

Candidate forename						Candidate surname					
Centre number						Candidate number					

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GCSE

A218/01

TWENTY FIRST CENTURY SCIENCE
ADDITIONAL SCIENCE A

Unit 4: Ideas in Context (Foundation Tier)

WEDNESDAY 30 MAY 2012: Afternoon

DURATION: 45 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:

Insert (inserted)

OTHER MATERIALS REQUIRED:

Pencil


Ruler (cm/mm)

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

- The Insert will be found in the centre of this document.
- 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 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).

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 40.
- A list of physics equations is printed on pages 4 and 5.
- An enlarged Periodic Table is provided.
-  Where you see this icon you will be awarded marks for the quality of written communication in your answer.

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TWENTY FIRST CENTURY SCIENCE EQUATIONS

USEFUL RELATIONSHIPS

EXPLAINING MOTION

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

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

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

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

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

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

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

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

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

Answer ALL the questions.

1 This question is based on the article ‘Hypothermia – a hazard for mountaineers’.

(a) A person gets hypothermia if their core body temperature drops below a certain temperature.

(i) What is this temperature?

answer _____ °C [1]

(ii) Shivering occurs during mild hypothermia.

Explain how shivering raises the core temperature of the body.



One mark will be for writing in sentences with correct spelling, punctuation and grammar.

_____ **[2+1]**

(iii) Temperature regulation in the human body is an example of homeostasis.

What is homeostasis?

_____ **[1]**

- (iv) Temperature receptors are found in different parts of the body.

Complete the table to show where the temperature receptors are found.

receptors for the detection of temperature ...	location
... outside the body	_____
... of the blood	_____

[2]

(b) There are three stages of hypothermia described in the article.

(i) Ann is a mountaineer. Her core body temperature is **31 °C**.

Which stage of hypothermia has she got?

Put a **ring** around the correct answer.

mild

moderate

severe

[1]

(ii) Look at the following data.

140 mountaineers climb a mountain range.

14 develop some form of hypothermia.

7 of the hypothermia patients have a core body temperature below **28 °C**.

What percentage of the **140** mountaineers have **SEVERE** hypothermia?

Show your working.

answer = _____ % [2]

(c) The article gives advice to help avoid hypothermia.

Explain why wearing wet clothes increases the risk of getting hypothermia.

[2]

(d) Respiration is a chemical reaction.

This reaction is controlled by enzymes.

Explain why severe hypothermia is so dangerous to the body.

[2]

[Total: 14]

2 This question is based on the article ‘The dangers and delights of chlorine and bromine’.

(a) Chlorine, bromine and iodine are all elements in group 7.

Some of their properties are shown in the table.

element	melting point in °C	boiling point in °C	density in g/cm³
chlorine	–101	–34	0.003
bromine	–7	59	3.1
iodine	114	184	4.9

(i) Which element, chlorine, bromine or iodine, has the highest density?

_____ **[1]**

(ii) How does the melting point of the elements change down group 7?

_____ **[1]**

(b) At room temperature, iodine is a grey element in the solid state.

(i) Describe the COLOUR and STATE of chlorine and bromine at room temperature.

_____ **[2]**

- (ii) The article discusses why a large spillage of chlorine is more hazardous than a large spillage of bromine.**

Suggest TWO reasons why.

[2]

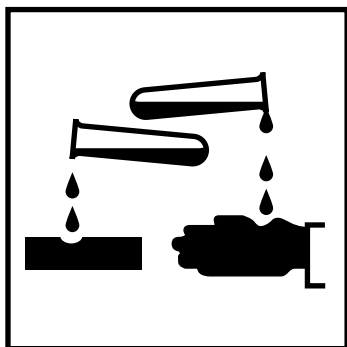
- (iii) If a large chlorine spillage happens, hospitals need to know what type of health problems to expect.**

Give TWO health problems, other than death, that chlorine causes.

1 _____

2 _____ **[1]**

(c) This is one of the hazard symbols for bromine.



(i) What type of hazard does this warning show?

_____ **[1]**

(ii) Some workers are specially trained to work with bromine.

They always wear a lab coat and goggles.

Give TWO other safety precautions that workers should take when they work with bromine.

1 _____

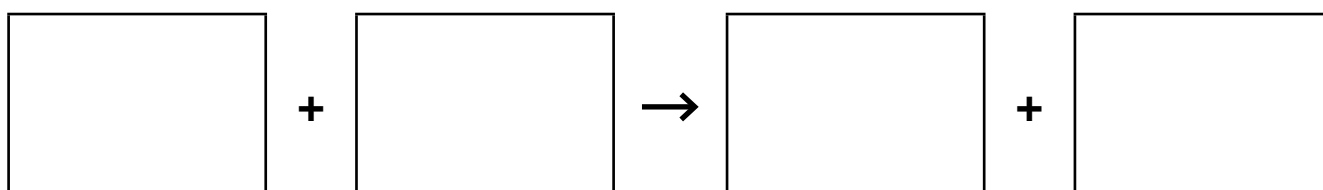
2 _____ **[1]**

(d) Bromine is made when chlorine reacts with sodium bromide.

The article gives an equation for this reaction.

Iodine can be made from sodium iodide in the same way.

Fill in the boxes to show a WORD equation for the reaction that happens when chlorine reacts with sodium iodide to make iodine.



[2]

(e) The article shows the structure of a chlorine atom.

(i) How many electrons are in one chlorine atom?

answer = _____ [1]

(ii) Fluorine is at the top of group 7.

The arrangement of electrons in a fluorine atom is shown below.

fluorine	2.7
-----------------	------------

Fill in the box to show the arrangement of electrons in a CHLORINE atom. [1]

chlorine	
-----------------	--

[Total: 13]

3 This question is based on the article ‘The National Grid’.

(a) At peak times large power stations together produce a total power of **63 Gigawatts.**

The article states that there are **181 large power stations supplying electricity to the National Grid.**

On average how much power is each large power station producing at peak times?

average power = _____ Gigawatts [1]

(b) The electrical power from a power station is produced by generators.

Suggest TWO ways that the output voltage of a generator could be increased.

_____ [2]

(c) (i) There are power losses in the National Grid.

How do power losses in the transformers compare to power losses in the cables?

Include numbers in your answer.

_____ [2]

(ii) Why is energy lost in the cables of the National Grid?

[2]

(d) Complete the sentence about mains electricity.

Choose words from this list.

available

alternating

digital

direct

230

11 k

275 k

400 k

The mains supply to our homes is

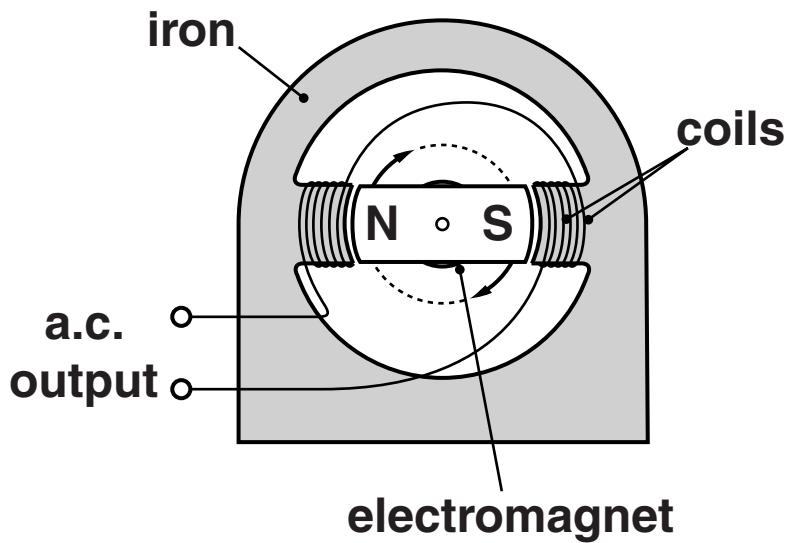
_____ current and has a voltage

of _____ V.

[2]

(e) Describe and explain how this generator produces electricity.

Use the diagram to help you.



[4]

[Total: 13]

END OF QUESTION PAPER

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The Periodic Table of the Elements

1	2	Key										3	4	5	6	7	0	
1 H hydrogen 1																		4 He helium 2
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							

* 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.