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 16 JUNE 2010: 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/DJ) MEP60594 33313

INSTRUCTIONS TO CANDIDATES

- **Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes on the first page.**
- **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.**
- **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).**

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 printed on the back page.**
- **The total number of marks for this paper is 60.**

EQUATIONS

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

$$\text{energy} = \text{mass} \times \text{specific heat capacity} \times \text{temperature change}$$

$$\text{energy} = \text{mass} \times \text{specific latent heat}$$

$$\text{fuel energy input} = \text{waste energy output} + \text{electrical energy output}$$

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

$$\text{energy supplied} = \text{power} \times \text{time}$$

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

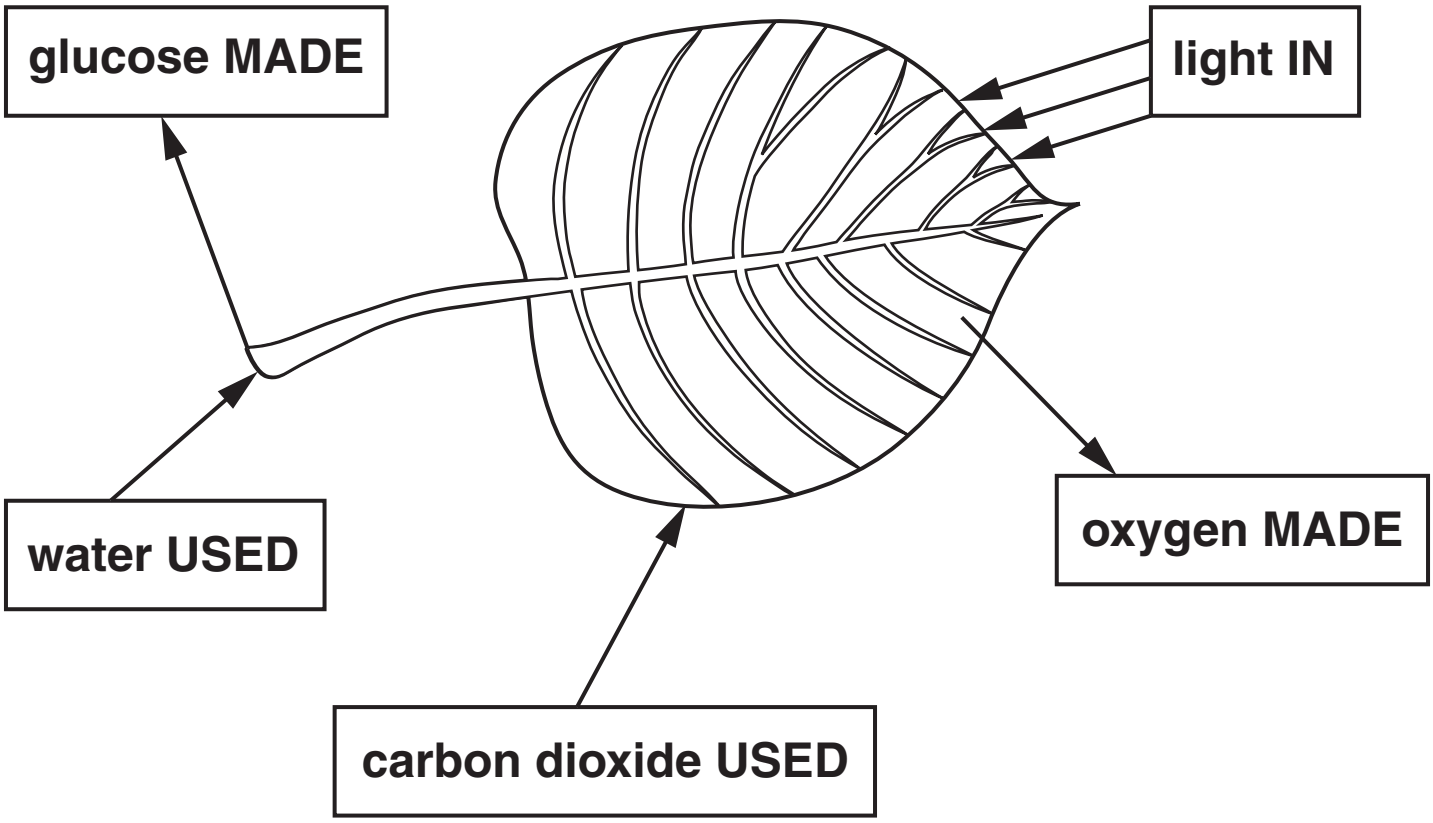
$$\text{wave speed} = \text{frequency} \times \text{wavelength}$$

Answer all the questions.

SECTION A – MODULE B2

1 Look at the diagram of a leaf.

It shows the substances involved in photosynthesis.



(a) Finish and balance the symbol equation for photosynthesis.

_____ + _____CO_2 →

_____ + _____O_2 **[2]**

(b) Plants will still exchange gases in the dark.

Look at the statements about the gases exchanged by plants.

Put ticks (✓) in the boxes next to the correct statements about gas exchange <u>IN THE DARK</u>.

All the carbon dioxide released in photosynthesis is used in respiration.	☐
Carbon dioxide is taken in to ensure the plant has a constant supply of energy.	☐
More carbon dioxide is taken in than released.	☐
Oxygen taken in is essential to ensure the plant has a constant supply of energy.	☐
More oxygen is released than taken in.	☐
Some of the oxygen produced in respiration is used in photosynthesis.	☐
The oxygen taken in is used for respiration.	☐

[2]

(c) Giving the plant more light can increase the rate of photosynthesis.

Write down <u>ONE OTHER</u> way the rate of photosynthesis can be increased.

_____ **[1]**

(d) Some of the glucose made by the plant can be used for energy.

The rest is changed into other substances for different uses.

Describe another use for glucose.

The substance it is changed into

_____ **.**

What the new substance is used for

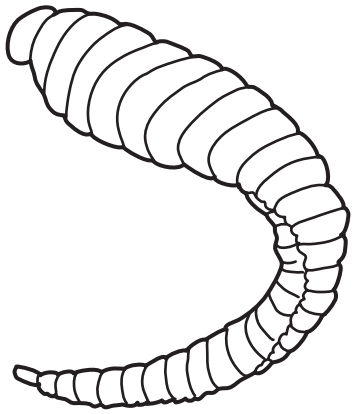
_____

_____ **. [2]**

[Total: 7]

2 David and Linda investigate the animals in four different streams.

(a) Look at one of the animals they catch.



This animal is an invertebrate.

How are invertebrates different from vertebrates?

_____ **[1]**

(b) David and Linda take one sample from each steam.

They record the number of animals in each sample.

The table opposite shows their results.

(i) Stream B has the highest <u>BIODIVERSITY</u>.

Explain using the data what is meant by the term biodiversity.

_____

_____ **[1]**

(ii) Suggest which stream has the highest levels of pollution.

Stream A, B, C or D _____

Write down <u>TWO</u> reasons for your answer.

1 _____

_____

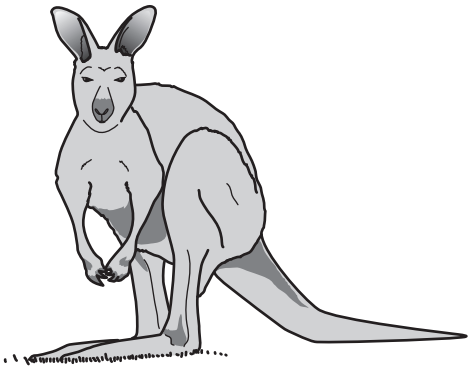
2 _____

_____ **[2]**

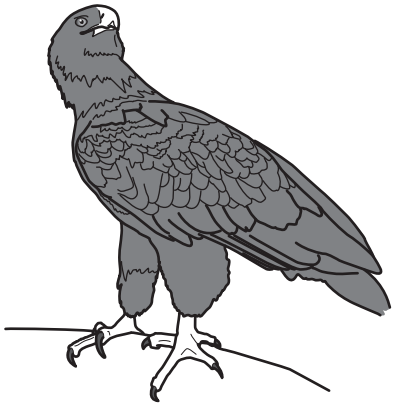
[Total: 4]

ANIMAL	TYPE OF WATER THEY LIVE IN	NUMBER OF ANIMALS IN SAMPLE			
		stream A	stream B	stream C	stream D
caddis fly lava	clean	0	5	0	0
dragonfly nymph	clean	1	8	1	0
flatworm	some pollution	5	3	0	0
leech	some pollution	8	6	4	0
rat-tailed maggot	very polluted	1	3	1	4
bloodworm	very polluted	0	0	0	3

3 Look at the pictures of a kangaroo and a wedge-tailed eagle.



kangaroo



wedge-tailed eagle

(a) The wedge-tailed eagles hunt kangaroos for food.

The population of kangaroos in an area goes up and down.

Explain why the population of eagles will also go up and down.

_____

_____

_____ **[2]**

(b) Kangaroos and camels can both be found living in the same Australian habitat.

They both have very large feet.

Use your knowledge of adaptation to suggest <u>ONE</u> reason why kangaroos have large feet.

_____ **[1]**

[Total: 3]

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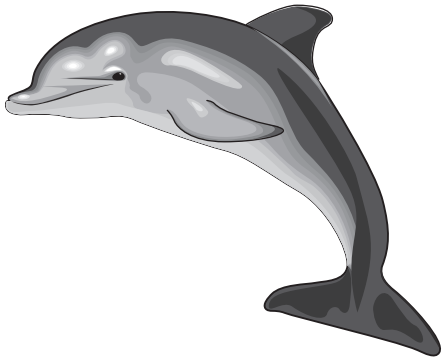
4 Look at the picture of a dolphin.



(a) Dolphins are classified as mammals.

Explain why.

_____

_____ **[1]**

(b) Most mammals live on land.

Dolphins are mammals that are adapted to live in water.

The ancestors of dolphins had back legs.

Over millions of years dolphins have evolved to have no back legs.

(i) Use Darwin's theory of natural selection to explain how this might have happened.

_____

_____

_____

_____ **[2]**

(ii) Lamarck had different ideas about evolution.

He may have suggested that some dolphins had their legs removed in accidents.

Then all their offspring were born without legs.

Explain why modern scientists may NOT agree with this statement.

_____

_____ **[1]**

(c) There are many separate species of dolphin.

Two of these are false killer whales and common bottlenose dolphins.

However, these two species can mate to produce offspring called wolphins.

(i) Finish the sentence to explain the term species.

Organisms of the same species are capable of breeding to produce

_____ **offspring. [1]**

(ii) In order to breed, the false killer whale and the common bottlenose dolphin must be closely related.

Explain what this means in terms of their ancestors.

_____

_____ **[1]**

[Total: 6]

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SECTION B – MODULE C2

5 A football clubhouse has barriers between it and the pitch.

(a) The barriers have been painted with emulsion paint.

Emulsion paint contains a solvent.

Write down the name of the solvent.

_____ **[1]**

(b) The clubhouse has been painted with oil-based paint.

Explain how oil-based paint dries.

_____

_____

_____ **[2]**

(c) The path outside the clubhouse is made of concrete.

The building is made out of reinforced concrete.

Reinforced concrete is a better construction material than non-reinforced concrete.

Explain why.

_____

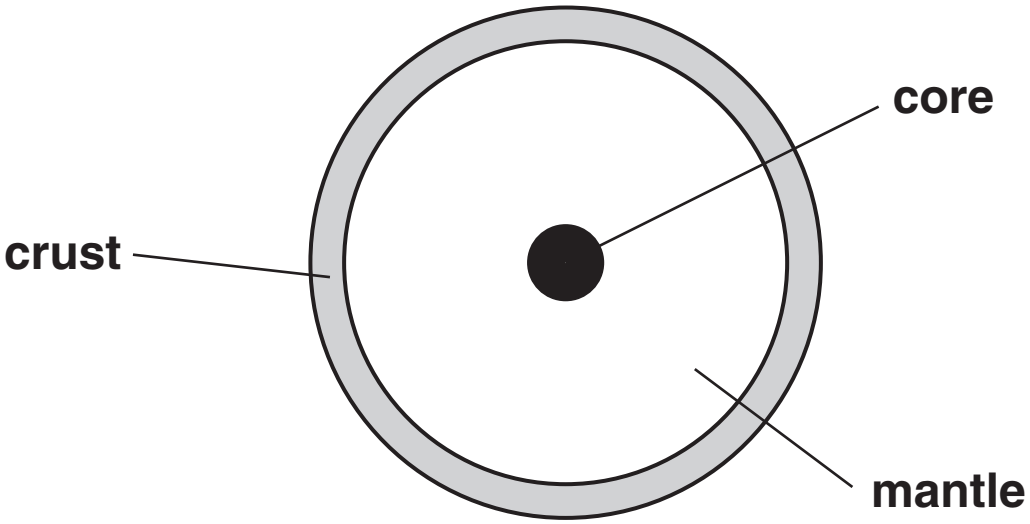
_____

_____ **[2]**

[Total: 5]

6 This question is about the structure of the Earth.

Look at the diagram of the Earth.



(a) The outer layer of the Earth is made up of two types of tectonic plates.

One type of plate is oceanic.

Write down the name of the other <u>TYPE</u> of plate.

_____ **[1]**

(b) The tectonic plates float <u>ON TOP</u> of the mantle.

Explain why.

_____

_____ **[1]**

[Total: 2]

BLANK PAGE

7 Clean air is a mixture of gases.

(a) Look at this list. It shows some of the gases found in clean air.

ARGON

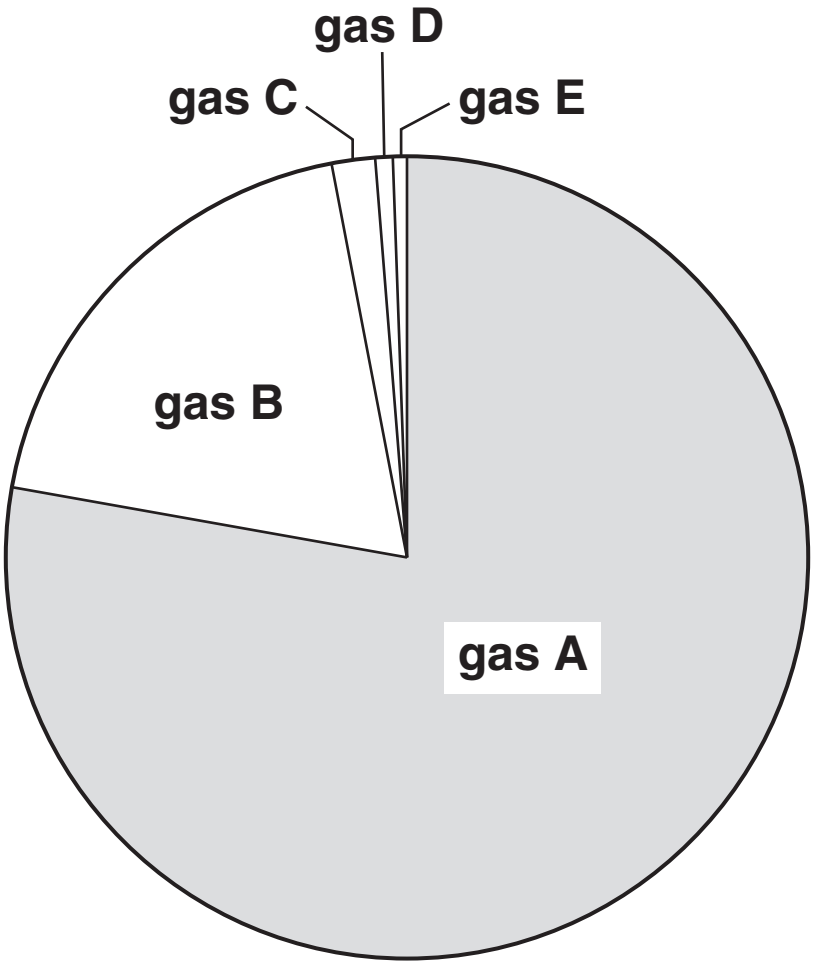
CARBON DIOXIDE

NITROGEN

OXYGEN

WATER VAPOUR

Look at this pie-chart. It gives information about the percentage of different gases in clean air.



What is the name of gas A?

Choose from the list.

answer _____ **[1]**

(b) Carbon monoxide and oxides of nitrogen are made in a car engine.

Carbon monoxide, CO, and nitrogen monoxide, NO, react in a catalytic converter.

This reaction makes nitrogen, N_2, and carbon dioxide.

Write a <u>BALANCED SYMBOL</u> equation for this reaction.

_____ **[2]**

[Total: 3]

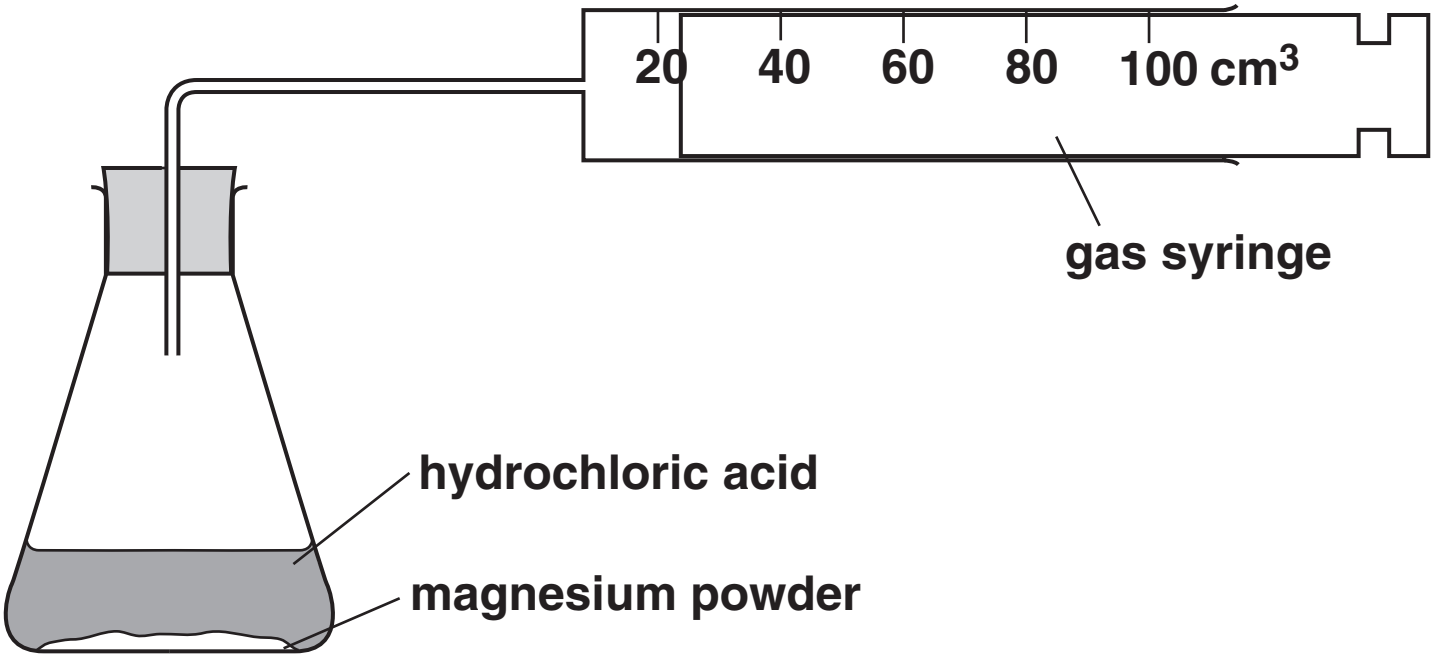
8 Ryan and Naomi investigate the reaction between magnesium and hydrochloric acid.

Magnesium chloride and hydrogen are made.

(a) Write the <u>WORD</u> equation for this reaction.

_____ **[1]**

(b) The diagram shows the apparatus they use.



Look at the table opposite.

It shows their results when 0.1 g of magnesium reacts with hydrochloric acid.

TIME IN SECONDS	TOTAL VOLUME OF GAS IN SYRINGE IN CM^3
0	0
20	50
40	80
60	90
80	100
100	100

(i) At what time does the reaction finish?

answer _____ seconds [1]

(ii) Complete the sentence.

The reaction is fastest between _____

seconds and _____ seconds. [1]

(iii) Naomi calculates the rate of the reaction using this equation.

$$\text{AVERAGE RATE} = \frac{\text{CHANGE IN VOLUME}}{\text{CHANGE IN TIME}}$$

Use this equation to calculate the average rate of this reaction between 0 and 40 seconds.

_____

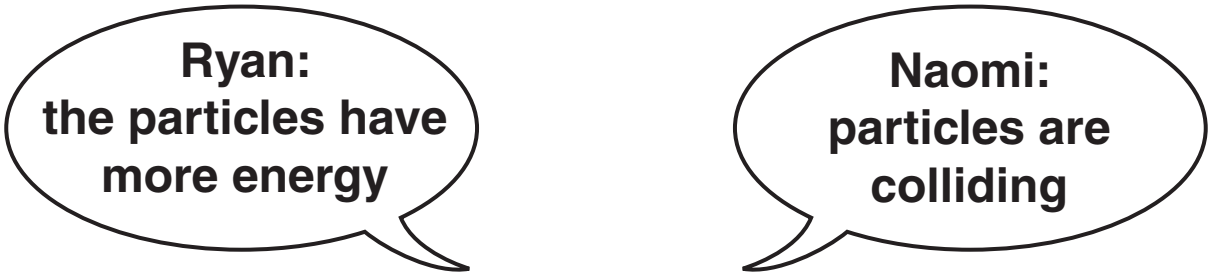
_____

answer _____ cm^3/s [1]

(c) Ryan and Naomi decide to repeat the experiment at a higher temperature.

They find that the rate of reaction increases.

This is their explanation.



The rate of reaction is faster at a higher temperature.

Explain why.

Use their ideas.

_____

_____

_____ **[2]**

[Total: 6]

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9 This question is about the properties of metals.

The table lists data for the properties of two metals, aluminium and steel.

Aluminium and steel are used to build car bodies.

METAL	DENSITY IN g/cm^3	RELATIVE STRENGTH	COST OF ONE TONNE OF METAL IN £
ALUMINIUM	2.7	70	1453
STEEL	7.9	210	439

(a) Write down one <u>ADVANTAGE</u> and one <u>DISADVANTAGE</u> of using aluminium to build a car body.

The data in the table may help.

advantage _____

_____

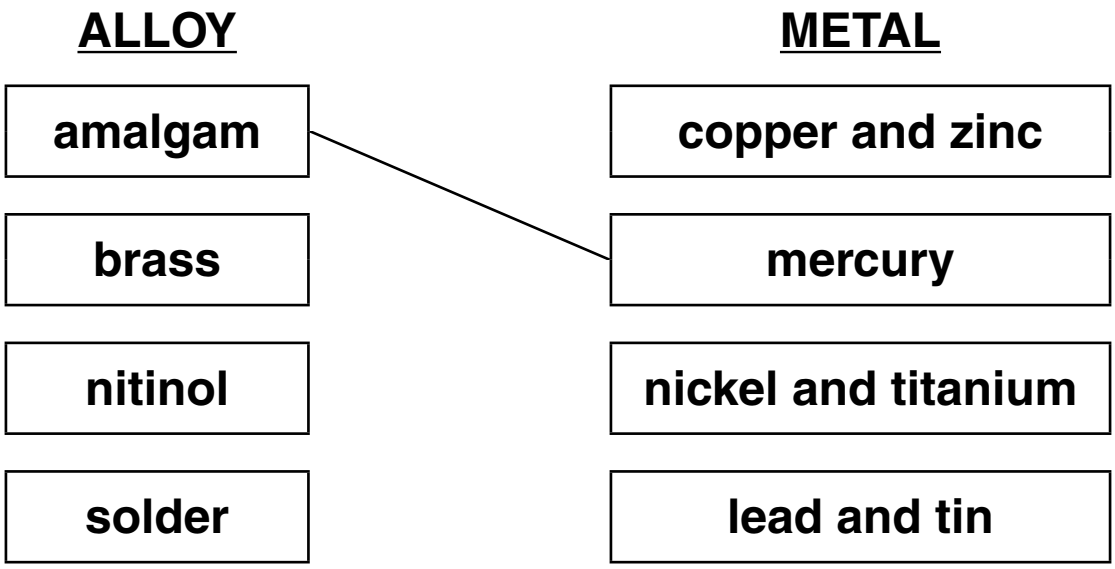
disadvantage _____

_____ **[2]**

(b) Alloys are mixtures of metals.

Draw a straight line to match each ALLOY to the main METAL or metals it contains.

One has been done for you.



[2]

[Total: 4]

SECTION C – MODULE P2

10 A wind turbine provides energy for a field studies centre on Exmoor.

(a) Finish these sentences by choosing the BEST words from this list.

CHEMICAL

ELECTRICAL

KINETIC

THERMAL

The wind has _____ energy.

The wind turbine transfers this into

_____ energy. [2]

(b) Write down ONE advantage and ONE disadvantage of using wind turbines.

advantage _____

_____

disadvantage _____

_____ [2]

(c) The wind turbine works for 10 hours every day.

The total energy produced each day is 60 kWh.

Calculate the power of the turbine.

The equations on page 3 may help you.

_____

_____

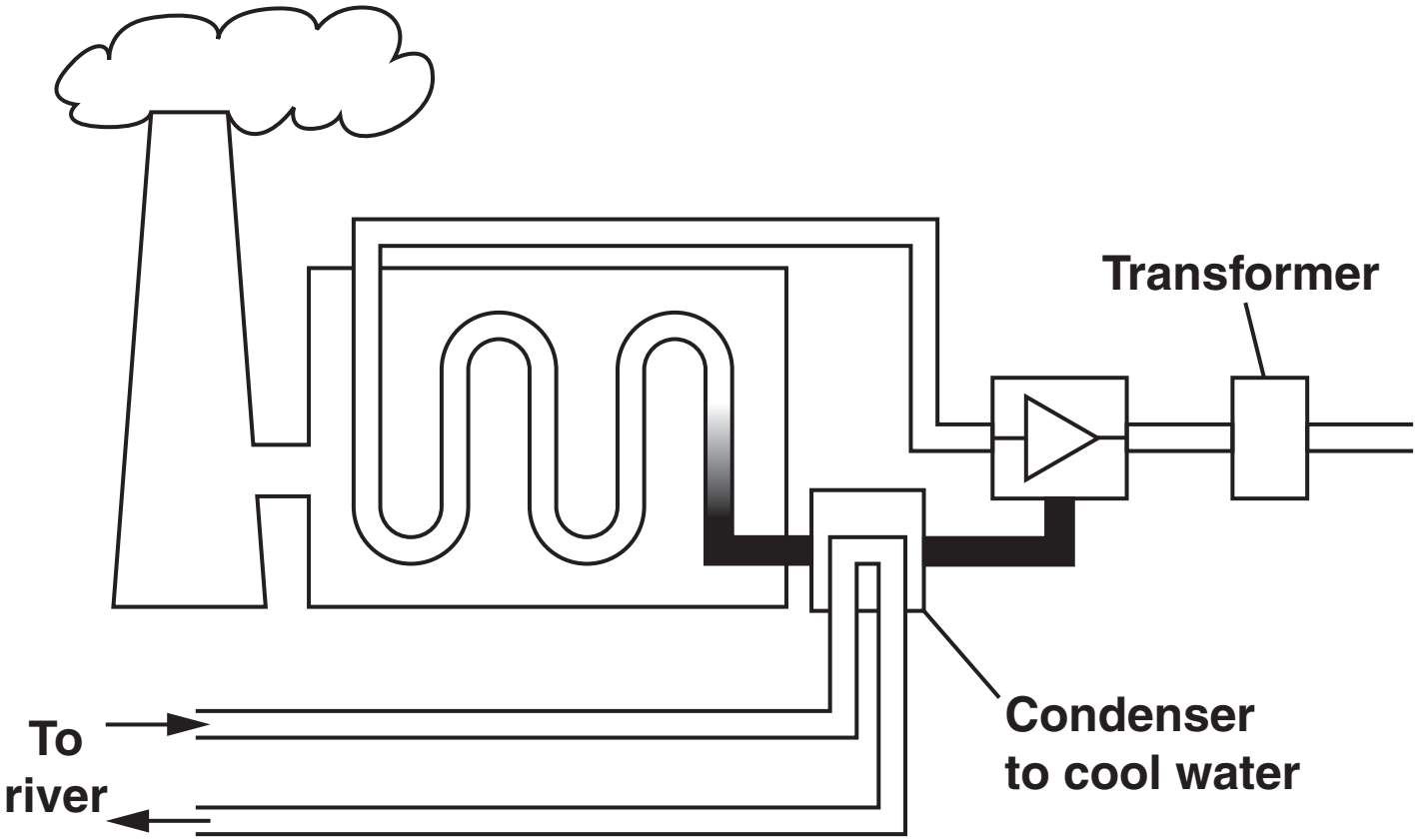
_____

answer _____ kW **[2]**

[Total: 6]

11 Most of our electricity is generated in power stations.

Look at the diagram of a power station.



(a) Describe how electricity is <u>GENERATED</u> at the power station.

_____

_____

_____

_____ **[3]**

(b) The transformer increases the voltage of the electricity.

It is then transmitted around the country.

Why is electricity transmitted at high voltages?

_____

_____ **[1]**

[Total: 4]

12 The National Aeronautics and Space Administration (NASA) in America is planning to send a <u>MANNED</u> spacecraft to Mars.

(a) Describe two <u>DIFFICULTIES</u> in sending a manned spacecraft such long distances.

1 _____

_____

2 _____

_____ **[2]**

(b) Previous missions to Mars have been <u>UNMANNED</u>.

Describe one <u>ADVANTAGE</u> of sending unmanned spacecraft into space.

_____

_____ **[1]**

(c) Unmanned spacecraft can send information back to Earth.

What scientific information about Mars can be sent back to Earth?

_____ **[1]**

[Total: 4]

13 (a) The Big Bang explains how the Universe began.

Galaxies are still moving apart through space as a result of the Big Bang.

More distant galaxies are moving apart even more quickly.

What evidence is there for this movement of galaxies?

Use ideas about red shift in your answer.

_____

_____

_____

_____ **[2]**

(b) At the end of their lives, some stars become white dwarfs.

Other stars become black holes.

(i) Why do some stars become black holes instead of white dwarfs?

_____ **[1]**

(ii) Light cannot escape from a black hole.

Explain why.

_____

_____ **[1]**

[Total: 4]

14 This question is about nuclear radiation.

(a) Three types of IONISING RADIATION can be identified by their penetrating power.

Julian tests the radiations, X, Y and Z, from different radioactive sources.

X penetrates paper and a thin aluminium sheet but is absorbed by a sheet of lead.

Y is absorbed by paper, a thin aluminium sheet and by a sheet of lead.

Z penetrates paper but is absorbed by a thin aluminium sheet and a sheet of lead.

Identify the three different radiations.

X is _____ radiation.

Y is _____ radiation.

Z is _____ radiation. [1]

(b) Uranium is an energy source used in nuclear power stations.

Plutonium is a waste product from nuclear power stations.

Plutonium can be processed to make more fuel for the power station.

What else can plutonium be used for?

_____ **[1]**

[Total: 2]

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.