number _____ **[1]**

(ii) Each study produced a different RANGE of possible numbers of polar bears.

Suggest why.

_____

_____ **[1]**

(c) The level of carbon dioxide in the air is increasing.

Scientists are worried that this might cause polar bears to become ENDANGERED.

Suggest how the increasing level of carbon dioxide could affect the polar bears.

_____

_____

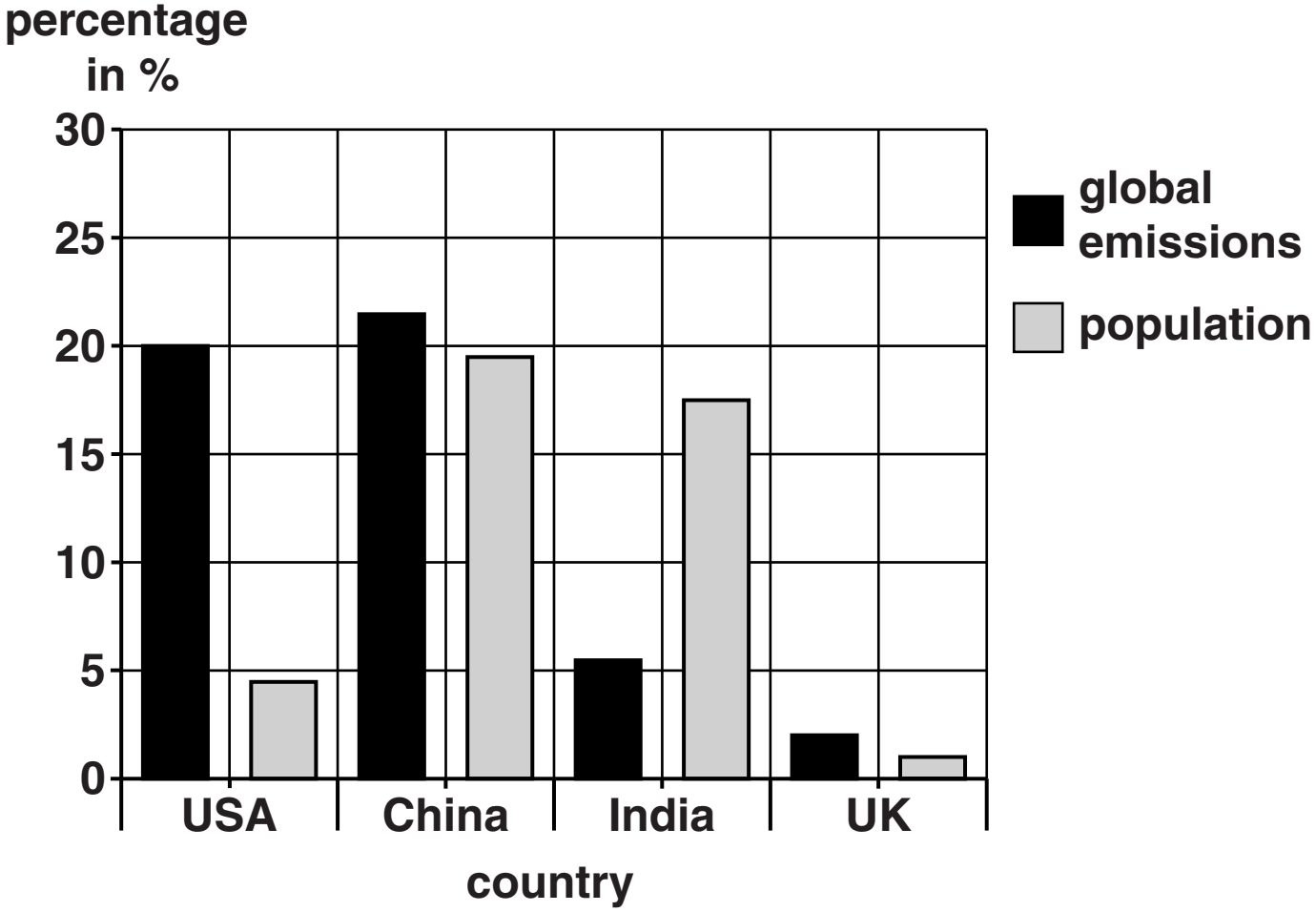
_____

_____ **[2]**

(d) The graph shows carbon dioxide emission data for four countries.

It shows the percentage of the world's total carbon dioxide emissions each country releases.

It also shows the percentage of the world's population that lives in each country.



Each country produces a different amount of carbon dioxide PER PERSON.

(i) Write down the four countries in order of the amount of carbon dioxide released per person.

_____ _____ _____ _____

HIGHEST **LOWEST**

[1]

(ii) Write down ONE reason for the differences in the amount of carbon dioxide released per person.

_____

_____ **[1]**

[Total: 7]

2 Scientists have recently discovered some fossil bones in Georgia in Eastern Europe.

The fossils may be from a human ancestor and are 1.8 million years old.

The scientists have modelled what they think the human ancestor looked like when it was alive.

(a) Only the bones have been preserved as fossils.

Why have the other parts of the body NOT become fossils?

_____

_____ **[1]**

(b) Scientists are trying to decide what to call this human ancestor.

One suggestion is *Homo georgicus.*

What system are the scientists using to name the human ancestor?

_____ **[1]**

(c) Most scientists agree that modern humans have less hair on their bodies than this ancestor.

One explanation for this is about fleas that can live in hair and feed on blood.

Modern humans may have evolved less hair because this means they have fewer fleas.

(i) What word is used to describe the type of feeding relationship between fleas and humans?

_____ **[1]**

(ii) How could humans have evolved to have less hair?

Use ideas about natural selection in your answer.

_____

_____

_____

_____

_____ **[3]**

(iii) One other explanation for the loss of hair is that it fell out due to human ancestors scratching.

They then had children who had less hair.

Why is this explanation UNLIKELY to be correct?

_____

_____ **[1]**

[Total: 7]

3 Michaela investigates gas exchange in leaves.

She uses a solution called hydrogencarbonate indicator.

It changes colour depending on how much carbon dioxide is in the air.

	LEVEL OF CARBON DIOXIDE		
	low	normal	high
colour of indicator	purple	red	yellow

(a) The leaves photosynthesise when light shines on them.

Photosynthesis uses carbon dioxide.

Complete the WORD equation for photosynthesis.

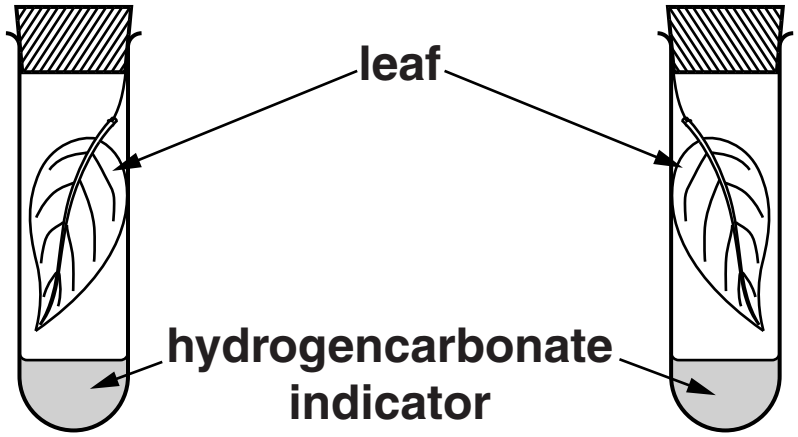
carbon dioxide + _____ →

_____ + _____

[2]

(b) Michaela sets up two tubes with leaves and red hydrogencarbonate indicator.

She puts one in bright light and one in the dark.



kept in bright light **kept in the dark**

Complete the table.

Write YES or NO to show the processes occurring in each leaf.

Write down the colour of the indicator in each tube after 30 minutes.

	IS PHOTOSYNTHESIS OCCURRING?	IS RESPIRATION OCCURRING?	COLOUR OF INDICATOR AFTER 30 MINUTES
tube in bright light			
tube in the dark			

[3]

(c) Carbon dioxide is described as a LIMITING FACTOR for photosynthesis.

What does the term limiting factor mean?

_____

_____ **[1]**

[Total: 6]

SECTION B – MODULE C2

4 This question is about metals used in making cars.

(a) Copper is used to make electrical wires because it is a good conductor of electricity.

Suggest one OTHER reason why copper is used to make electrical wires.

_____

Explain your answer.

_____

_____ **[2]**

(b) Aluminium and steel are both used to make car bodies.

Write down AND EXPLAIN one advantage and one disadvantage of using ALUMINIUM rather than steel to make car bodies.

advantage _____

_____

_____

disadvantage _____

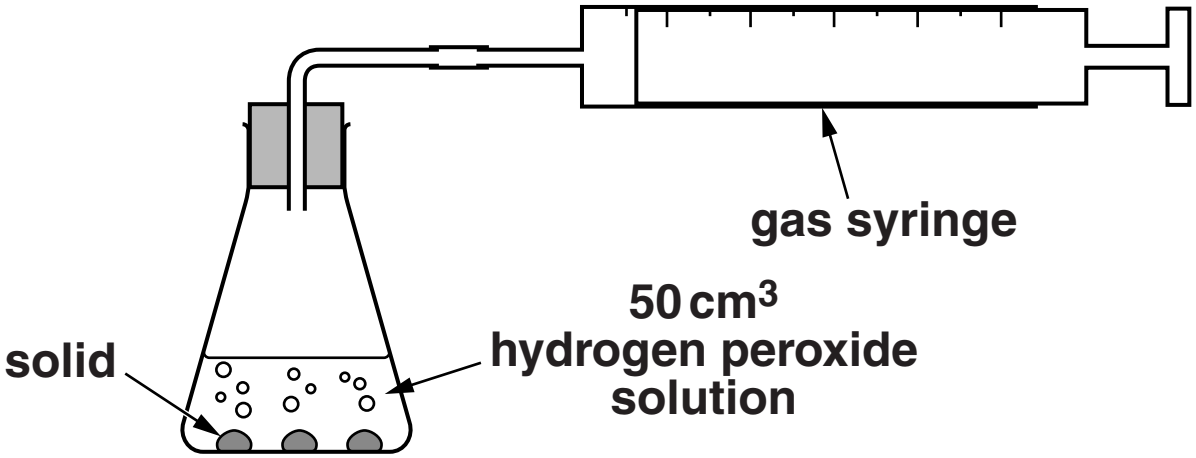
_____

_____ **[2]**

[Total: 4]

5 Louise and Mike investigate the decomposition of hydrogen peroxide solution.

Look at the diagram. It shows the apparatus they use.



Look at the word equation for the reaction.

hydrogen peroxide → water + oxygen

On its own, hydrogen peroxide solution reacts very slowly.

A solid must be added to make the reaction faster.

Louise and Mike add different solids to hydrogen peroxide solution.

They measure the rate of the reaction each time.

Look at their results.

SOLID ADDED	MASS OF SOLID AT START IN g	MASS OF SOLID AT END IN g	RELATIVE RATE OF REACTION
NONE	–	–	1
A	0.2	0.1	10
B	0.3	0.2	5
C	0.1	0.1	10
D	0.2	0.2	1

(a) Which solid is acting as a CATALYST for this reaction?

Choose A, B, C or D.

answer _____

Explain your answer.

_____

_____

_____

_____ **[3]**

(b) Catalysts are SPECIFIC.

What is meant by this?

_____ **[1]**

[Total: 4]

6 Limestone, marble and granite are rocks used in building.

(a) Place limestone, marble and granite in order of their hardness.

Write the hardest rock first.

hardest _____

_____

softest _____ **[1]**

(b) Limestone is heated with clay.

Write down the name of the substance made.

_____ **[1]**

(c) Calcium carbonate, $CaCO_3$, is heated.

Calcium oxide, CaO, and carbon dioxide are made.

(i) Write a BALANCED SYMBOL equation for this reaction.

_____ **[1]**

(ii) This reaction is an example of THERMAL DECOMPOSITION.

What is meant by thermal decomposition?

_____

_____ **[1]**

[Total: 4]

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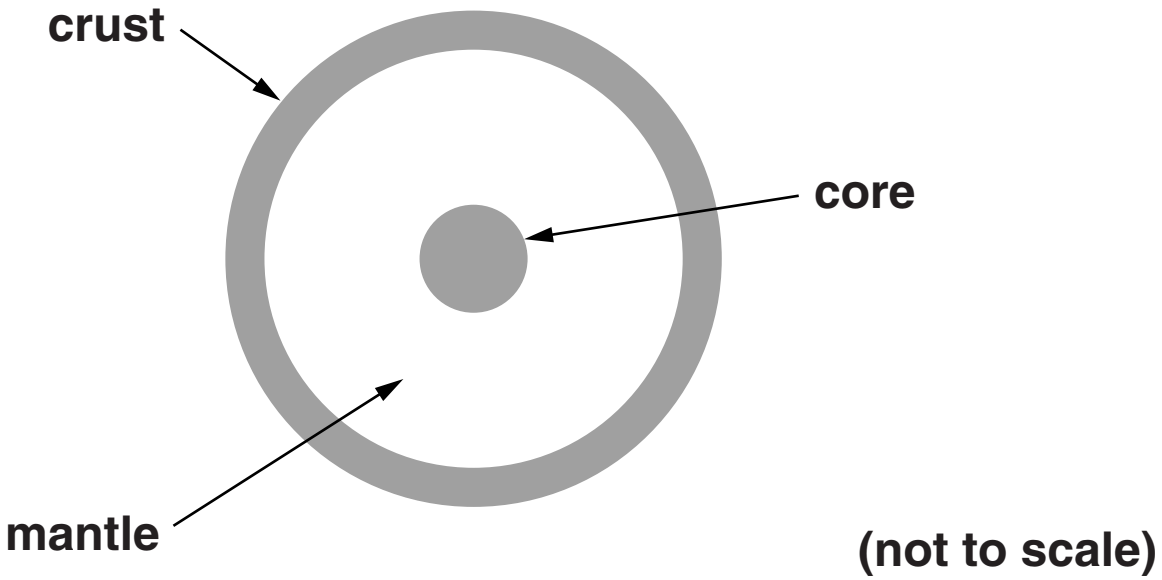
7 Look at the diagram. It shows the structure of the Earth.



(a) Look at the mantle.

The mantle near the crust is different from the mantle near the core.

Write about these differences.

_____

_____

_____

_____ **[2]**

(b) The crust is made up of tectonic plates.

The tectonic plates are found ON TOP of the mantle.

Explain why.

_____

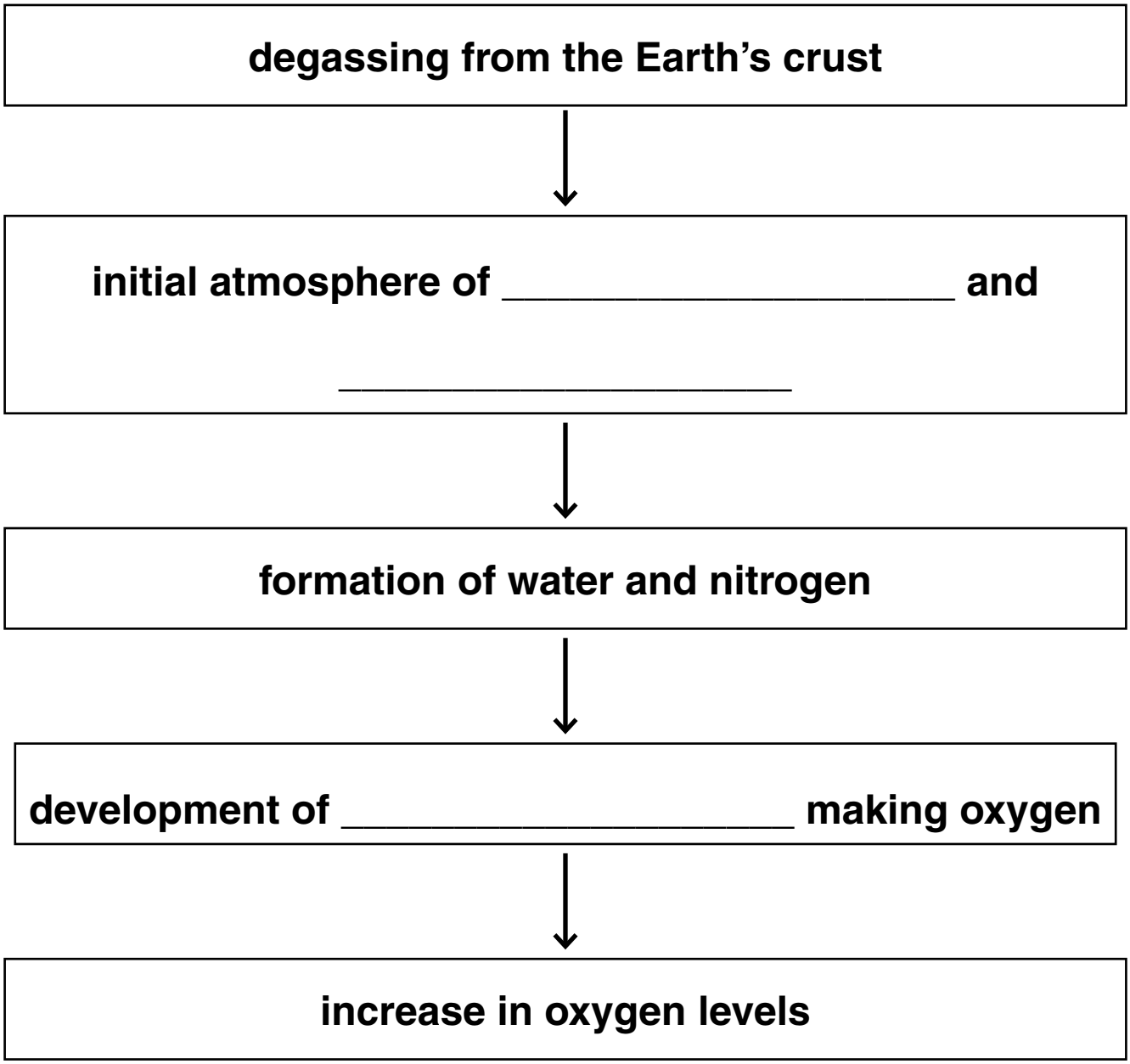
_____ **[1]**

[Total: 3]

8 This question is about the Earth's atmosphere.

The atmosphere is believed to have evolved from gases escaping from inside the Earth.

Look at the flowchart. It shows one theory of how our atmosphere evolved.



(a) Complete the gaps in the flowchart. [3]

(b) Catalytic converters remove carbon monoxide, CO, and nitric oxide, NO, from exhaust gases.

Carbon dioxide, CO_2, and nitrogen, N_2, are made.

Write a BALANCED SYMBOL equation for this reaction.

_____ **[2]**

[Total: 5]

SECTION C – MODULE P2

9 Sizewell is a nuclear power station in Suffolk.

It is next to the sea.

Nuclear power stations produce waste.

(a) Finish the sentence.

Power stations are often built by the sea because they _____

_____ **. [1]**

(b) Most electricity is generated from power stations that burn fossil fuels.

(i) Write down one ADVANTAGE of using uranium instead of burning fossil fuels.

_____

_____ **[1]**

(ii) Nuclear power stations produce radioactive waste.

Write down one OTHER DISADVANTAGE of using uranium instead of burning fossil fuels.

_____

_____ **[1]**

(c) The electricity produced by a nuclear power station is transmitted around the country.

This is done at very HIGH VOLTAGES.

Explain why.

_____

_____ **[1]**

[Total: 4]

10 Charlie has solar lamps in her garden.

The Sun shines onto the photocells. These are on top of the solar lamps.

The electricity produced charges batteries in the solar lamp.

(a) Write about how light produces electricity in a PHOTOCELL.

Use ideas about

- **energy**
- **atoms and electrons**

_____

_____

_____

_____ **[2]**

(b) Write down one DISADVANTAGE of using photocells to provide electricity.

_____

_____ **[1]**

(c) The current through the LED in the lamp is 0.02 A. The voltage from the batteries is 3 V.

(i) Calculate the power of the LED.

The equations on page 3 may help you.

_____

_____

answer _____ **[2]**

(ii) How long would it take for the LED to use 1kWh of electricity?

The equations on page 3 may help you.

_____

_____

answer _____ **h (hours) [2]**

[Total: 7]

11 About 65 million years ago an asteroid struck the Earth.

Some scientists think this caused the dinosaurs and other living things to become extinct.

(a) Most asteroids orbit the Sun in a belt between two planets.

Finish the sentence by choosing the BEST planets from this list.

EARTH

JUPITER

MARS

MERCURY

NEPTUNE

SATURN

URANUS

VENUS

Most asteroids are found between the planets

_____ and

_____ . [1]

(b) Some asteroids and comets are called Near Earth Objects (NEOs).

Scientists MONITOR Near Earth Objects.

Explain why.

_____

_____ **[1]**

(c) Comets orbit the Sun in elliptical orbits.

Their speeds change as they approach the Sun.

(i) Describe how the speed of a comet changes as it approaches the Sun.

_____ **[1]**

(ii) Explain why the speed changes in this way.

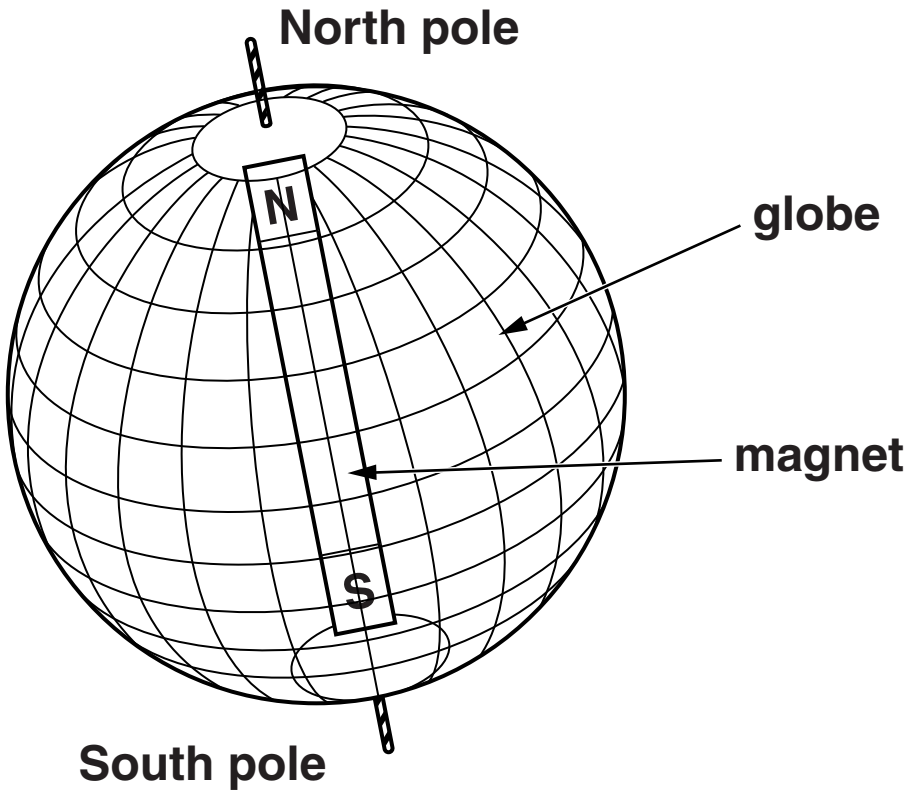
_____

_____ **[1]**

[Total: 4]

12 Alan's science teacher makes a model of the Earth.

He places a magnet inside a globe.



(a) Draw, on the diagram, the magnetic field SURROUNDING THE EARTH.

Show clearly

- **the shape of the field**
- **the direction of the field.** **[2]**

(b) Cosmic rays are charged particles.

What happens to cosmic rays when they approach the Earth's atmosphere?

In your answer describe

- **how the rays behave**
- **what they produce.**

_____

_____

_____ **[2]**

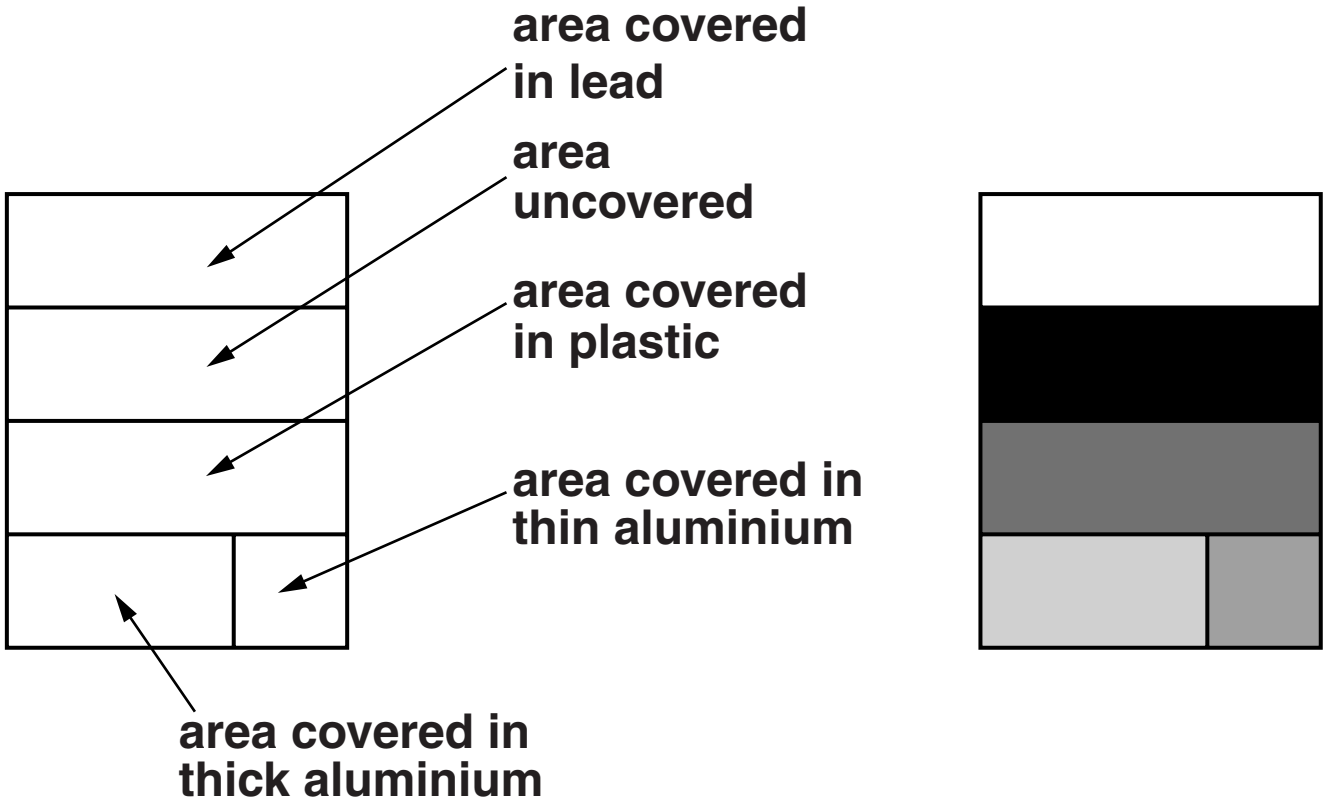
[Total: 4]

13 Scientists who work near radioactive material wear a film badge.

The film in the badge is partly covered with different materials.

If the film in the badge is exposed to radiation, it turns dark when developed.

If the film in the badge is not exposed to radiation, it stays clear when developed.



inside the film badge **exposed film**

Explain how the exposed film shows that someone has been exposed to a STRONG source of BETA radiation.

_____

_____

_____ **[1]**

[Total: 1]

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.