THIS IS A NEW SPECIFICATION

OCR
RECOGNISING ACHIEVEMENT

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Thursday 23 May 2013 – Morning

GCSE TWENTY FIRST CENTURY SCIENCE
SCIENCE A

A143/01 Modules B3 C3 P3 (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

- Your quality of written communication is assessed in questions marked with a pencil (✐).
- A list of useful relationships is printed on page 2.
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **60**.
- This document consists of **20** pages. Any blank pages are indicated.

TWENTY FIRST CENTURY SCIENCE EQUATIONS

Useful relationships

The Earth in the Universe

distance = wave speed × time

wave speed = frequency × wavelength

Sustainable energy

energy transferred = power × time

power = voltage × current

$$\text{efficiency} = \frac{\text{energy usefully transferred}}{\text{total energy supplied}} \times 100\%$$

Explaining motion

$$\text{speed} = \frac{\text{distance travelled}}{\text{time taken}}$$

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time taken}}$$

momentum = mass × velocity

change of momentum = resultant force × time for which it acts

work done by a force = force × distance moved in the direction of the force

amount of energy transferred = work done

change in gravitational potential energy = weight × vertical height difference

$$\text{kinetic energy} = \frac{1}{2} \times \text{mass} \times [\text{velocity}]^2$$

Electric circuits

power = voltage × current

$$\text{resistance} = \frac{\text{voltage}}{\text{current}}$$

$$\frac{\text{voltage across primary coil}}{\text{voltage across secondary coil}} = \frac{\text{number of turns in primary coil}}{\text{number of turns in secondary coil}}$$

Radioactive materials

energy = mass × [speed of light in a vacuum]^2

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Question 1 begins on page 4

PLEASE DO NOT WRITE ON THIS PAGE

Answer **all** the questions.

1 Electrical tools used on building sites do not use the mains voltage.

(a) What is the mains voltage?

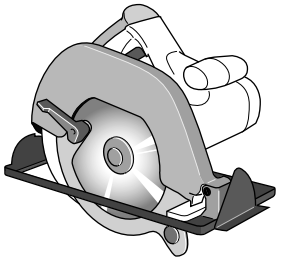
Put a (ring) around the correct value.

230 V **500 V** **1100 V** **2300 V**

[1]

(b) A circular saw on a building site uses 110 V.

Calculate the power of this saw. It takes a current of 15 amps.



power = ... watts **[2]**

(c) A different circular saw has a power of 2 kW.

During a week, it is used for a total of 8 hours.

Calculate the cost of using the saw.

1 kilowatt-hour costs 25p.

cost = ... p **[2]**

[Total: 5]

2 This question is about the use of resources.

(a) Energy sources are important resources.

Which of the following energy sources are **non-renewable**?

Put ticks (✓) in the boxes next to the **two** non-renewable energy sources.

biofuel	☐
coal	☐
nuclear	☐
solar	☐
wind	☐

[2]

(b) Which of the following describes the use of resources in a **sustainable** way?

Put a tick (✓) in the box next to the **best** description.

Using as few resources as possible.	☐
Using as many resources as possible.	☐
Using natural resources, not artificial ones.	☐
Using resources no faster than they are produced.	☐

[1]

[Total: 3]

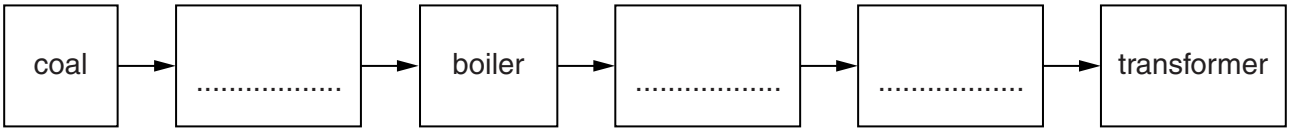
3 This question is about different types of power stations.

(a) The block diagram below shows the production of electricity by a coal-burning power station.

Complete the block diagram by writing a word in each of the empty boxes.

Choose words from this list.

furnace **generator** **motor** **turbine**



[3]

(b) Which of the following statements is an **advantage** of using a hydroelectric power station instead of a coal-burning power station?

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

Hydroelectric power has expensive fuel costs. ☐

Hydroelectric power produces radioactive waste. ☐

Hydroelectricity is a non-renewable energy source. ☐

Hydroelectric power does not produce carbon dioxide. ☐

[1]

(c) In some countries, such as Sweden, hydroelectric power provides a large proportion of the country's electricity. In many other countries this is not possible.

Suggest reasons why hydroelectric power cannot provide much electricity in some countries.

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

[Total: 6]

4 Read this advertisement from a firm selling loft insulation.

Are you losing money through your roof?

In a home without any insulation, a quarter of the heat is lost through the roof. Insulating your loft is a simple and effective way to save energy and reduce your heating costs. And the cost of fuel for heating is certain to increase in the next three years!
Even if your loft is already insulated, it may be only 100 mm thick – the recommended thickness is now 270 mm. Topping it up to 270 mm will still save you a lot of money.

Just look at the figures below. Can you afford to ignore them?

	Installing 270 mm of insulation in a loft with no insulation	**Topping up insulation to 270 mm in a loft which has only 100 mm of insulation**
approximate saving per year	£175	£25
cost to buy and install	£170	£150
time taken to pay for itself	less than a year	up to six years

Explain the differences between the two columns of data in the table and how these figures will be affected by rising fuel costs.

The quality of written communication will be assessed in your answer.

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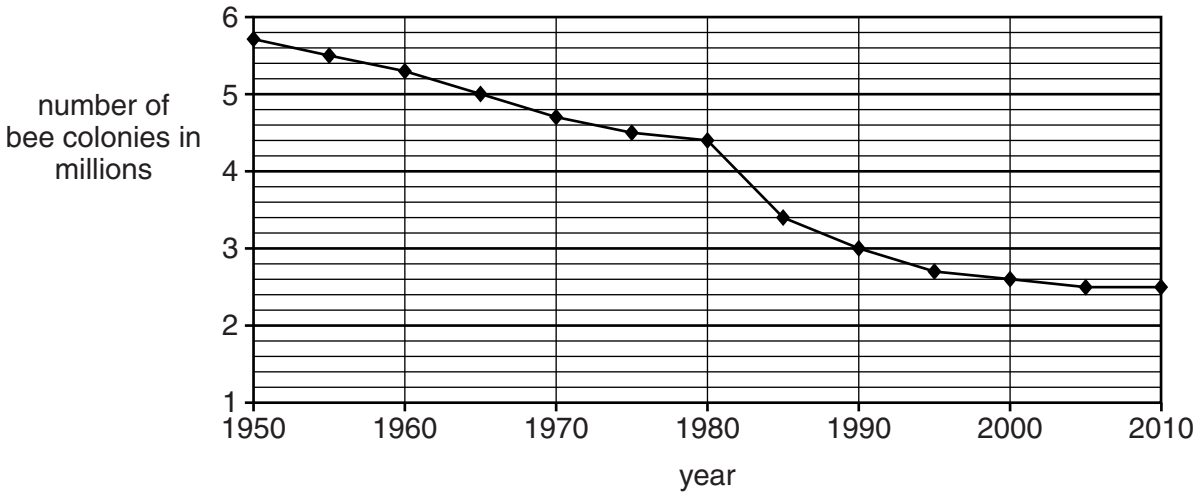
..... **[6]**

[Total: 6]

5 There has been a large decline in the number of bee colonies in the USA over the last 60 years.

(a) Look at the graph.



(i) Calculate the total drop in the number of bee colonies (in millions) between 1950 and 2010.

drop in bee colonies = ... millions **[1]**

(ii) Bees pollinate flowers on fruit trees.

Use the graph to suggest what might have happened to the production of fruit in the USA from 1950 to 1970.

Justify your answer.

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

(iii) A parasitic mite was introduced to the USA. It kills bees.

Explain how the graph shows that the mites were introduced in 1980.

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

(iv) Suggest reasons why the rate of decline in the number of bee colonies is levelling off.

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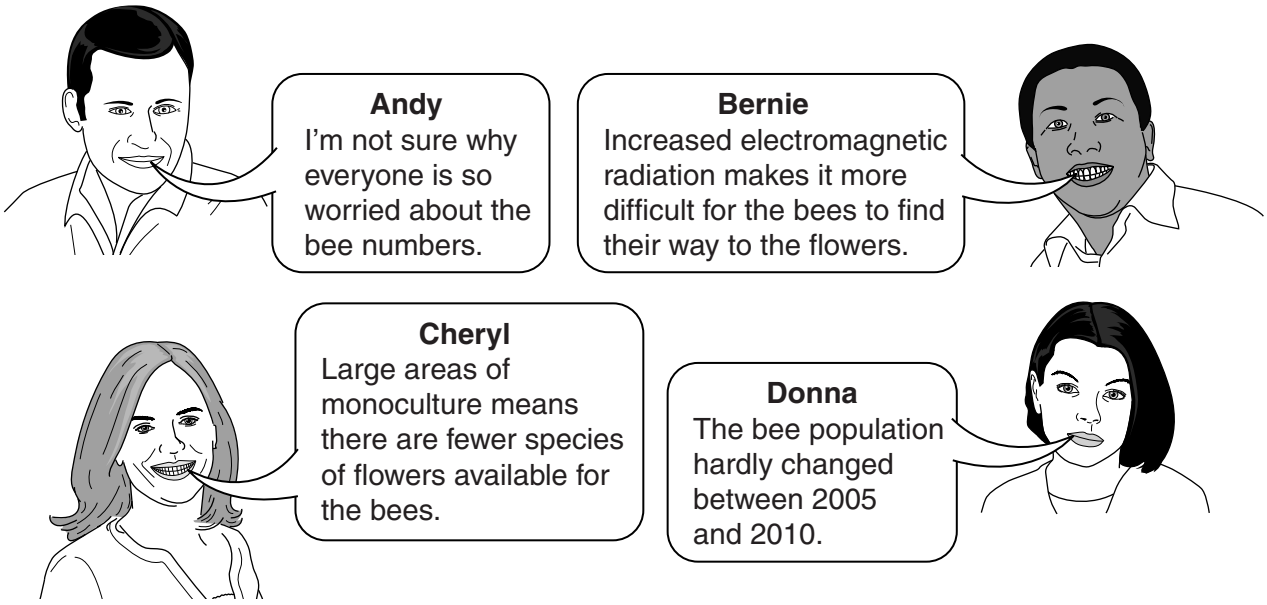
..... **[2]**

(b) Some people are discussing the decline in bee numbers.



(i) Which person, **Andy**, **Bernie**, **Cheryl** or **Donna**, is talking about data from the graph?

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

Andy ☐

Bernie ☐

Cheryl ☐

Donna ☐

[1]

(ii) Which **two** people from **Andy**, **Bernie**, **Cheryl** or **Donna**, are suggesting explanations?

Put ticks (✓) in the boxes next to the **two** correct answers.

Andy ☐

Bernie ☐

Cheryl ☐

Donna ☐

[1]

(c) **Cheryl** talks about large areas of monoculture.

Explain why having large areas of monoculture reduces biodiversity.

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

[Total: 9]

6 Adelie penguins live in Antarctica where it is extremely cold.

(a) The penguins are adapted to live in this environment.

Physical adaptations are features of an animal's body that help them survive.

Behavioural adaptations are how animals behave to help them survive.

(i) Look at the list of adaptations of the Adelie penguins.

Put a tick (✓) in the correct box in each row to show whether the adaptation is an example of a **physical** adaptation, a **behavioural** adaptation or **both**.

Adaptation	Physical	Behavioural	Both
leathery skin on the bottom of its feet to protect them on the rocks			
strong claws to grip onto the rocks			
gland produces oil that the penguin spreads over its feathers			
streamlined body shape			
huddles together in groups to keep warm			

[3]

(ii) Explain how Adelie penguins have evolved to become adapted to their environment.

The quality of written communication will be assessed in your answer.

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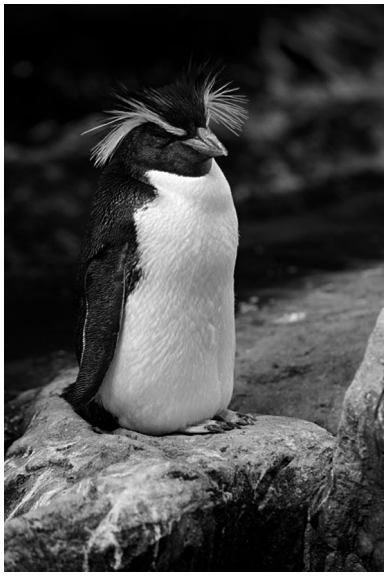
..... **[6]**

(b) Macaroni penguins also live in Antarctica.



The number of Macaroni penguins is so low that they are an endangered species and are at risk of extinction.

Extinctions are usually the result of a change in the environment. These changes can be natural or man-made.

Write down **two** possible changes to the Macaroni penguin's environment that might lead to it becoming extinct.

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

[Total: 11]

7 Rocks in the Earth's crust are made in different ways.

The type of rock depends on the processes that have made it.

(a) Draw a straight line from each **process** to the **description** of that process.

process	description
erosion	Small grains are squashed and stick together.
mountain building	Rock is worn away by wind and rain.
sedimentation	Tectonic plates collide.

[2]

(b) This is a picture of a sedimentary rock.

It gives evidence of where the rock was formed.

Which sentence gives the best explanation of how this rock pattern was formed?

Put a tick (✓) in the box next to the **best** answer.

Animals swimming at the bottom of seas. ☐

Water evaporating leaving the rock exposed. ☐

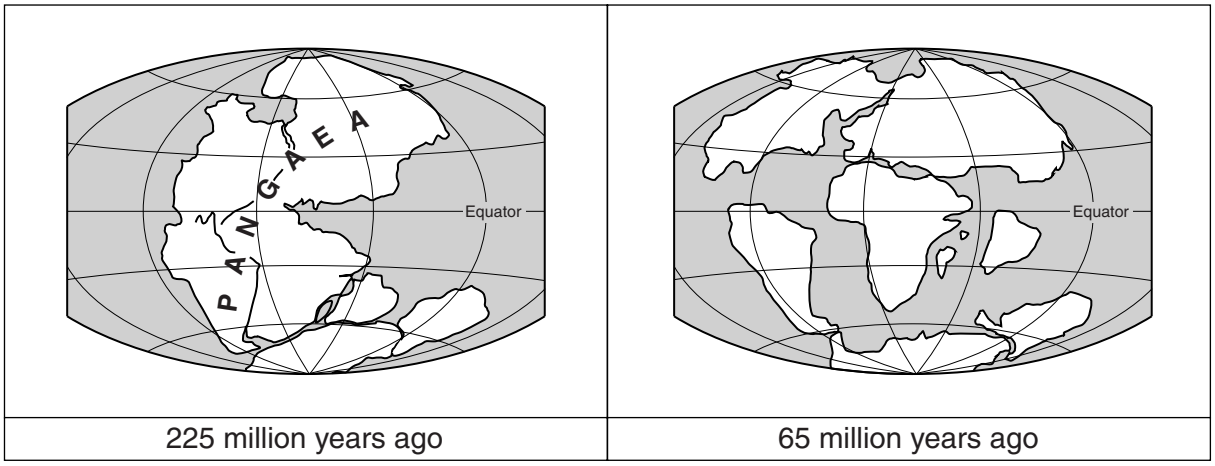
Plants dying and being covered with sediment. ☐

Water flowing over a sandy beach. ☐

[1]

(c) The maps show the world 225 million and 65 million years ago.

Between these times the positions of land masses changed.



225 million years ago | 65 million years ago

How do scientists explain these changes?

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

[Total: 5]

8 This is a question about salt.

(a) Finish this sentence.

Salt is brought out of the ground by mining or by ..... the salt in water.

[1]

(b) When salt is mined, the ground above may collapse.

This is called subsidence.

Suggest **two** problems that this may cause.

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

(c) People live in places where salt is mined.

Why do people accept the risk of living in places where salt is mined?

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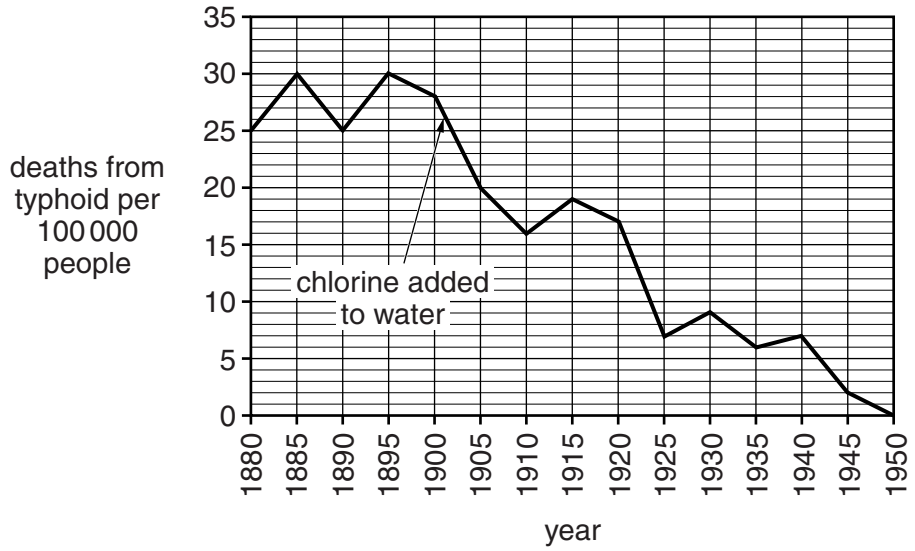
..... **[1]**

[Total: 4]

9 Typhoid is a disease that is passed on by infected water.

The graph shows the deaths in London from typhoid from 1880 to 1950.



(a) Look at the graph.

It shows that treatment of London's drinking water by adding chlorine began in 1901.

Describe and explain the effect of adding chlorine to London's water supply on the deaths from typhoid.

The quality of written communication will be assessed in your answer.

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(b) (i) Use the graph to find the number of deaths from typhoid in 1895 and 1925.

Write your answers in the table.

	1895	1925
deaths from typhoid per 100 000 people		

[1]

(ii) Two students are discussing the information in the graph.

Matt says these numbers show that it was a good idea to add chlorine to water.

Julie says the number of deaths rises and falls so much that you can't tell.

Who is right?

Explain your answer.

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

(c) Traces of harmful chemicals are sometimes made when chlorine is added to water.

Why is chlorine added to water even though harmful chemicals may be made?

Put ticks (✓) in the boxes next to the **two** correct answers.

Chlorine bleaches the water. ☐

The risk from the harmful chemicals is very small. ☐

Chlorine is a toxic chemical. ☐

Most people believe chlorine is risk free. ☐

The benefit of adding chlorine to water is large. ☐

[2]

[Total: 11]

END OF QUESTION PAPER

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