OCR
RECOGNISING ACHIEVEMENT

H

GENERAL CERTIFICATE OF SECONDARY EDUCATION

GATEWAY SCIENCE
SCIENCE B
Unit 2 Modules B2 C2 P2
(Higher Tier)

B622/02

**Thursday 15 January 2009
Afternoon**

Duration: 1 hour

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number					

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 **20** pages. Any blank pages are indicated.

FOR EXAMINER'S USE		
Section	**Max.**	**Mark**
A	20	
B	20	
C	20	
TOTAL	60	

OCR is an exempt Charity

Turn over

EQUATIONS

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

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 Trees, like all plants, make food by photosynthesis.

(a) Complete the word equation for photosynthesis.

(chlorophyll)

carbon dioxide + ... $\xrightarrow{\hspace{2cm}}$ glucose + ...

(light)

[2]
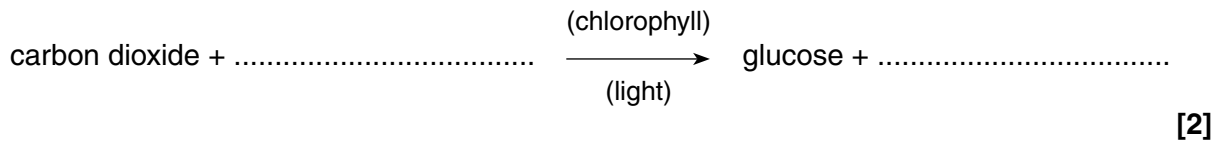
(b) Many people think that planting more trees will help reduce global warming.

Explain why planting more trees may help reduce global warming.

....

.... [1]

(c) In a forest, very few short trees survive if they are surrounded by tall trees.

Explain why.

....

.... [1]

(d) Trees are taller than other plants because the wood in their stems is strong enough to support their weight.

Wood contains a lot of cellulose.

What substance is cellulose made from?

.... [1]

(e) Some trees have a plant called mistletoe growing on them.

Mistletoe is a parasite.

What is meant by the term **parasite**?

....

.... [1]

[Total: 6]

2 Lynx and snowshoe hares live in northern Canada.

Lynx are the main predator of snowshoe hares.

Snowshoe hares are the main prey of lynx.
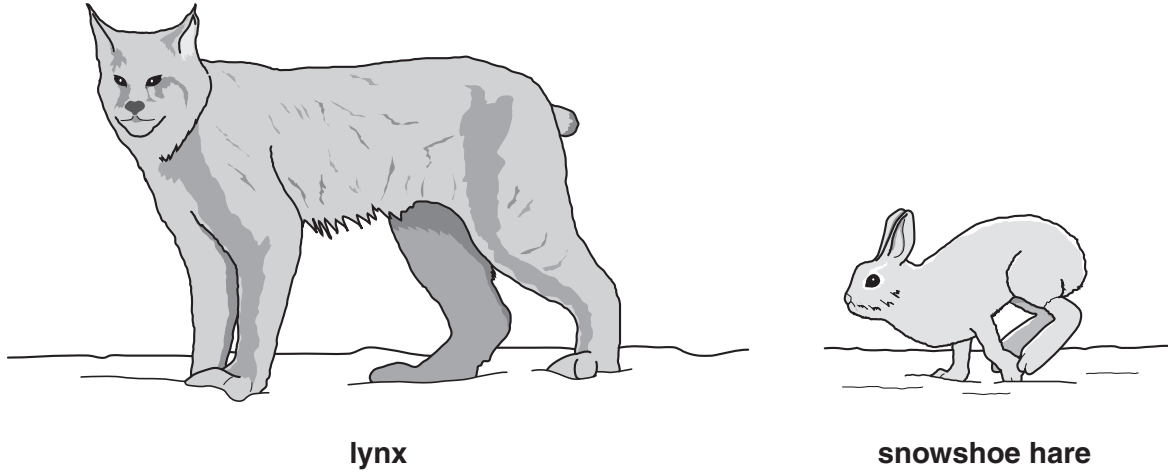
lynx   **snowshoe hare**

(a) The graph shows how the lynx and snowshoe hare populations changed over a number of years.
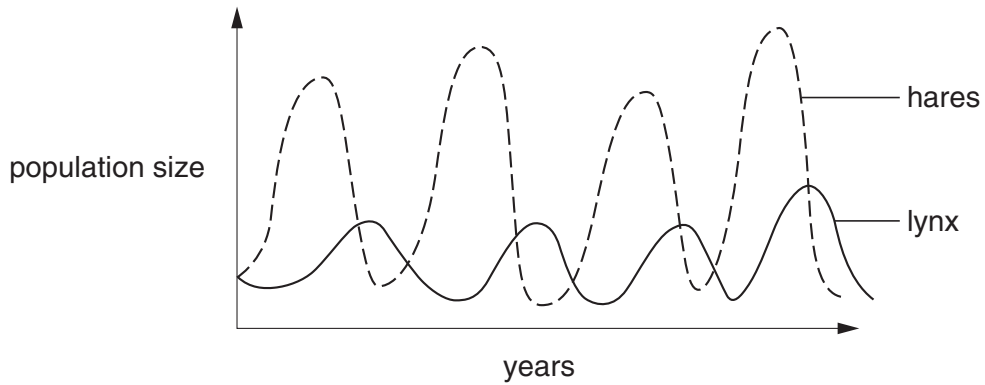
(i) Look at the graph.

Describe how the size of the lynx population affects the size of the hare population.

....

....

.... **[2]**

(ii) In Britain, foxes hunt rabbits.

The fox and rabbit populations do **not** show the same pattern of population change as the lynx and snowshoe hare populations.

Suggest why.

....

.... **[1]**

(b) Lynx and snowshoe hares were hunted for their fur for over a hundred years.

While they were hunted they were a **sustainable** resource.

Suggest how they were maintained as a sustainable resource.

....

.... **[1]**

(c) Snowshoe hares get their name because of their large feet which help them to move easily over snow.

Explain how large feet help them move easily over snow.

....

.... **[1]**

Turn over for the remainder of question 2

(d) Snowshoe hares eat different types of plants. These include dandelions.

petal

leaf
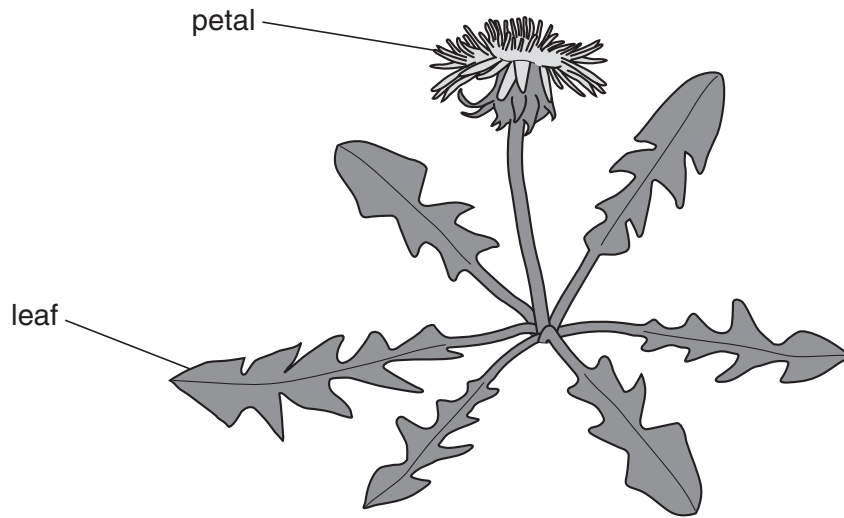
dandelion plant

Look at the dandelion plant.

How are dandelion plants pollinated?

....

Give a reason for your answer.

....

.... **[2]**

[Total: 7]

3 Dolphins live in the sea. They are mammals.
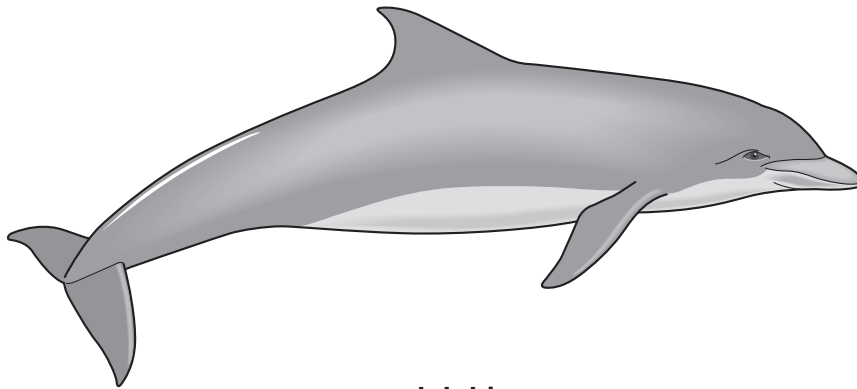
dolphin

(a) Scientists think that dolphins evolved from dog-like mammals that lived around 50 million years ago.

These animals lived on the land but ate fish and other sea creatures.

(i) One reason scientists think dolphins evolved from dog-like mammals is because of the fossils they have found.

We do **not** have fossils to show every stage in dolphin evolution.

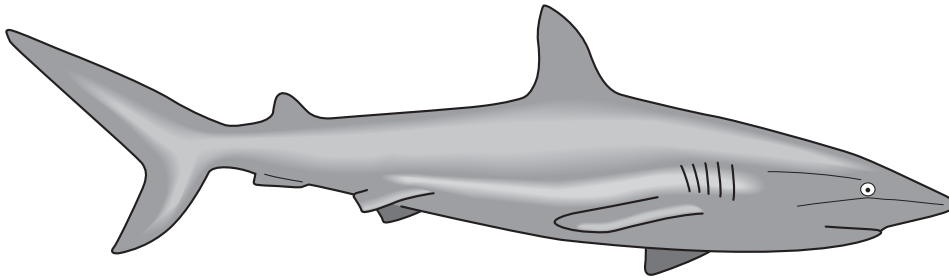Why don't we have fossils of every stage?

....

.... **[1]**

(ii) Suggest how dolphins could have evolved from a dog-like mammal.

In your answer, use Darwin's theory of **natural selection**.

....

....

....

....

....

....

.... **[3]**

Turn over for the remainder of question 3

(b) Sharks also live in the sea.

shark

   (i) Dolphins are mammals. Sharks are fish.

   Write down **one** way mammals are different from fish.

   ....

   .... **[1]**

   (ii) Although dolphins are descended from land animals, they have evolved to appear similar to sharks.

   Explain why dolphins have evolved to appear similar to sharks.

   ....

   .... **[1]**

(c) Dolphins and sharks live in the sea.

Look at the list.

community

ecosystem

population
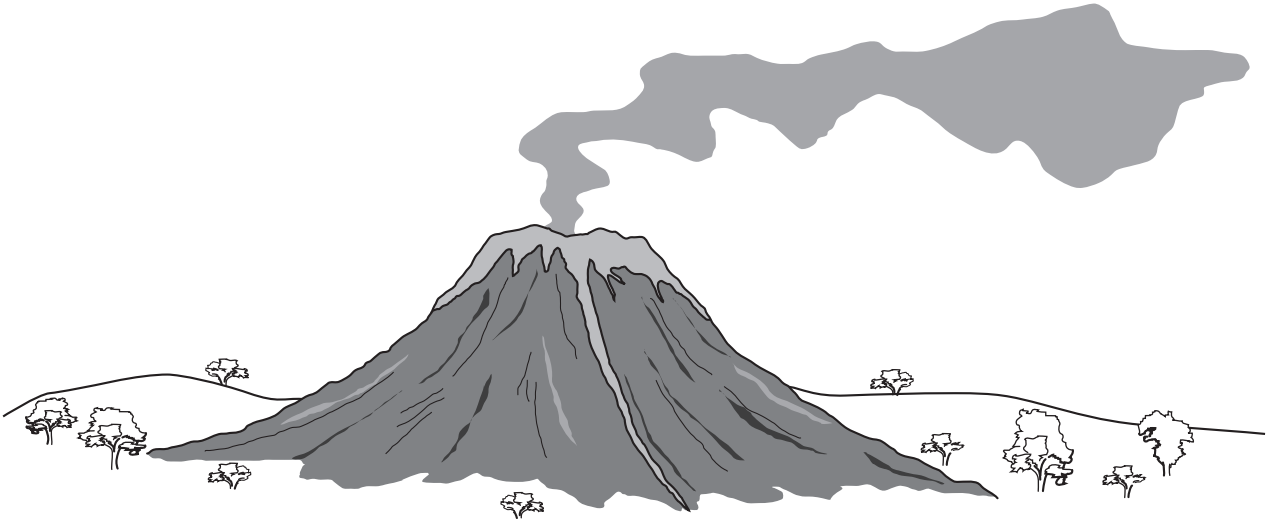
Which word in the list **best** describes the sea?

.... **[1]**

[Total: 7]

Section B – Module C2

4 This question is about rocks.

Look at the picture of a volcano.

(a) Geologists study volcanoes.

Write down **two** reasons why geologists study volcanoes.

....

....

.... **[2]**

(b) Igneous rock is made when molten rock cools.

Some igneous rocks have large crystals. Others have small crystals.

Explain why igneous rocks can have different sized crystals.

....

.... **[1]**

(c) The Earth's surface is made up of tectonic plates.

An oceanic plate collides with a continental plate.

The oceanic plate goes **underneath** the continental plate.

What is the name of this process?

.... **[1]**
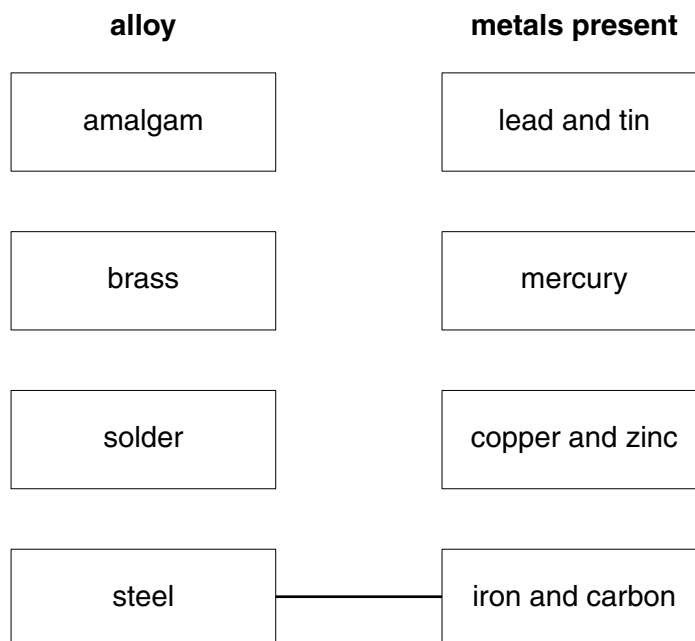
[Total: 4]

5 This question is about metals and alloys.

(a) Brass, solder, steel and amalgam are alloys.

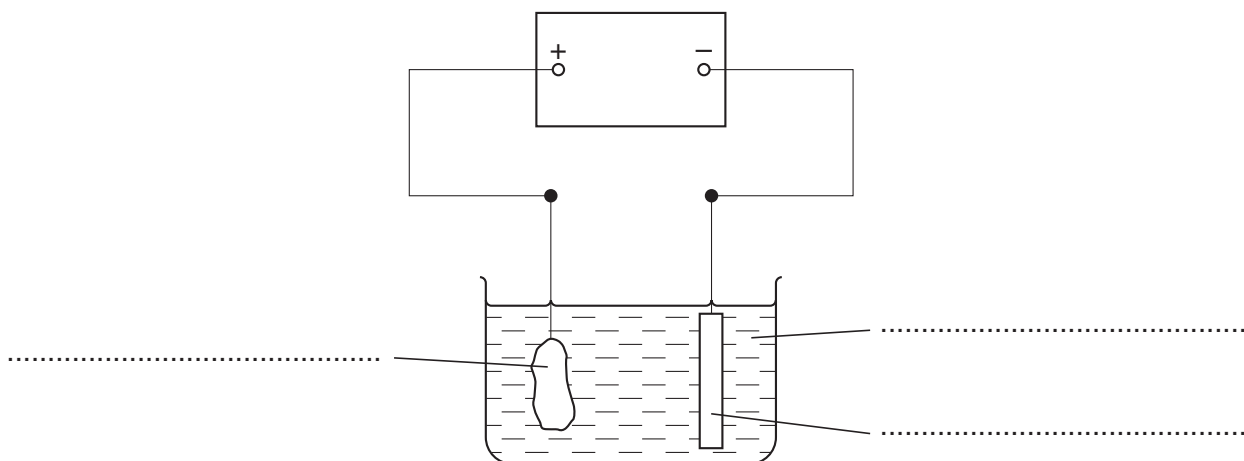Join the boxes to show the metals present in each alloy.

Steel has been done for you.

alloy	**metals present**
amalgam	lead and tin
brass	mercury
solder	copper and zinc
steel	iron and carbon

[2]

(b) Wayne and Helen are purifying copper.
Look at the diagram. It shows the apparatus they use.

....

....

....

Look at the list of labels.

copper sulfate solution

impure copper anode

pure copper cathode

Complete the labels on the diagram to show how impure copper is purified. **[2]**

[Total: 4]

6 This question is about the materials used to make cars.

© Volker Steger / Science Photo Library

(a) A car manufacturer is developing a new material to be used for car windscreens.

Suggest **two** properties the new material must have.

1 ....

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

(b) Car bodies are made from steel or aluminium.

(i) One advantage of using aluminium is that it is less dense than steel.

Explain why this is an advantage.

....

.... **[1]**

(ii) Describe and explain one **other** advantage of using aluminium rather than steel to make car bodies.
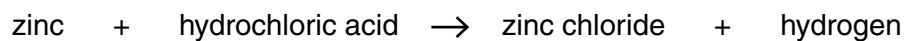
advantage ....

explanation ....

.... **[2]**
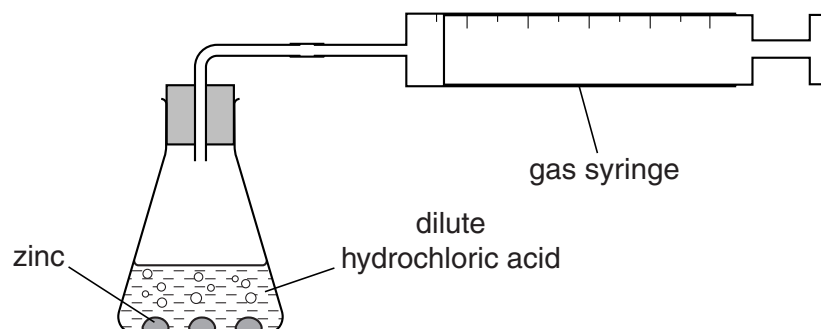
[Total: 5]

Turn over

7 Colin and Ann investigate the reaction between zinc and hydrochloric acid.

The word equation for the reaction is

zinc   +   hydrochloric acid $\rightarrow$ zinc chloride   +   hydrogen

The diagram shows the apparatus they use.

gas syringe

dilute
hydrochloric acid

zinc

Look at the graph.

It shows their results when 1 g of zinc lumps reacts with 20 cm^3 of dilute hydrochloric acid.

total
volume of gas
given off in cm^3

time in minutes
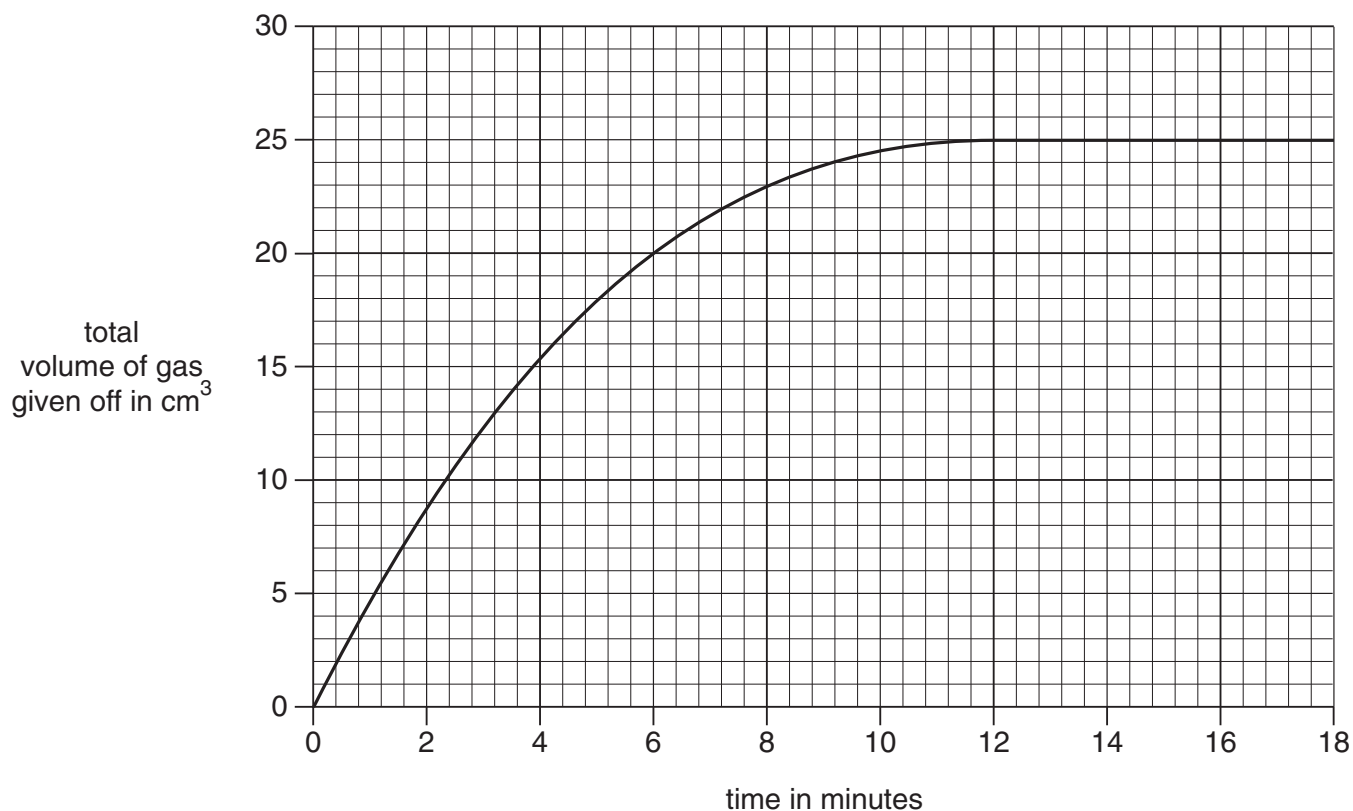
(a) How long does it take for the reaction to stop?

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

(b) Copper powder is a good **catalyst** for this reaction.

What is a catalyst?

....

.... **[1]**

(c) The reaction goes faster if powdered zinc is used instead of zinc lumps.

Explain why.

Use ideas about collisions between particles.

....

.... **[1]**

(d) The reaction goes faster at higher temperatures.

Explain why.

Use ideas about collisions between particles.

....

....

.... **[2]**

(e) Zinc, Zn, reacts with hydrochloric acid, HCl.

Zinc chloride, ZnCl_2, and hydrogen, H$_2$, are made.

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

.... **[2]**

[Total: 7]

Section C – Module P2

8   The solar *sunFLOWER*™ lamp is used to light a footpath.
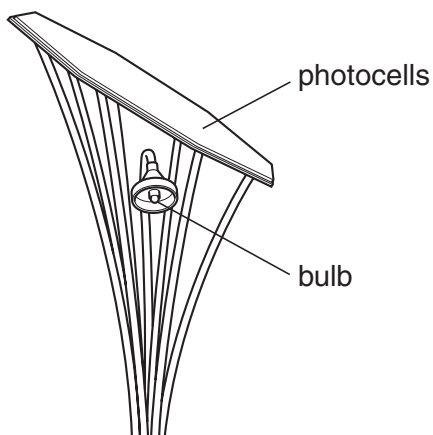
© OCR

Photocells on top of the lamp transfer light energy from the Sun into electricity.

This energy is stored in a battery to light a bulb when it gets dark.

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

....

.... **[1]**

(b) The *sunFLOWER*™ is shaded by trees.

Why is its power reduced?

.... **[1]**

(c) Describe how light from the Sun produces electricity in a photocell.

In your answer, use ideas about

- energy

- atoms

- electrons.

....

....

....

.... **[3]**

[Total: 5]

9 Near Earth Objects (NEOs) are asteroids or comets that may collide with Earth.

© John Chumack / Science Photo Library

(a) What **two** materials is a comet made from?

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

(b) A planet has a near circular orbit.

What **shape** is the orbit of a comet?

.... **[1]**

(c) About 65 million years ago, an asteroid hit the Earth.

Describe evidence found on Earth to support past asteroid collisions.

....

....

....

.... **[2]**

[Total: 4]

10 Ionising radiation is all around us as background radiation.

(a) What contributes to ionising background radiation?

Put (rings) around the **two** correct answers.

cosmic rays

electric toasters

granite rocks

tap water

video recorders

[2]

(b) **Removing** electrons from particles makes ions.

How else can ions be made?

.... [1]

(c) Beta radiation is one type of nuclear radiation.

Beta radiation is used to check the thickness of paper.

The thickness of the paper **increases**.

What happens to the amount of beta radiation passing through?

.... [1]

(d) Nuclear reactors produce radioactive waste.

Write down **two** ways of disposing of radioactive waste.

1 ....

2 .... [2]

[Total: 6]

11 Jo works out how much it costs **each week** to use different kitchen appliances.

She writes information into this table.

appliance	power rating in W	time used in hours	energy used in kWh
kettle	2800	1.50	4.2
toaster		0.50	0.6
microwave	800	1.75	1.4
fridge	70	60.00	4.2

 (a) Calculate the power rating of the toaster.

 ....

 ....

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

 (b) Electricity costs 12p per kWh.

 Calculate the cost of using the toaster each week.

 ....

 ....

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

 (c) Jo uses off-peak electricity for some of her kitchen appliances.

 Describe one advantage and one disadvantage **to Jo** of using off-peak electricity.

 advantage ....

 ....

 disadvantage ....

 .... **[2]**

 [Total: 5]

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										

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

Elements with atomic numbers 112-116 have been reported but not fully authenticated

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.