

**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

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

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Candidate  
Number

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**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	
<b>TOTAL</b>	<b>60</b>	

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

## 2

### EQUATIONS

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

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

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

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

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

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

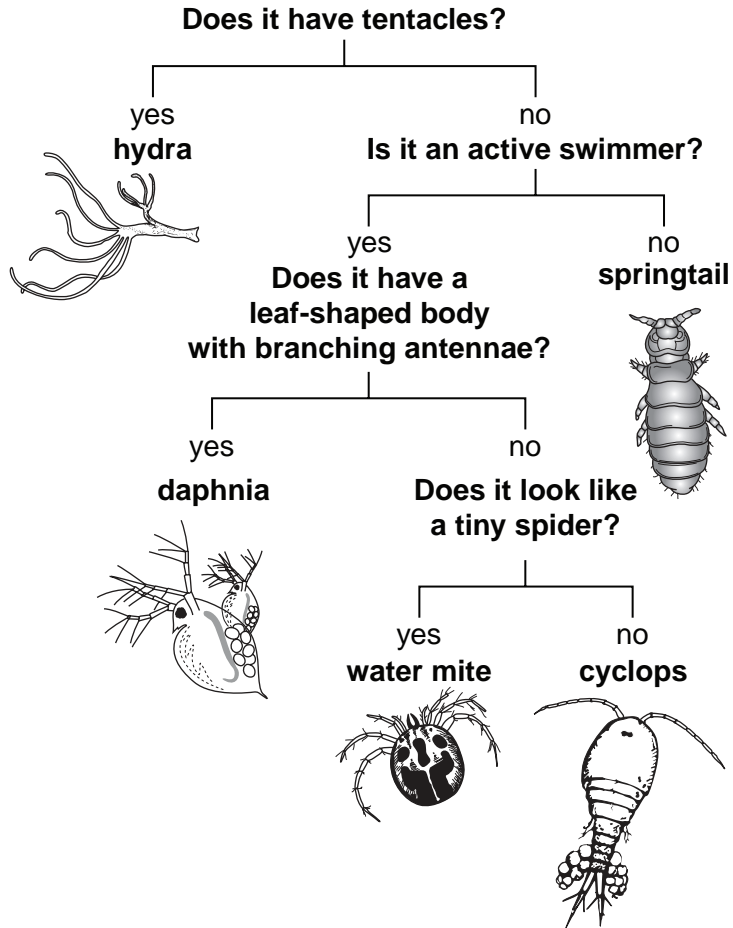
$$\text{energy (kilowatt hours)} = \text{power (kW)} \times \text{time (h)}$$

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

Answer **all** the questions.

**Section A – Module B2**

- 1 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]

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

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

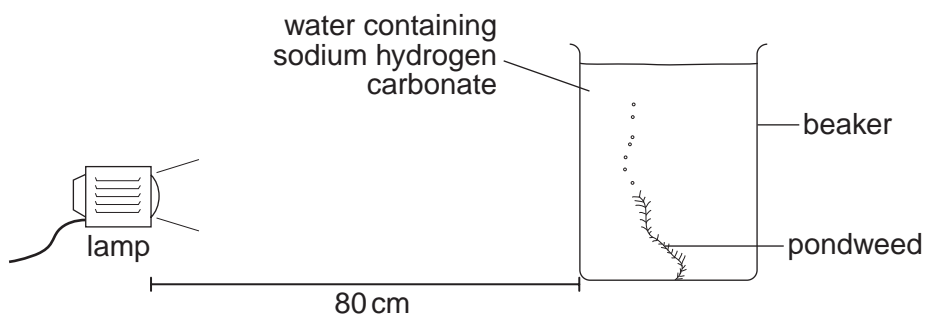
Explain why.

.....  
 .....[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.

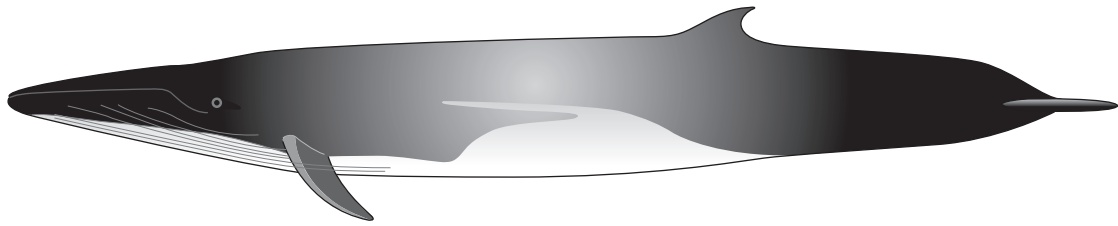
Explain why.

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

[Total: 4]

[Turn over

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.

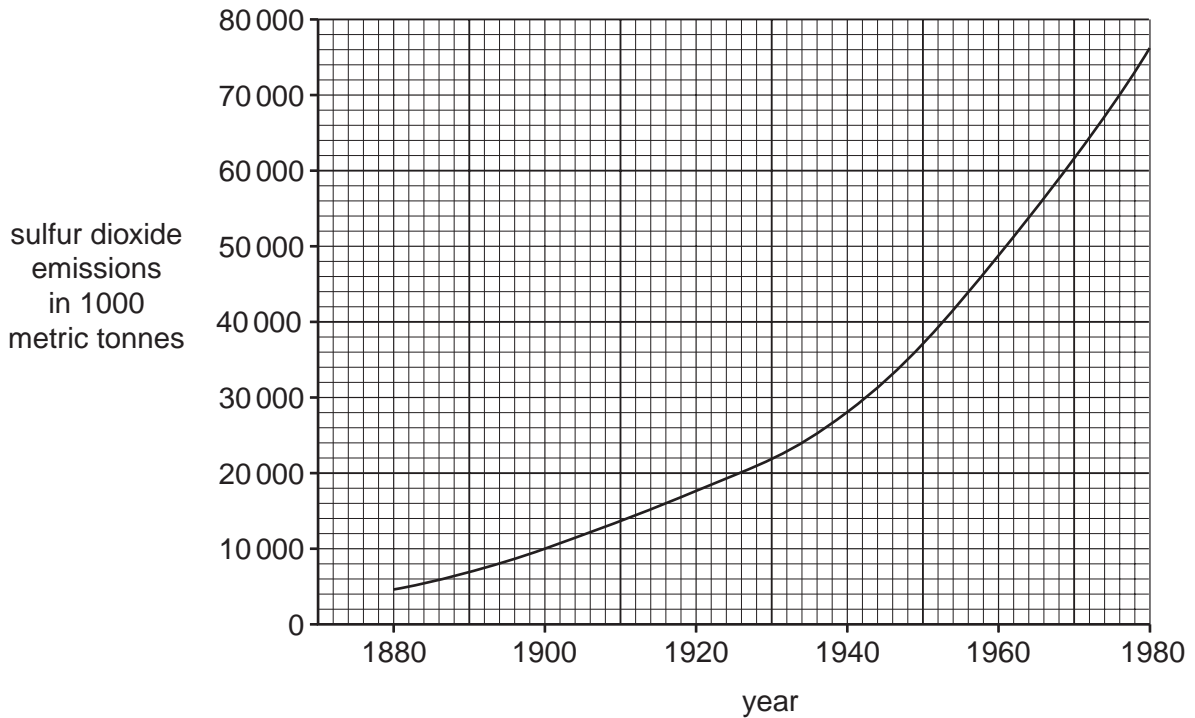
.....

.....[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]

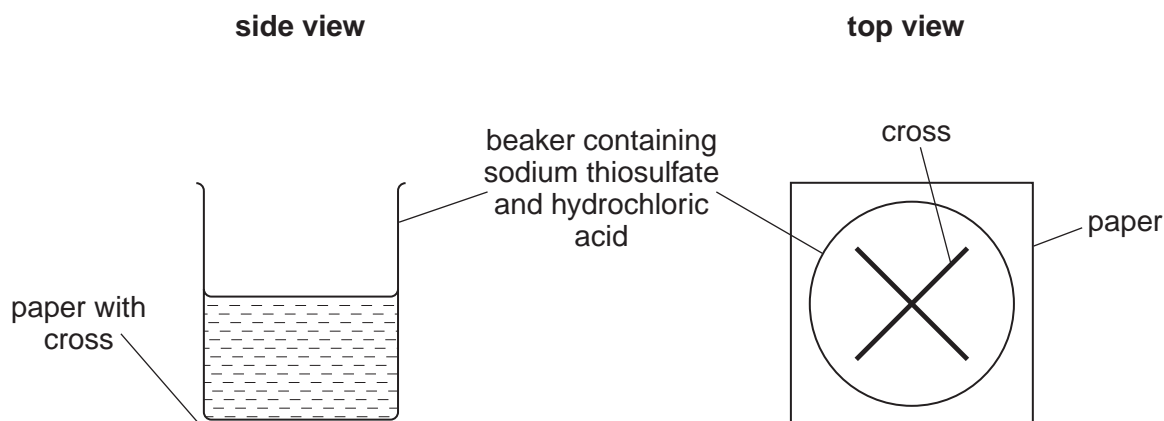
[Total: 4]

## 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
<b>A</b>	41
<b>B</b>	74
<b>C</b>	135
<b>D</b>	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.

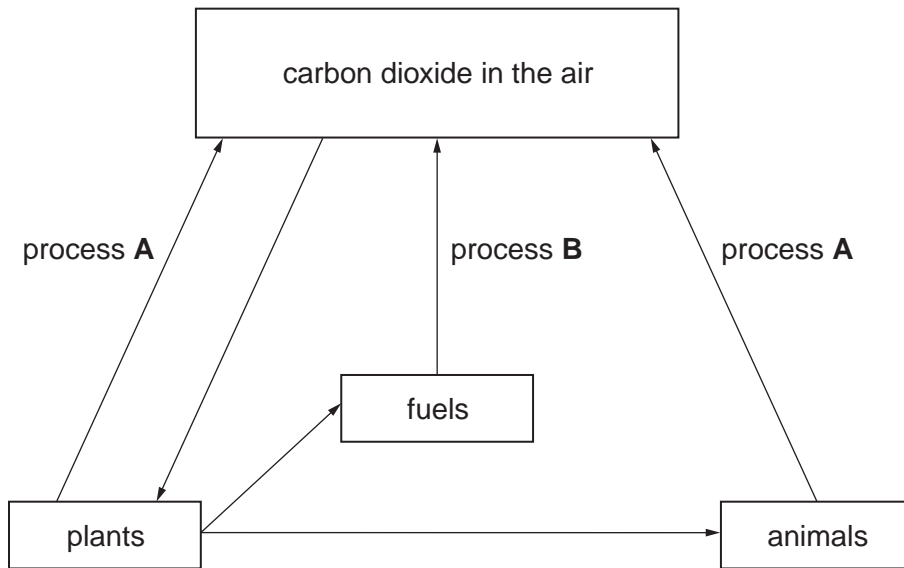
Carbon monoxide, CO, burns in oxygen, O<sub>2</sub>.

Carbon dioxide, CO<sub>2</sub>, 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
iron
brick
glass

rock it is made from
haematite ore
sand
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]

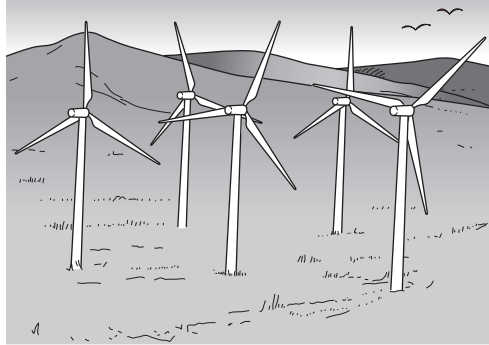
[Total: 4]

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.

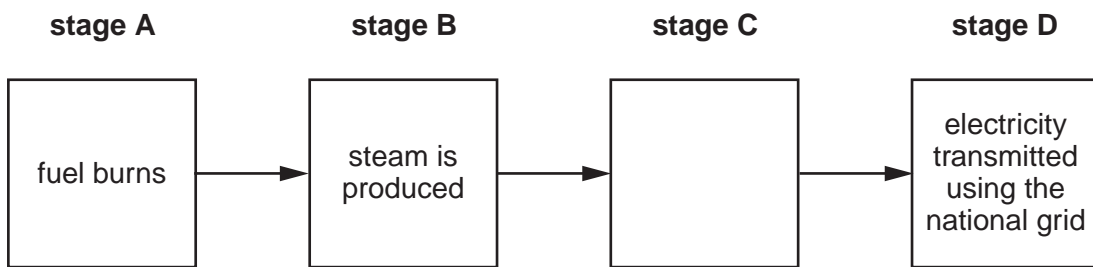
A **generator** is part of a **power station**. It produces **alternating current (AC)**.

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]

(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]

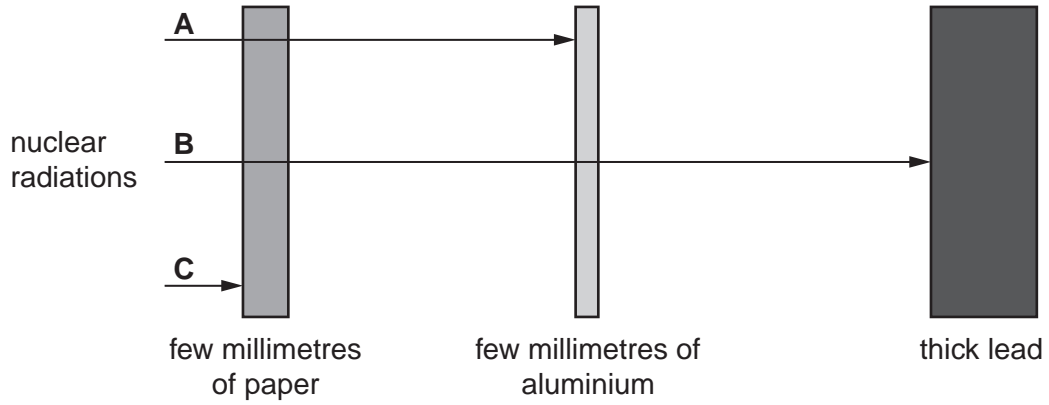


11 This question is about **nuclear** radiation.

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.

.....

.....

.....

.....

.....

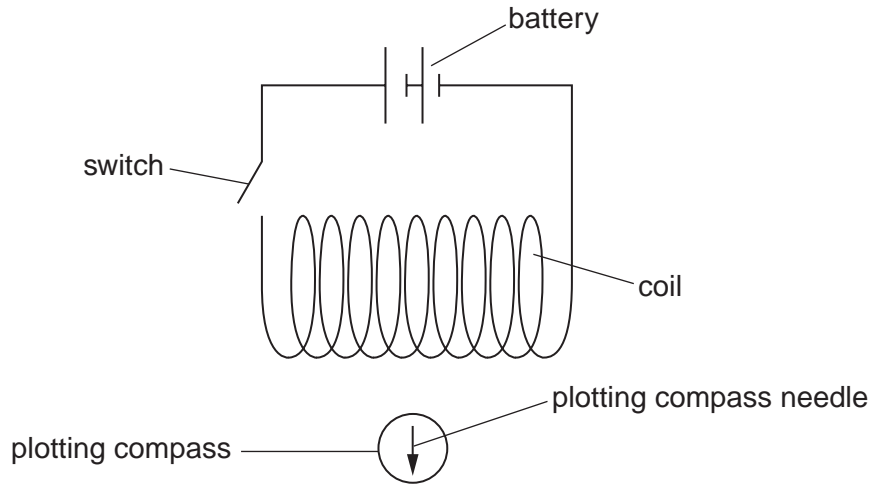
.....[3]

[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**

*Copyright Acknowledgements:*

Q.1 diagram      Data source: Wildfowl & Wetlands Trust, www.wwt.org.uk  
 Q.7 photo        © iStockphoto.com / Malcolm Romain

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