

Monday 30 January 2012 – Afternoon**GCSE GATEWAY SCIENCE
SCIENCE B****B622/01** Unit 2 Modules B2 C2 P2 (Foundation Tier)

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

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.

2

EQUATIONS

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

$$\text{wave speed} = \text{frequency} \times \text{wavelength}$$

$$\text{power} = \text{voltage} \times \text{current}$$

$$\text{energy (kilowatt hours)} = \text{power (kW)} \times \text{time (h)}$$

3

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) 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

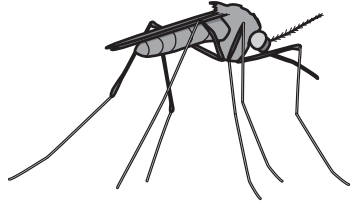
[2]

4

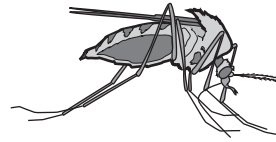
- (b) The larvae develop into adult mosquitoes.

Look at the pictures.

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



type A



type B

- (i) Sue thinks the two types might be the same species because they look very similar.

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

.....

.....

.....

..... [2]

- (ii) What type of animal is a mosquito?

Put a ring around the correct answer.

amphibian

fish

invertebrate

mammal

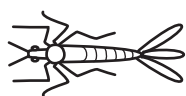
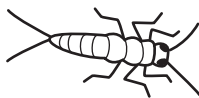
reptile

[1]

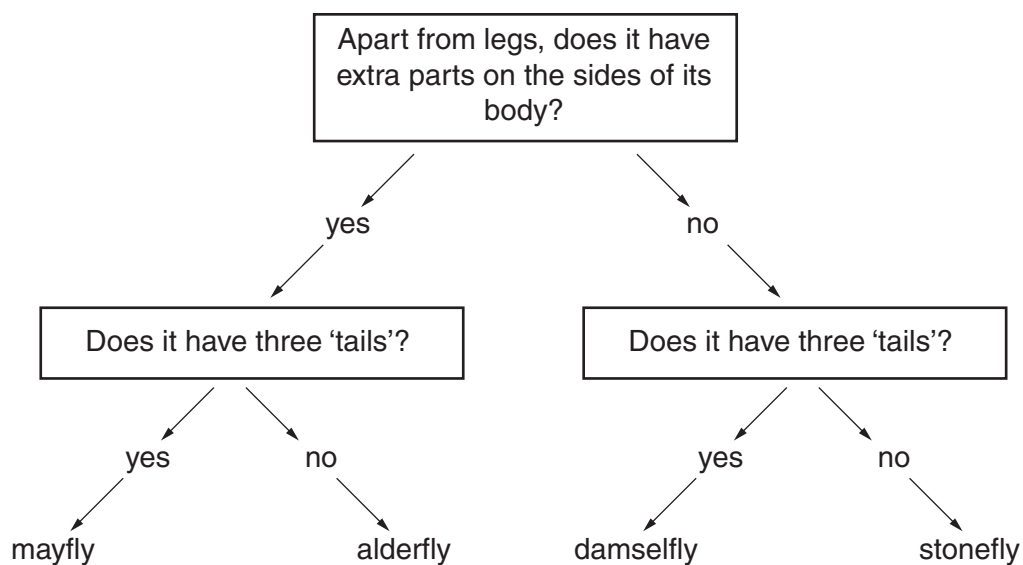
5

(c) Sue also finds the larvae of some other insects living in the pond.

The diagram shows four of the larvae she finds.

**A****B****C****D**

Use the key to identify **A** and **C**.



A is

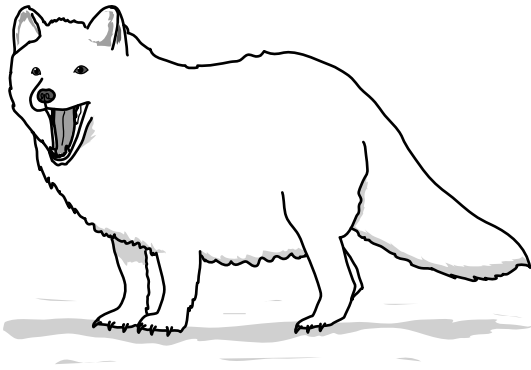
C is [2]

[Total: 7]

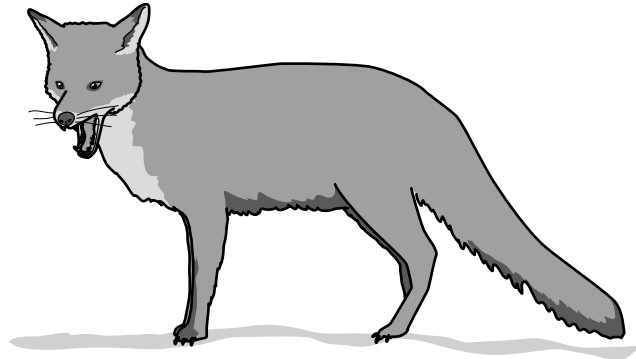
- 2 The pictures show two types of fox.

The Arctic fox lives in the Arctic.

The red fox lives in many parts of the world, including Britain.



Arctic fox



red fox

- (a) Both types of fox are predators.

Write down **two** ways in which both types of fox are adapted to be predators.

- 1
-
- 2
- [2]

- (b) 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]

7

- (c) There are fewer Arctic foxes per km² living in the Arctic than there are red foxes per km² living in Britain.

Suggest **one** reason why there are fewer Arctic foxes per km².

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

- (d) In some parts of the world, red foxes are moving into the places where Arctic foxes live.

As a result of this, in some places Arctic foxes are becoming endangered.

What does **endangered** mean?

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

[Total: 6]

3 Coal was formed from the remains of plants that lived millions of years ago.

(a) When coal is burned, carbon dioxide is released.

This is because coal contains a lot of carbon.

(i) The plants that formed coal also contained carbon.

Explain how carbon got into those plants millions of years ago.

.....

.....

.....

..... [2]

(ii) The amount of carbon dioxide in the atmosphere is increasing.

One reason is because humans are burning more fossil fuels, like coal, every year.

Write down **one** reason why humans are burning more fossil fuels.

..... [1]

(iii) Write down **one other** gas that is produced when coal is burned.

..... [1]

(iv) Is coal a sustainable resource?

Explain your answer.

.....

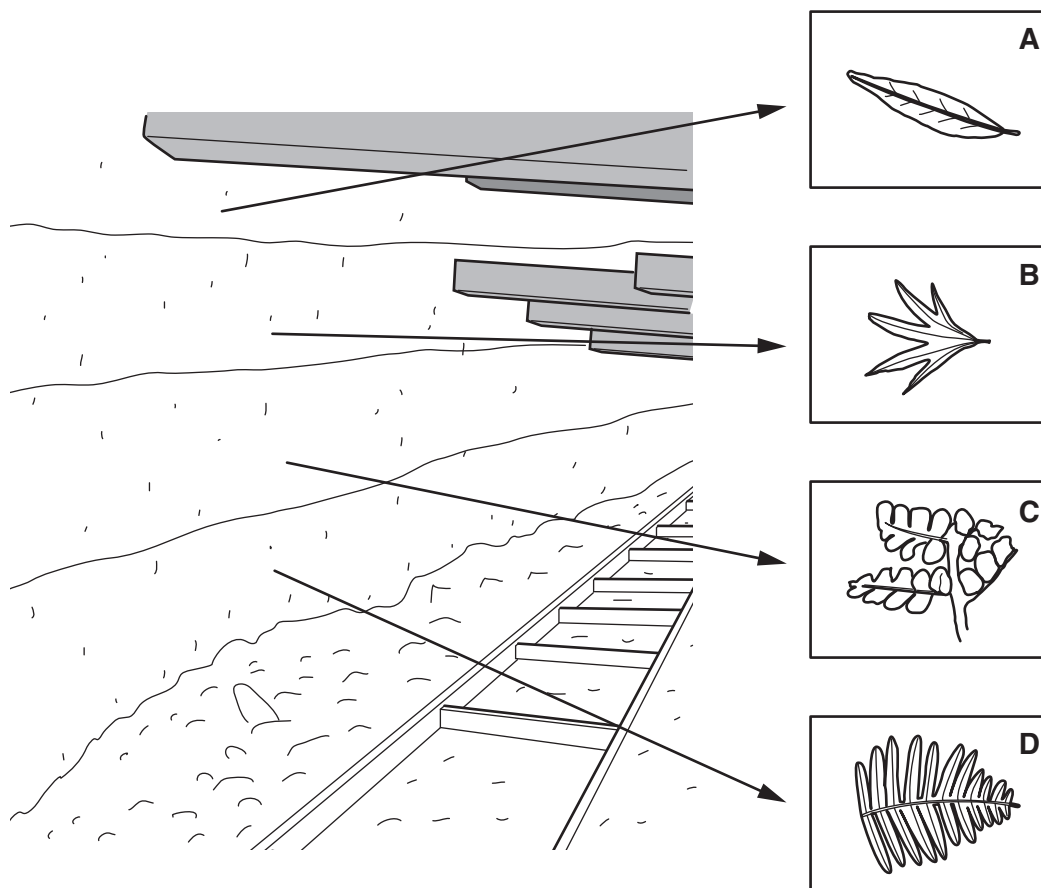
.....

..... [1]

9

(b) Coal sometimes contains fossilised plants.

The drawing shows some fossilised plants found on the coal face in a coal mine.



Which fossil is most likely to be the oldest?

Explain your answer.

.....

..... [2]

[Total: 7]

10

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Section B – Module C2

4 This question is about volcanoes.

(a) What type of rock is formed when molten magma cools down?

Choose from this list.

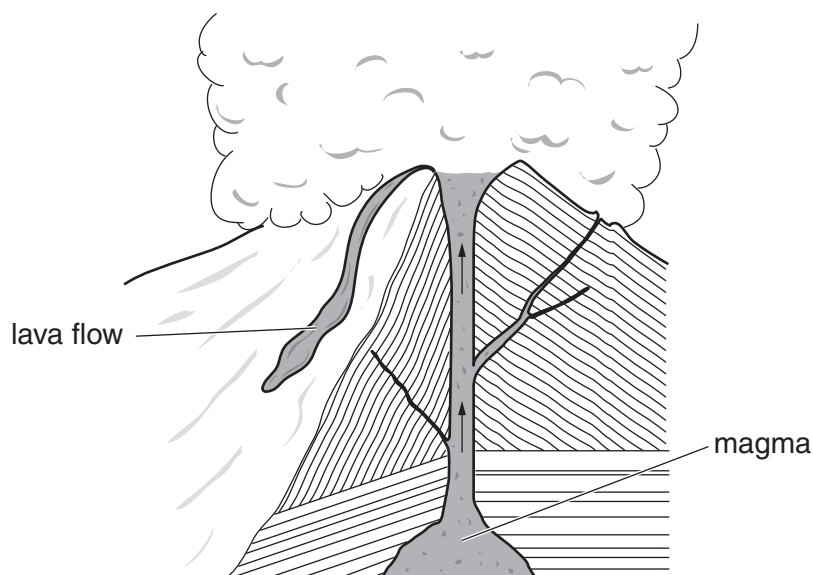
igneous

metamorphic

sedimentary

answer [1]

(b) 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]

(c) It can be very dangerous when a volcano erupts.

Some people still choose to live near volcanoes.

Suggest why.

.....
 [1]

[Total: 3]

Turn over

12

5 This question is about the gases in the air.

(a) Complete the sentence.

The two main gases in **clean** air are oxygen and

[1]

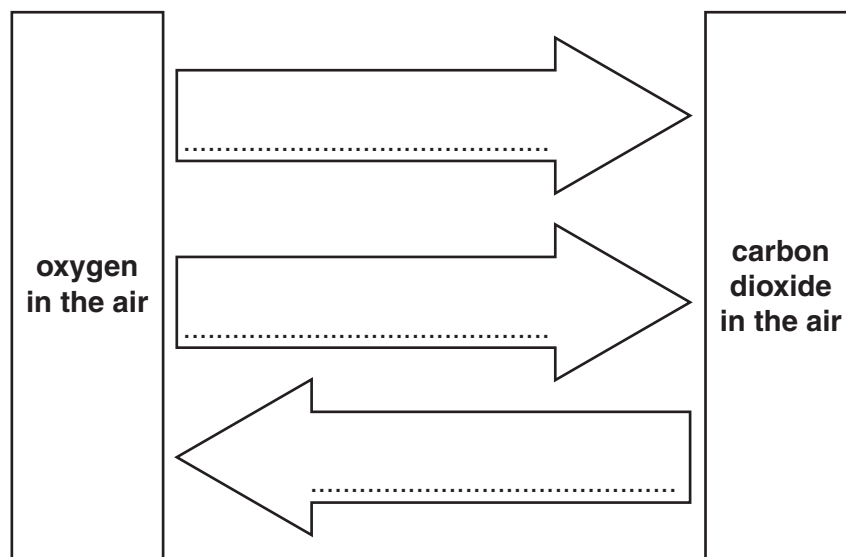
(b) The percentage of oxygen and carbon dioxide in the air do not vary much.

This is because of

combustion,
photosynthesis
and
respiration.

The diagram shows how these processes keep the percentages about the same.

Complete the diagram by writing the name of each process in the correct arrow.



[1]

(c) Air contains pollutants.

This can cause problems.

(i) Oxides of nitrogen cause photochemical smog.

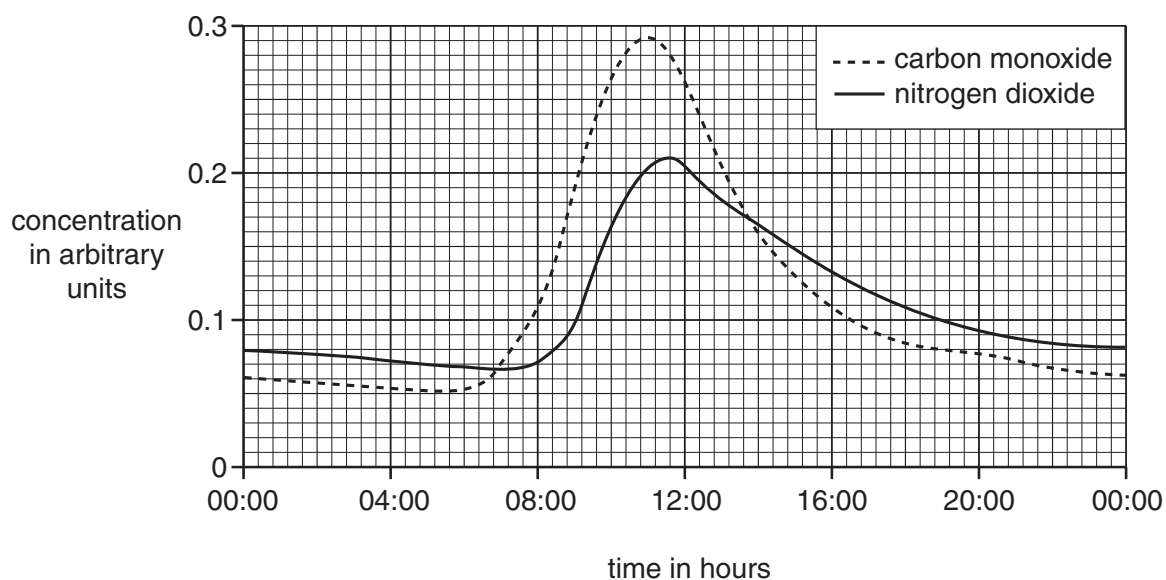
Complete the table.

pollutant	problem caused
carbon monoxide	
oxides of nitrogen	photochemical smog
sulfur dioxide	

[2]

(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]

[Total: 5]

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

Zinc sulfate and hydrogen are made.

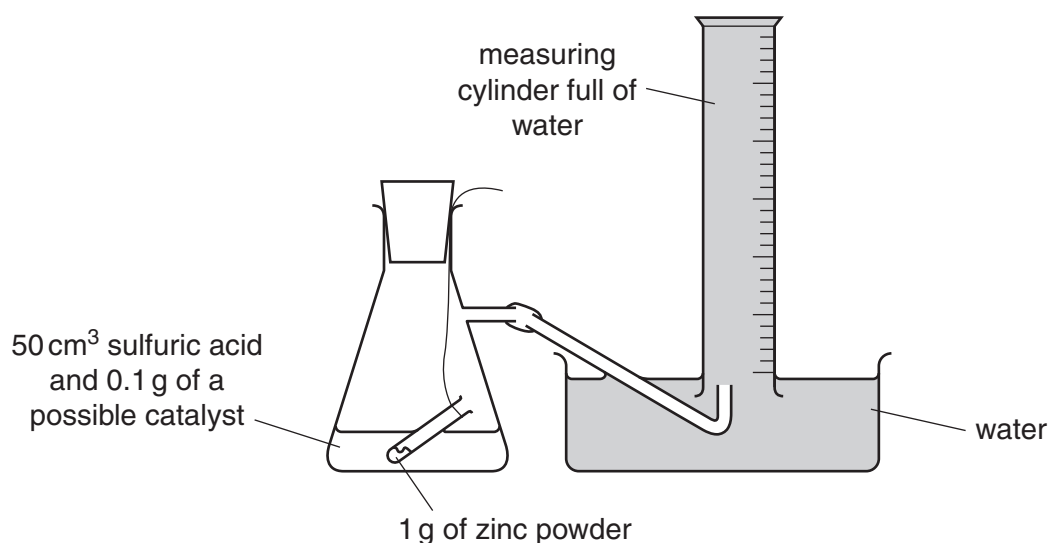
- (a) Write a **word** equation for this reaction.

..... [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 cm³ 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

15

- (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**.

Write about two **other** ways to make the reaction go faster.

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

- (iii) Copper sulfate has the formula CuSO_4 .

What is the total number of **atoms** in the formula?

..... [1]

[Total: 6]

16

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



(a) James painted the walls of the kitchen.

Write down **one** reason why James painted the walls.

..... [1]

(b) 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]

(c) The granite for the table was dug out of the ground by **quarrying**.



Write about **two** environmental problems caused by quarrying.

.....

 [2]

17

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

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

Write down the name of the process used to purify copper.

Choose from this list.

alloying

catalysis

combustion

electrolysis

answer [1]

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

Stainless steel is an **alloy**.

What is meant by an alloy?

..... [1]

[Total: 6]

Section C – Module P2

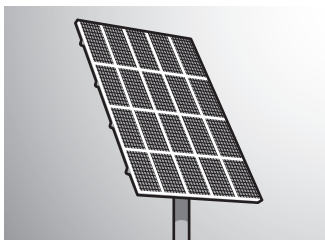
8 This question is about energy from the Sun.

(a) The Earth receives energy from the Sun.

Write down the two **main** forms of energy that the Earth receives from the Sun.

..... and [1]

(b) (i) Photocells use energy from the Sun.



Look at the statements about photocells.

Some are true and some are false.

Put ticks (✓) in the boxes to show if each statement is true or false.

The first one has been done for you.

	true	false
Photocells convert energy from the Sun into electricity.	☒	☐
Photocells produce alternating current (AC).	☐	☐
More power is produced if the surface area facing the Sun is increased.	☐	☐

[1]

(ii) Photocells have advantages and disadvantages as a source of electricity.

Write down **one advantage** of using photocells.

.....
 [1]

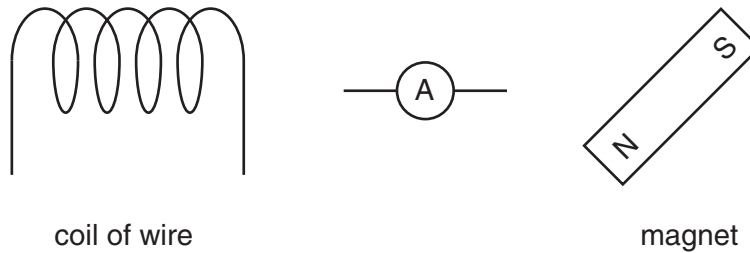
[Total: 3]

19

9 This question is about generating electricity.

(a) Molly builds a generator to produce electricity.

She uses a magnet and a coil of wire.



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]

20

- (b) Power stations generate electricity on a large scale.



Some power stations use a **fossil fuel** such as coal.

Other power stations burn **renewable** fuels.

- (i) Write down the name of one **other fossil fuel** used in power stations.

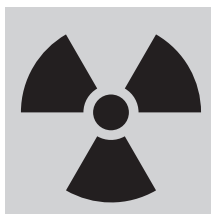
..... [1]

- (ii) Write down the name of one **renewable** fuel burned in power stations.

..... [1]

[Total: 5]

- 10 This question is about nuclear radiation.



- (a) There are three types of nuclear radiation.

One type is **alpha** radiation.

Write down the names of the **other** two types of radiation.

1

2 [1]

- (b) Nuclear radiation can harm people.

Workers who use radioactive materials need to be safe.

Write down **two** things they can do to be safe when handling radioactive materials.

.....

..... [2]

[Total: 3]

11 This question is about the cost of using electricity.

(a) Look at the pictures of some appliances and their power ratings.



lamp 60 W



kettle 2500 W



radio 15 W



iron 1200 W

Each appliance is switched on for 5 minutes.

Which appliance costs the **least** to run?

..... [1]

(b) Nasim cooks a meal in a conventional oven.

It takes 3 hours to cook.

The oven has an average power of 3.5 kW.

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

.....

answer kWh [1]

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

Calculate the cost of cooking the meal.

.....

answer pence [1]

[Total: 3]

12 Look at the statements about the Earth.

(a) Put a tick (✓) in the box next to the correct statement.

The Earth is a star that orbits the Sun.

☐

The Earth is a planet that orbits the Moon.

☐

The Earth is a planet that orbits the Sun.

☐

The Sun is a star that orbits the Earth.

☐

[1]

(b) Complete the sentence using words from this list.

black holes

comets

galaxies

planets

stars

Large groups of are called [1]

(c) Asteroids are part of our Solar System.

They orbit between Mars and Jupiter.

What are asteroids made of?

..... [1]

[Total: 3]

13 This question is about how the Universe was formed.

(a) Complete the sentence.

The Universe started with [1]

(b) Stars are part of the Universe. They only last for a finite time and can end as a black hole.

How do stars **start** their life?

..... [1]

(c) Black holes cannot be seen.

Why can black holes not be seen?

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

[Total: 3]

END OF QUESTION PAPER



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The Periodic Table of the Elements

1	2	Key										3	4	5	6	7	0		
		relative atomic mass atomic symbol name atomic (proton) number																	
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

1	H	1
	hydrogen	

* 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.