Candidate forename					Candidate surname				

Centre number					Candidate number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

GCSE

A216/01

TWENTY FIRST CENTURY SCIENCE ADDITIONAL SCIENCE A

Unit 2: Modules B5 C5 P5 (Foundation Tier)

MONDAY 25 JUNE 2012: Afternoon
DURATION: 40 minutes
plus your additional time allowance

MODIFIED ENLARGED

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

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes on the first page. Please write clearly and in capital letters.

- Use black ink. HB pencil may be used for graphs and diagrams only.

- Answer <u>ALL</u> 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).

INFORMATION FOR CANDIDATES

- 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 <u>42</u>.

- A list of physics equations is printed on pages 4 and 5.

- An enlarged copy of the Periodic Table will be provided.

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TWENTY FIRST CENTURY SCIENCE EQUATIONS

USEFUL RELATIONSHIPS

EXPLAINING MOTION

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

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

change in energy = work done

change in GPE = weight × vertical height difference

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

ELECTRIC CIRCUITS

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

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

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

$$\text{power} = \text{potential difference} \times \text{current}$$

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

THE WAVE MODEL OF RADIATION

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

Answer ALL the questions.

1 Industry in Britain uses thousands of tonnes of gases from the air every year.

(a) The pie chart opposite shows the amounts of the four main gases in dry air.

Write the names of the gases in the boxes.
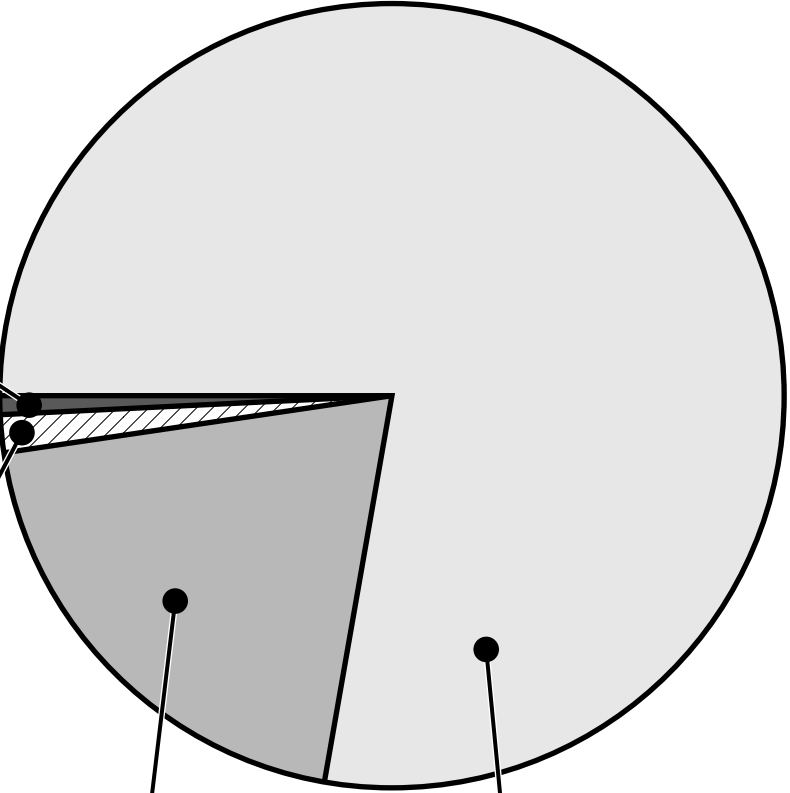
Two have been done for you.

(b) Complete the table to show the chemical symbol for argon and the formula for carbon dioxide.

	argon	carbon dioxide
symbol or formula		

[2]

carbon dioxide

argon

[2]

(c) Gases in the air have low boiling points.

Explain why.

Use ideas about

- size of molecules

- forces between molecules.

_____

_____

_____

_____ [3]

[Total: 7]

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2 Read this article.

Archaeologists have discovered a small lead mine that was used **4000** years ago.
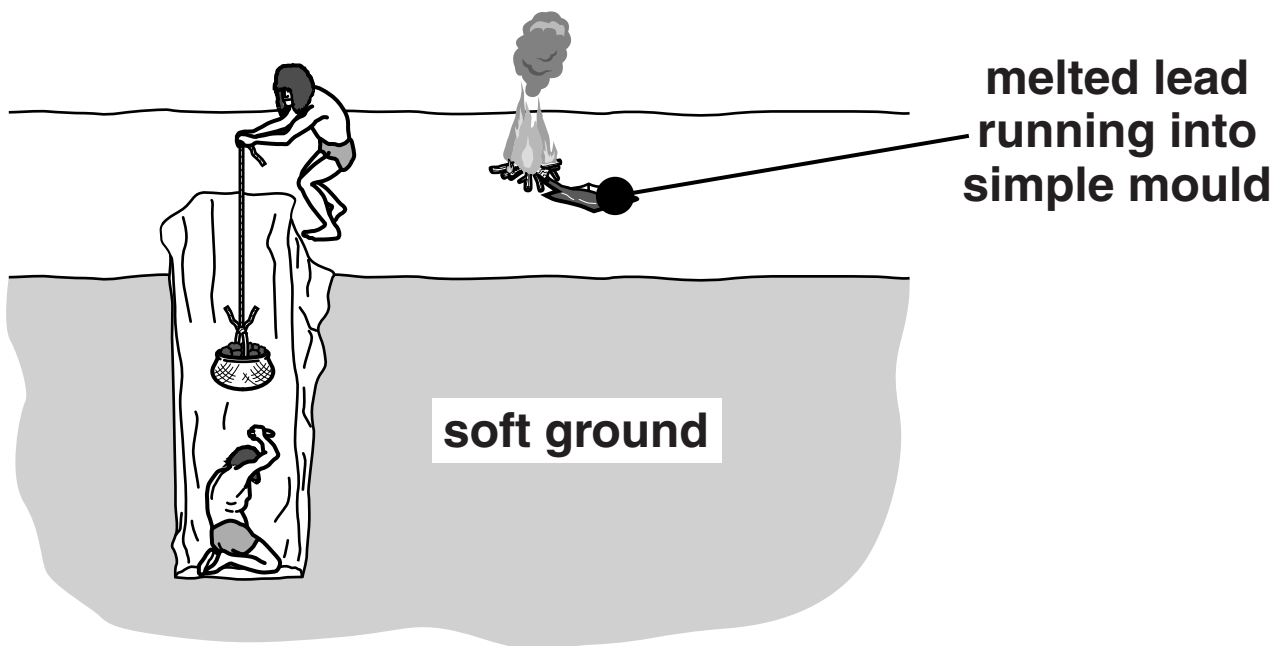
The miners made a deep hole through soft ground until they reached the lead ore.

They then dug out the ore and loaded it into baskets.

Once it was on the surface more men put the lead ore into a wood fire to react.

Melted lead came out of the lead ore.

Lead fumes and clouds of sulfur dioxide gas were given off.

melted lead running into simple mould

soft ground

(a) Here is some information about three of the substances involved in the process.

	lead ore	lead fumes	sulfur dioxide
effect	dust is harmful if breathed in for a long time	harmful if breathed in for a long time	kills plants and causes breathing problems

Mining and producing lead was dangerous.

Use the information in the article and table above to explain TWO possible reasons why mining and producing lead was dangerous.

_____

_____

_____

_____ [3]

(b) The lead ore contains lead sulfide. Two reactions happen when lead sulfide is heated in the fire.

   (i) In the first reaction in the fire, oxygen gas reacts with solid lead sulfide to make solid lead oxide and sulfur dioxide gas.

   Complete the table to show the state symbols for the substances in this reaction.

   One has been done for you.

substance	state symbol
oxygen	*g*
lead sulfide	
lead oxide	
sulfur dioxide	

[1]

   (ii) In the second reaction, carbon takes oxygen away from the lead oxide to make lead and another substance.

   Suggest a word equation for this reaction.

   _____ [1]

(iii) Carbon takes oxygen away from lead oxide.

What does this tell you about lead?

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

It is a silvery metal. ☐

It is not very reactive. ☐

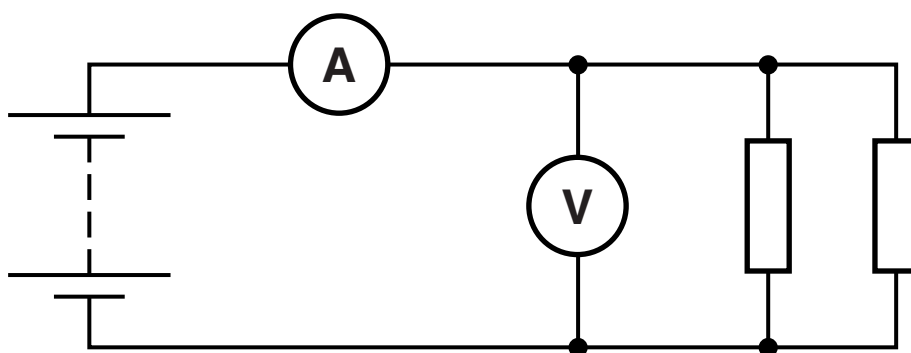It is a pollutant. ☐

It is a dense metal. ☐

[1]

(iv) What do we call a reaction in which oxygen is removed?

_____ [1]

[Total: 7]

3 **Alyson uses this circuit to investigate the current drawn from a battery by resistors in parallel.**

The diagram shows Alyson's circuit when she has TWO identical resistors in parallel.

She changes the number of identical resistors in parallel and obtains these results.

number of resistors	current in amps	p.d. in volts
none	0.00	2.8
one	0.07	2.8
two	0.14	2.8
three	0.21	2.8

(a) Calculate the resistance of just ONE of the resistors.
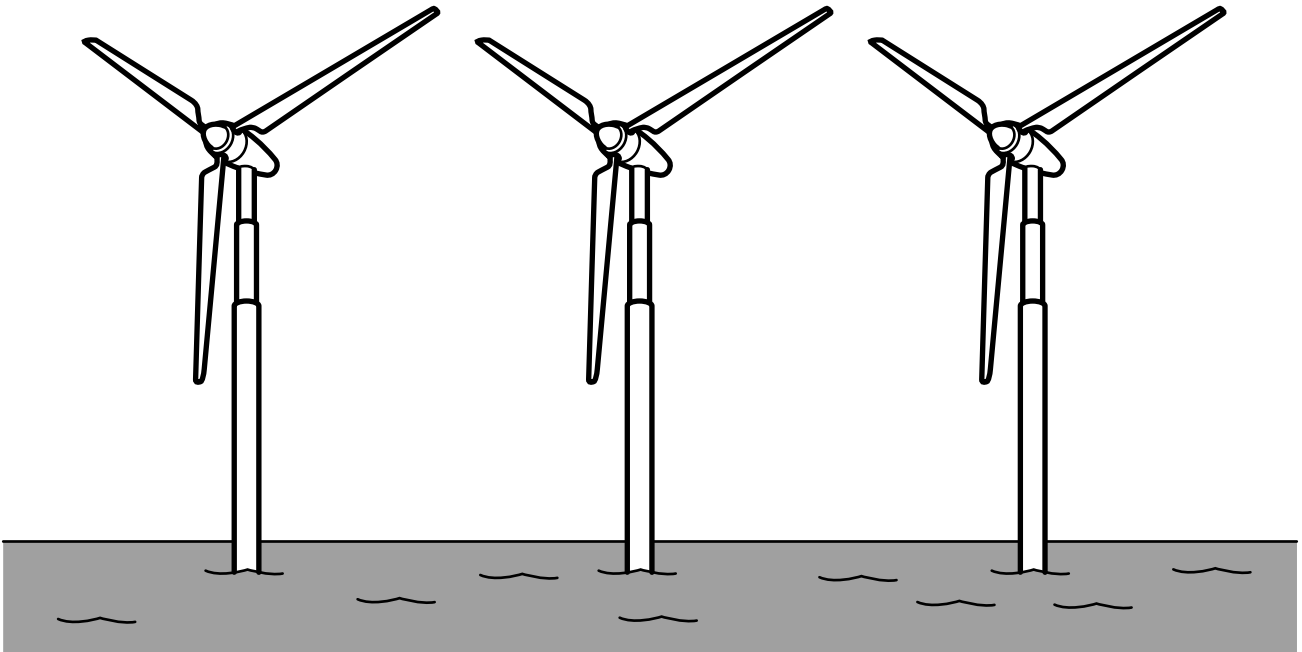
resistance = _____ Ω [1]

(b) Alyson notices that increasing the number of resistors increases the current.

Use ideas about parallel circuits to explain the pattern in Alyson's results.

_____

_____

_____

_____

_____

_____ **[3]**

[Total: 4]

4 At least **10%** of mains electricity in the UK comes from wind turbines out at sea.

(a) Which of the following describes mains electricity in houses?

Put a (ring) around the correct answer.

50V a.c.

50V d.c.

230V a.c.

230V d.c.

[1]

(b) The sentences below explain how wind turbines generate electricity.

Complete the sentences by putting a (ring) around the correct words in CAPITALS.

Each wind turbine makes electricity with a

BATTERY / GENERATOR / TRANSFORMER.

As the blades rotate, they spin a

BRUSH / MAGNET / RESISTOR   inside a

coil of wire.

This way of making electricity is called

ELECTROMAGNETIC / STATIC / TRANSMISSION

induction.   [2]

(c) Here are some ways of changing the output voltage of a wind turbine.

Put ticks (✓) in the boxes next to the TWO changes which could INCREASE the voltage.

Reduce the diameter of the coil. ☐

Replace all the iron with copper. ☐

Make the turbine spin round faster. ☐

Decrease the weight by removing all the iron. ☐

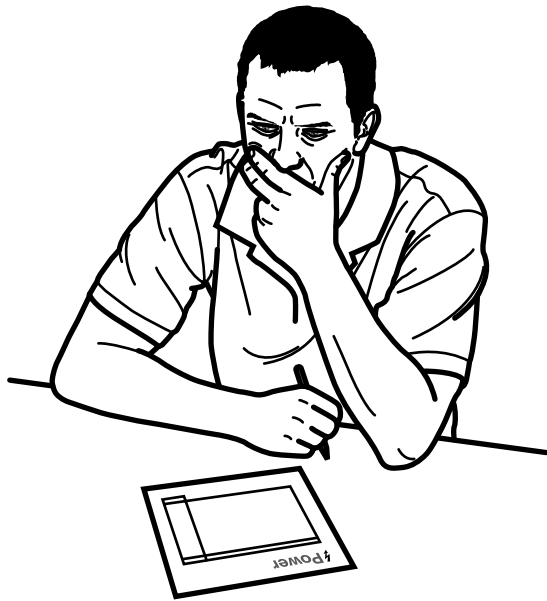Increase the number of turns of wire in the coil. ☐

[2]

[Total: 5]

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5 **Bill worries about how much he pays for electricity.**

He investigates the energy used by the appliances in his home.

(a) He finds this data for his computer.

power = 0.12 kW

How should he calculate the electrical energy in kWh transferred to the computer when he leaves it on for 24 hours?

Put a (ring) around the correct calculation.

0.12 × 24

$$\frac{0.12}{24}$$

0.12 × 1000 × 24

$$\frac{0.12 \times 1000}{24}$$

[1]

(b) Bill pays **12p** for each kilowatt hour of electricity.

How much does he pay to keep his **3 kW** heater switched on for **5** hours?

cost = _____ p [1]

(c) Bill knows that energy transfers are usually measured in joules.

Why are electrical energy transfers measured in kilowatt hours?

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

The joule is too small a unit of energy. ☐

Only heat energy is measured in joules. ☐

One joule is the same as a kilowatt-hour. ☐

[1]

(d) Bill finds this data about his television when he leaves it on all day.

energy transfer	amount in kWh
mains electricity into television	2.40
sound and light out of television	0.12

How should he calculate the percentage efficiency of his television?

Put a (ring) around the correct calculation.

$$\frac{0.12}{2.40}$$

$$\frac{0.12}{2.40} \times 100$$

$$\frac{2.40}{0.12}$$

$$\frac{2.40}{0.12} \times 100$$

[1]

(e) Bill recharges his mobile phone every day.

The charging unit contains a transformer.

Complete this sentence for the transformer. Use a word from this list.

charge

current

voltage

The transformer reduces the _____ of the mains electricity. [1]

[Total: 5]

6 **This question is about DNA and cell division.**

(a) **(i)** **Where in a cell is DNA found?**

Put a ⟨ring⟩ around the correct answer.

cytoplasm

membrane

nucleus

[1]

(ii) **Where in a cell are proteins made?**

Put a ⟨ring⟩ around the correct answer.

cytoplasm

membrane

nucleus

[1]

(b) Look at the statements about DNA and proteins.

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

DNA is cut up into lengths of protein. ☐

A copy of the DNA is carried to where proteins are made. ☐

Parts of the protein are made next to the DNA then taken away to be put together. ☐

DNA is changed into amino acids, which then move around the cell. ☐

[1]

(c) Put a tick (✓) in the box next to the correct word or phrase to complete each sentence.

The bases join together to hold one

chromosome	
DNA strand	to another.
gene	

During mitosis

chromosomes	
DNA strands	separate.
genes	

During the growth part of the cell cycle

chromosomes	
DNA strands	separate.
genes	

[2]

(d) Mitosis produces new cells from a parent cell.

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

Each parent cell produces four new cells. ☐

The new cells are genetically different from each other. ☐

The new cells are genetically identical to the parent cell. ☐

The parent cell has more genes than the new cells. ☐

[1]

[Total: 6]

7 Ben is going camping in North America.

He hopes to see black bears.
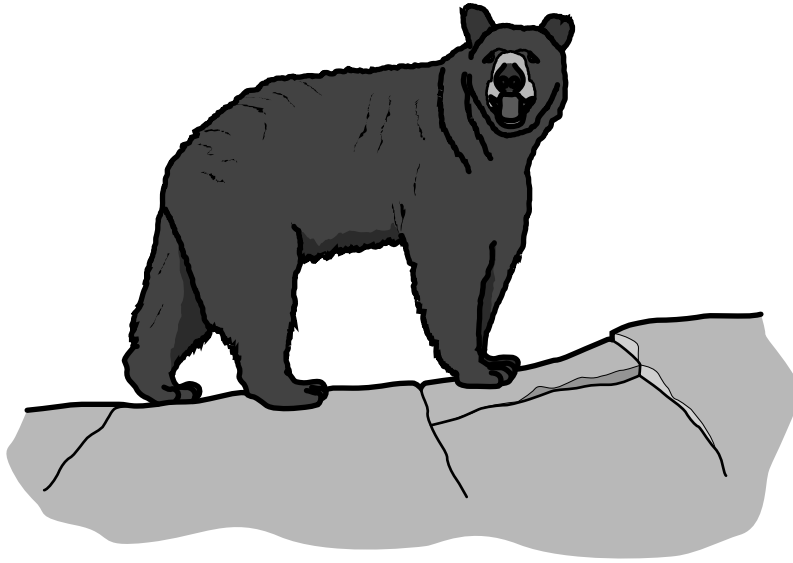
(a) Each adult black bear has **74** chromosomes in each body cell.

Some of the bear's cells divide to produce gametes.

Here are some statements about reproduction in bears.

They are not in the correct order.

A fertilisation takes place

B a zygote forms

C cells form with half as many chromosomes

D cells divide by meiosis

E an embryo is produced

Fill in the boxes with the letters A, B, C, D and E, to show the correct order. One has been done for you.

				E

[2]

(b) How many chromosomes are in each cell of the bear embryo?

Put a (ring) around the correct answer.

37

46

74

148

224

[1]

[Total: 3]

8 (a) Growth in plants is different from growth in animals.

Explain how plant growth is different from animal growth.

Use ideas about unspecialised cells and meristems in your answer.

_____

_____

_____

_____ [3]

(b) Plants grow towards the sunlight.

(i) What is the name of this process?

answer _____ [1]

(ii) How does this help plants?

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

It allows plants to get more water. ☐

It allows plants to make more sugars. ☐

It allows plants to get more air. ☐

[1]

[Total: 5]

END OF QUESTION PAPER

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