OCR
RECOGNISING ACHIEVEMENT

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B622/02

GENERAL CERTIFICATE OF SECONDARY EDUCATION

GATEWAY SCIENCE

SCIENCE B

Unit 2 Modules B2 C2 P2 (Higher Tier)

TUESDAY 17 JUNE 2008

Morning
Time: 1 hour

CUP/T52439

Candidates answer on the question paper.
Additional materials (enclosed):
None

Calculators may be used.
Additional materials: Pencil
Ruler (cm/mm)

Candidate Forename		Candidate Surname	
Centre Number		Candidate Number	

INSTRUCTIONS TO CANDIDATES

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or 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.

INFORMATION FOR CANDIDATES

- The number of marks for each question is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **60**.
- A list of physics equations is printed on page two.
- The Periodic Table is printed on the back page.

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

This document consists of **20** printed pages.

[Turn over

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

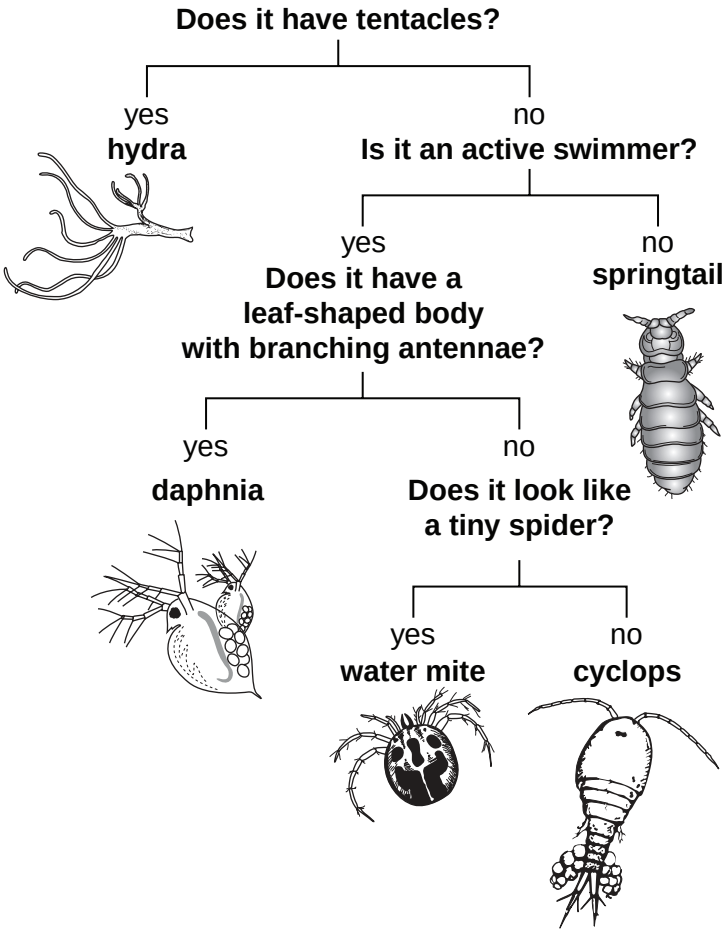
energy (kilowatt hours) = power (kW) × time (h)

wave speed = frequency × wavelength

Answer **all** the questions.

Section A – Module B2

1 John investigates a pond water habitat.
He collects a sample of water and looks at the animals in it.
He then uses a key to identify the animals.



(a) Write down **two** characteristics of daphnia.

Use the information in the key.

1 .....

2 .....[2]

(b) The animals in the key are invertebrates.

What does **invertebrate** mean?

.....

.....[1]

[Turn over for the remainder of question 1

(c) John finds out about the plants in the pond.

The plants photosynthesise faster in the summer than in the winter.

Explain why.

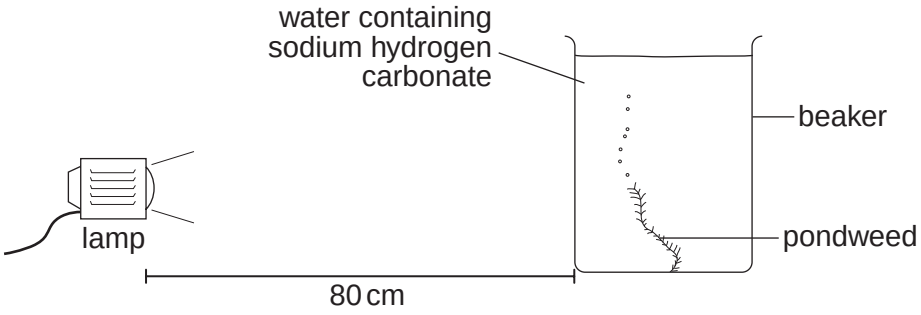
.....

.....[1]

(d) John investigates how quickly pondweed produces oxygen.

Look at the diagram.

It shows the apparatus he uses.



John adds different amounts of sodium hydrogen carbonate to the water in the beaker.

This provides the pondweed with different concentrations of carbon dioxide to use for photosynthesis.

He counts the number of bubbles given off in five minutes.

The table shows his results.

mass of sodium hydrogen carbonate in grams	number of bubbles given off in five minutes
0.00	6
0.02	25
0.04	39
0.06	45
0.08	45

(i) Describe the pattern in the results.

.....

.....

.....[2]

(ii) Explain the pattern in the results.

Use ideas about limiting factors.

.....

.....

.....[2]

[Total: 8]

2 Look at the picture of the bear.

(a) Brown bears are **not** adapted to live in cold conditions in the Arctic.
Polar bears have adaptations so they can live in very cold conditions.

Describe **one** of these adaptations.

.....

.....

Explain how the adaptation you have chosen helps the polar bear.

.....

.....[2]

(b) In April 2006, a bear with both polar bear and brown bear features was found in Canada.
DNA showed the bear had a polar bear mother and a brown bear father.

(i) What is the name given to the offspring of two different species?

.....[1]

(ii) Past crosses between polar bears and brown bears have resulted in fertile offspring.
Some scientists suggest that polar bears and brown bears should be classified as the same species.

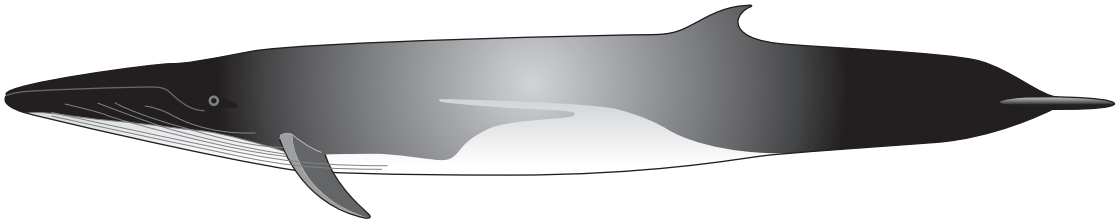
Explain why.

.....

.....[1]

[Total: 4]

3 Look at the picture of a fin whale.



(a) Some whales are kept in captivity.

Suggest **one** argument for and **one** argument against keeping whales in captivity.

for .....

.....

against .....

.....[2]

(b) In 1986, the International Whaling Commission agreed to stop hunting whales.

In October 2006, Iceland announced their intention to start hunting again.

Fin whales are an endangered species.

They intend to hunt fin whales within sustainable limits.

Sustainable development of fin whales could allow hunting without extinction.

Describe how.

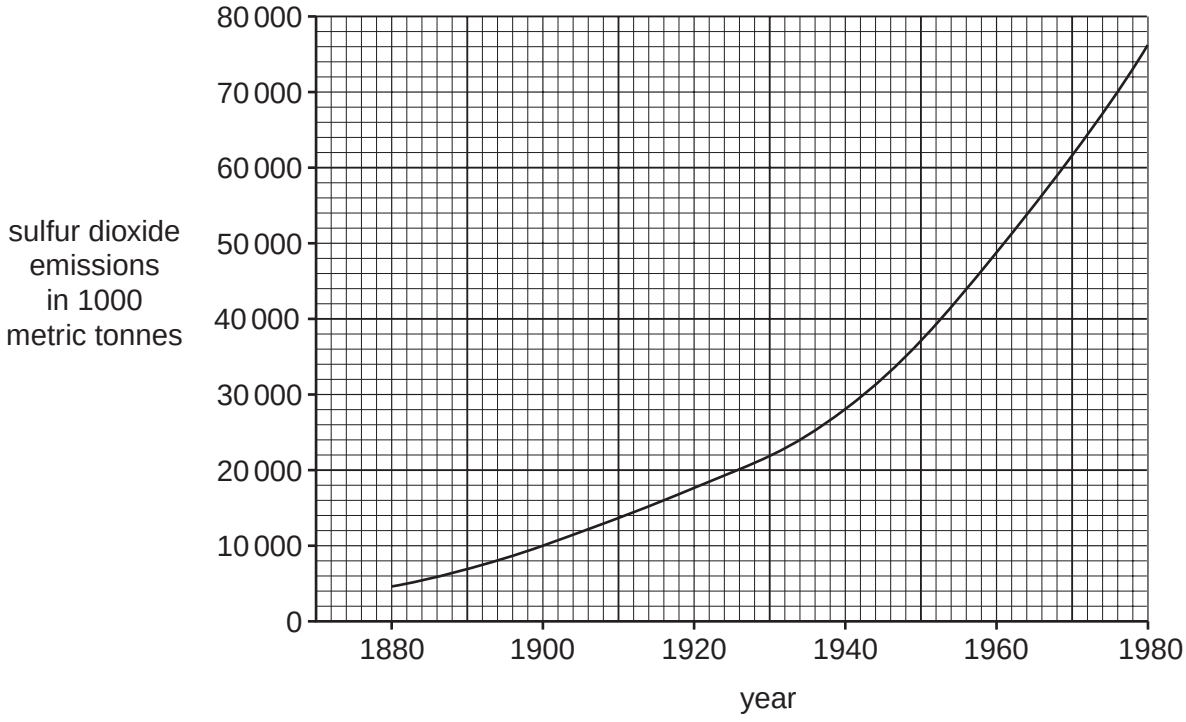
.....

.....[2]

[Total: 4]

4 Look at the graph.

It shows world sulfur dioxide emissions between 1880 and 1980.



(a) The change in sulfur dioxide levels is causing problems in the environment.

Write down **one** of these problems.

.....[1]

(b) The human population is increasing rapidly.

Write down the name given to the increasing rate of human population growth.

.....[1]

(c) The increase in the human population has led to an increase in sulfur dioxide pollution.

Describe **two other** consequences of the increase in human population.

1 .....

.....

2 .....

.....[2]

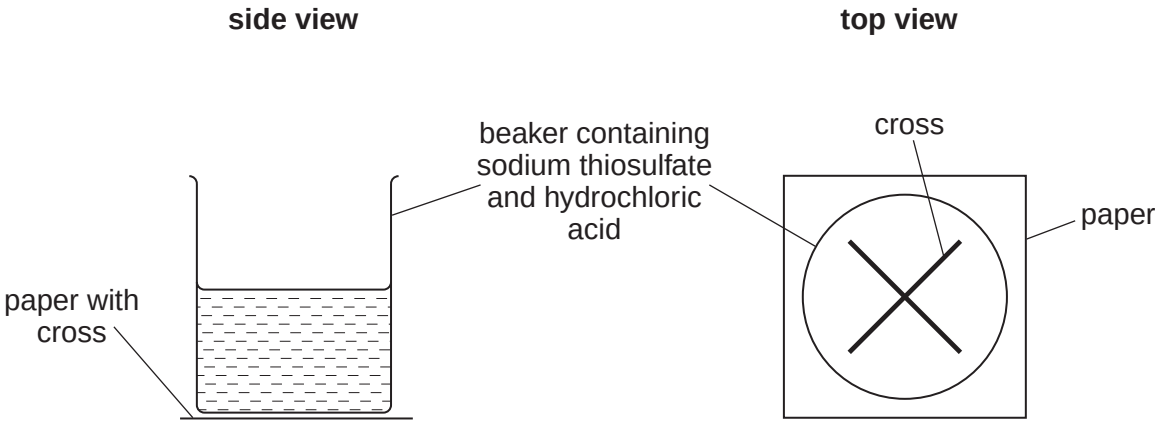
[Total: 4]

Section B – Module C2

5 Rob and Catherine investigate the reaction between sodium thiosulfate and hydrochloric acid.

A yellow solid is made during the reaction.

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



Rob and Catherine look down at the cross. A yellow solid is made. The liquid in the beaker gets cloudy.
After a time they cannot see the cross.
Rob and Catherine measure this reaction time.
They do the experiment four times.
They use four different concentrations of sodium thiosulfate solution, **A**, **B**, **C** and **D**.
They do all the experiments at 20 °C.

Look at their results.

concentration of sodium thiosulfate	reaction time in seconds
A	41
B	74
C	135
D	67

(a) Which is the **least** concentrated solution of sodium thiosulfate?

Choose from **A**, **B**, **C** or **D**.

answer ..... [1]

(b) The rate of the reaction can be increased by raising the temperature of the sodium thiosulfate to 40 °C.

Explain why. Use ideas about collisions between particles.

.....

.....

.....

.....[3]

(c) The reaction between sodium thiosulfate and hydrochloric acid happens quite slowly.

Rusting is another slow reaction.

Iron objects rust more quickly in areas near to the sea.

Suggest why.

.....[1]

(d) Iron reacts with oxygen and water to make hydrated iron(III) oxide.

What is the name of this process?

Choose from the list.

alloying

decomposition

electrolysis

oxidation

answer .....[1]

[Total: 6]

6 This question is about the air.

(a) Carbon monoxide is a pollutant found in air.

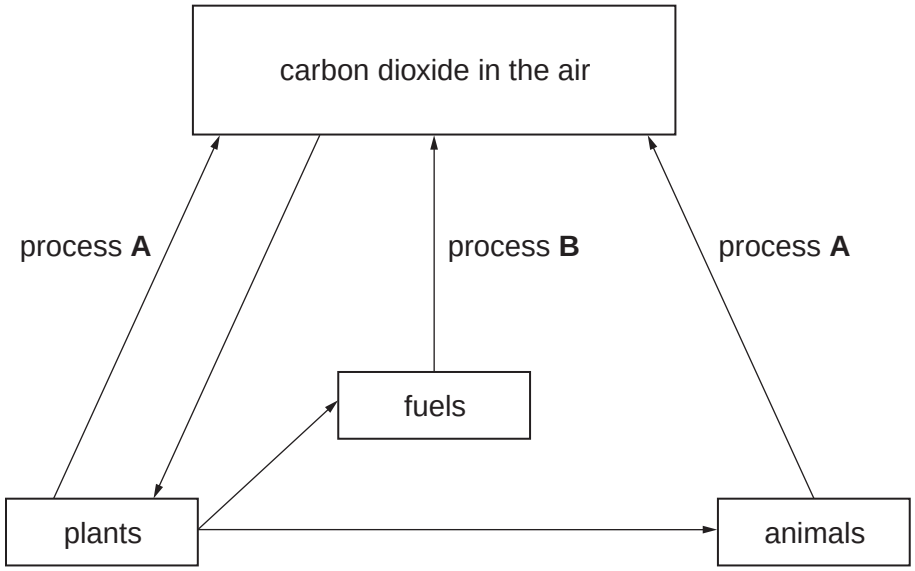
Carbon monoxide, CO, burns in oxygen, O_2.

Carbon dioxide, CO_2, is made.

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

.....[2]

(b) Look at the diagram of the carbon cycle.



(i) What is the name of process **A**?

Choose from the list.

combustion

degassing

photosynthesis

respiration

answer .....[1]

(ii) What is the name of process **B**?

Choose from the list.

combustion

degassing

photosynthesis

respiration

answer .....[1]

(c) The carbon cycle keeps the composition of the air constant.

Cutting down rain forests is called **deforestation**.

Deforestation changes the composition of the air.

Suggest how the composition changes.

.....

Explain your answer.

.....

.....[2]

[Total: 6]

7 This question is about construction materials.

Look at the photograph. It shows some buildings.

© iStockphoto.com / Malcolm Romain

(a) Rocks such as granite, limestone and marble are used to construct buildings.

Limestone and marble are both calcium carbonate.

Marble is much harder than limestone.

Explain why. Use ideas about rock types.

.....

.....

.....[2]

(b) Some construction materials are made from rocks in the Earth's crust.

Iron, brick and glass are construction materials.

Draw straight lines to link each **construction material** to the **rock it is made from**.

construction material	**rock it is made from**
iron	haematite ore
brick	sand
glass	clay

[2]

[Total: 4]

8 This question is about paints.

Paints are made up of three materials.

They are a **solvent**, a **binding medium** and a **pigment**.

(a) Pigments give the paint its colour.

Some pigments are **thermochromic**.

Thermochromic pigments change colour when they are heated.

Write down **one** use of thermochromic pigments.

.....[1]

(b) In oil paints, the pigment is dispersed in an oil.

Oil paints dry slowly.

Explain **how** oil paints dry.

.....

.....[1]

(c) Paints are **colloids**.

Look at the sentences about colloids.

Which sentences about colloids are correct?

Put ticks (✔) in the boxes next to the correct sentences.

Particles are mixed and dispersed through a liquid.	☐
Solid particles dissolve in the liquid.	☐
A colloid is a single compound.	☐
Solid particles are suspended in a liquid.	☐

[2]

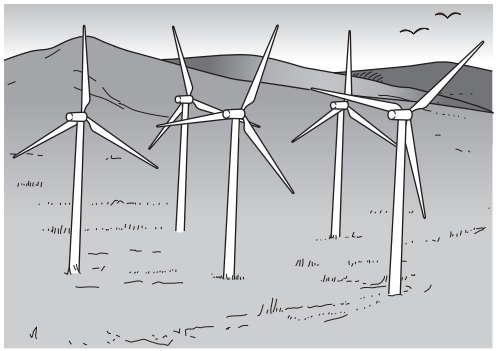
[Total: 4]

Section C – Module P2

9 This question is about wind turbines.

Wind turbines are often located in groups on wind farms.

The energy of the wind can be transferred into electrical energy by the turbines.



Write about the advantages **and** disadvantages of using wind turbines for producing electricity.

advantages .....

.....

.....

disadvantages .....

.....

.....[3]

[Total: 3]

10 This question is about generation of electricity and the cost of using it.

(a) Batteries produce **direct** current.

A **generator** is part of a **power station**. It produces **alternating current** (AC).

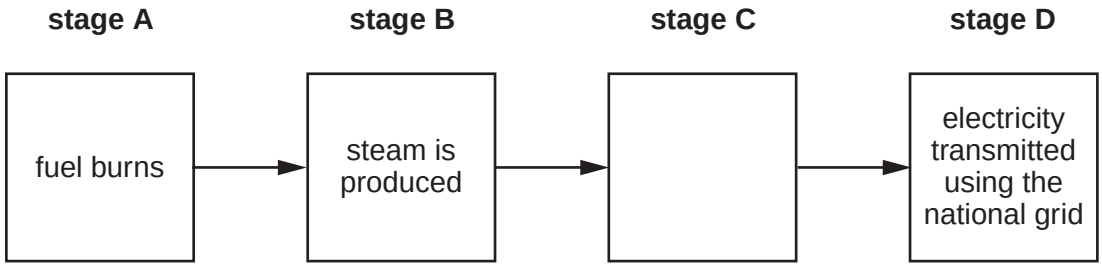
Describe what is meant by AC.

.....

.....[1]

(b) Power stations are part of the electricity supply system.

The diagram shows the main stages in the production of electricity in a power station.



(i) Describe how the electricity is produced during **stage C** in the power station.

.....

.....

.....[2]

(ii) Transformers are used at **stage D** to change the voltage.

Describe why transformers are used.

In your answer, write about

- what happens to the voltage
- what effect this has on the energy transmitted.

.....

.....

.....[2]

[Turn over for the remainder of question 10

(c) The electrical appliances in Robert's house use electricity.

In one week, the electrical appliances in Robert's house

- use 12 kilowatts of power
- are on for a total of 8 hours.

(i) Calculate the total number of units of electrical energy used by Robert's appliances in one week.

The equations on page 2 may help you.

.....

.....

answer ..... units of electrical energy [2]

(ii) The cost of a unit of electricity is 10 pence.

Calculate the cost of the electricity used in Robert's house in one week.

.....

.....

answer ..... pence [1]

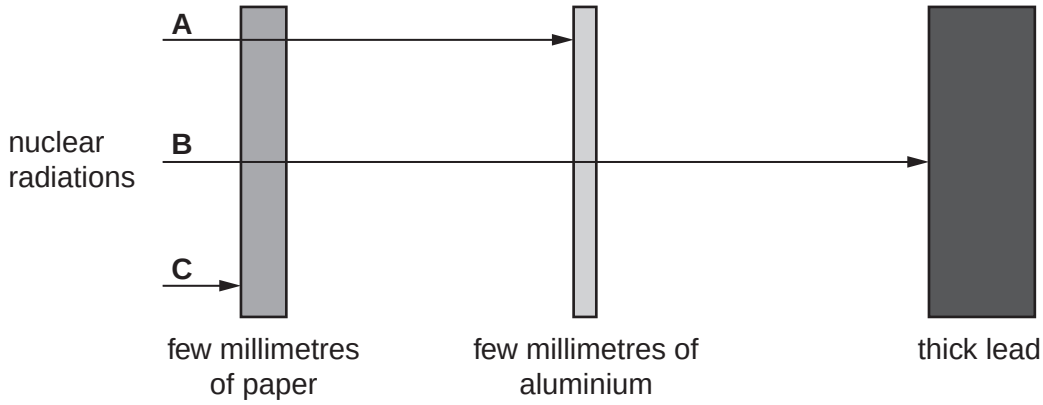
[Total: 8]

11 This question is about **nuclear** radiation.

In a physics lesson, Pardeep's class are learning about nuclear radiation.

The teacher tells the class about how nuclear radiations penetrate substances.

The teacher does an experiment. The diagram shows the results.



Pardeep thinks that nuclear radiation **A** is **beta** radiation.

He does not think that **B** or **C** can be beta radiation.

Explain why he is correct.

.....

.....

.....

.....

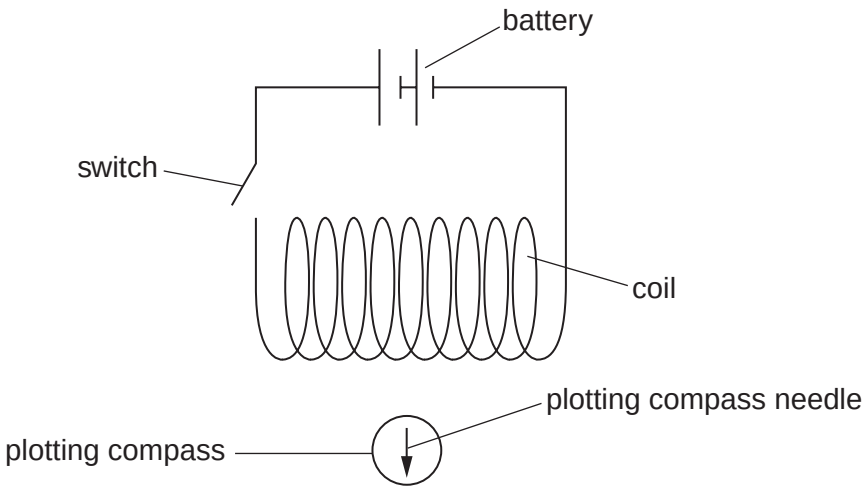
.....[3]

[Total: 3]

12 Kate is investigating magnetic fields.

She uses a coil and a plotting compass.

The coil is connected to a switch and a battery.



Kate closes the switch.

The plotting compass needle moves.

Explain why the plotting compass needle moves.

.....

.....

.....[2]

[Total: 2]

13 This question is about the Universe.

(a) Objects beyond our Solar System, such as galaxies, are very large distances away. Scientists measure these very large distances in **light-years**.

Describe what is meant by a light-year.

.....

.....[1]

(b) The **Big Bang** theory describes how the Universe began.
The Big Bang led to the formation of galaxies.

What does the Big Bang theory say about the movement of galaxies?

.....[1]

(c) There is a lot of evidence for the Big Bang theory.

Look at the two statements about light reaching Earth from galaxies.

The statements are incomplete.

Complete the statements in the right hand boxes.

Seen from Earth, light from galaxies is shifted	....
The further away galaxies are	....

[2]

[Total: 4]

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.