

Monday 25 June 2012 – Afternoon

**GCSE TWENTY FIRST CENTURY SCIENCE
ADDITIONAL SCIENCE A**

A216/01 Unit 2: Modules B5 C5 P5 (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: 40 minutes



Candidate forename		Candidate surname	
Centre number		Candidate number	

MODIFIED LANGUAGE

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

- 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 **42**.
- A list of physics equations is printed on page 2.
- The Periodic Table is printed on the back page.
- This document consists of **16** pages. Any blank pages are indicated.

TWENTY FIRST CENTURY SCIENCE EQUATIONS

Useful Relationships

Explaining Motion

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

$$\text{momentum} = \text{mass} \times \text{velocity}$$

$$\text{change of momentum} = \text{resultant force} \times \text{time for which it acts}$$

$$\text{work done by a force} = \text{force} \times \text{distance moved in the direction of the force}$$

$$\text{change in energy} = \text{work done}$$

$$\text{change in GPE} = \text{weight} \times \text{vertical height difference}$$

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

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

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

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Question 1 begins on page 4

PLEASE DO NOT WRITE ON THIS PAGE

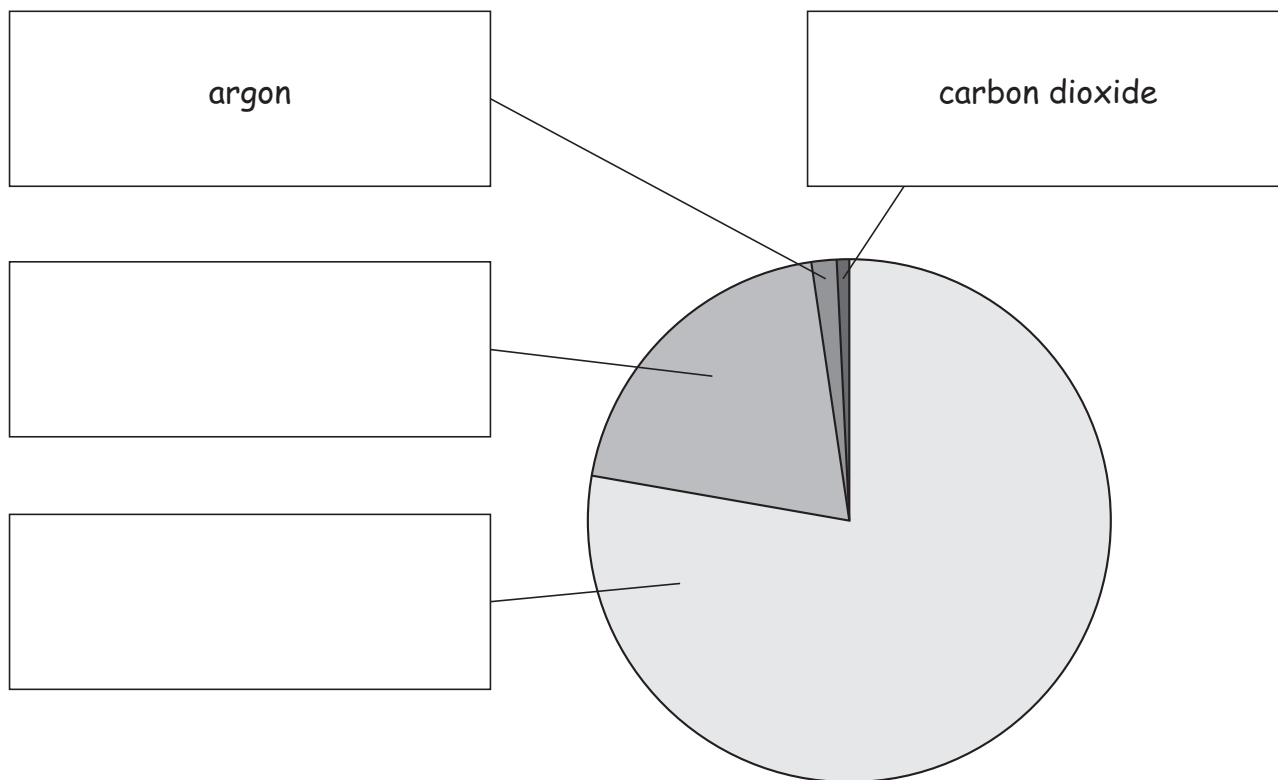
Answer **all** the questions.

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

(a) The pie chart 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.



[2]

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

	argon	carbon dioxide
symbol or formula		

[2]

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

Explain why.

Use ideas about

- size of molecules
- forces between molecules.

.....

.....

.....

..... [3]

[Total: 7]

2 Read this article.

Archaeologists have discovered a small lead mine that was used 4000 years ago.

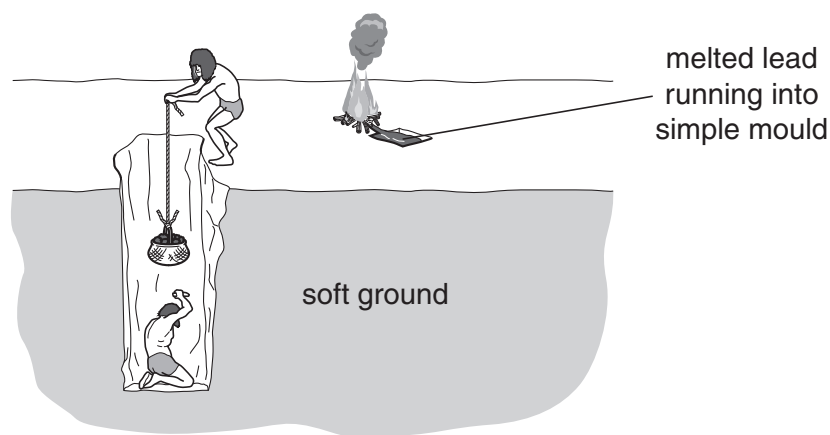
The miners made a deep hole through soft ground until they reached the lead ore.

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

When the lead ore was out of the mine, more men put it 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.



(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. When lead sulfide is heated in the fire two reactions happen.

- (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. ☐

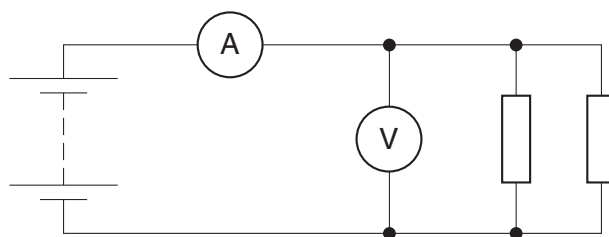
[1]

- (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 when she increases the number of resistors the current increases.

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

.....

.....

.....

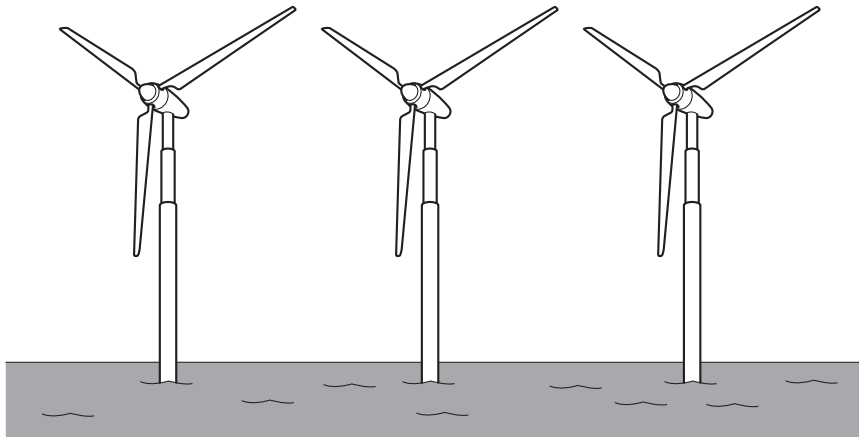
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..... [3]

[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 **bold**.

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]
Turn over

- 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.

$$0.12 \times 24 \qquad \frac{0.12}{24} \qquad 0.12 \times 1000 \times 24 \qquad \frac{0.12 \times 1000}{24} \qquad [1]$$

- (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?

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	<input type="checkbox"/>
DNA strand	<input type="checkbox"/>
gene	<input type="checkbox"/>

to another.

During mitosis

chromosomes	<input type="checkbox"/>
DNA strands	<input type="checkbox"/>
genes	<input type="checkbox"/>

separate.

During the growth part of the cell cycle

chromosomes	<input type="checkbox"/>
DNA strands	<input type="checkbox"/>
genes	<input type="checkbox"/>

separate.

[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.

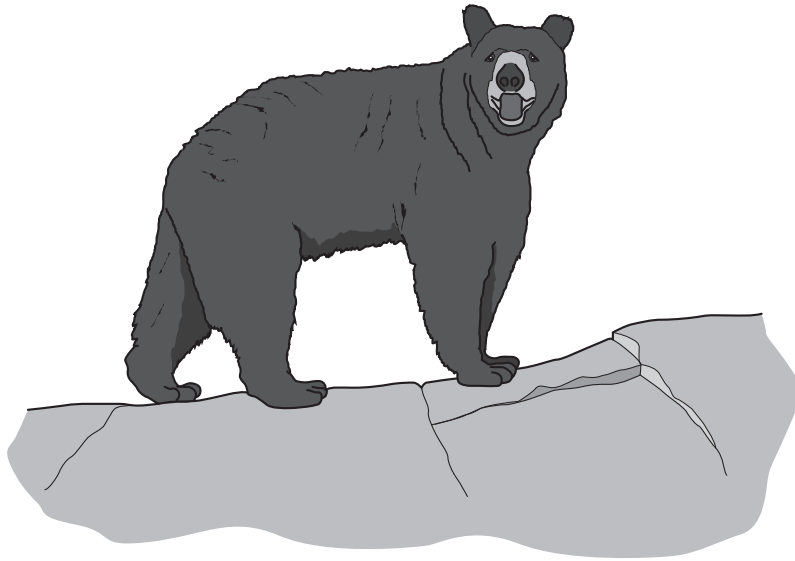
☐

[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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The Periodic Table of the Elements

16

1	2	Key										3	4	5	6	7	0
		relative atomic mass atomic symbol name atomic (proton) number															
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.