

Candidate forename						Candidate surname					
Centre number						Candidate number					

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GCSE

A218/02

TWENTY FIRST CENTURY SCIENCE
ADDITIONAL SCIENCE A

Unit 4: Ideas in Context (Higher 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) Temperature regulation is an example of homeostasis.

(i) Name two EFFECTORS involved in the process of temperature regulation in humans.

_____ and _____ **[1]**

(ii) Describe the role of the HYPOTHALAMUS in temperature regulation.



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

_____ **[2+1]**

(iii) Homeostasis involves negative feedback.

What is negative feedback?

[2]

(b) The article gives a list of symptoms for hypothermia.

Fingers and toes can appear pale when a person suffers from moderate hypothermia.

Use your knowledge of temperature regulation to explain how this happens.

[2]

- (c) The core body temperatures of twenty mountaineers are recorded.

The temperatures ($^{\circ}\text{C}$) are shown below.

33.5	33.7	33.9	34.2	34.5
34.9	35.1	35.6	35.8	36.0
36.1	36.8	36.9	37.0	37.2
37.4	37.4	37.8	37.9	38.0

- (i) What percentage of the group of mountaineers have core body temperatures within the NORMAL range stated in the article?

Show your working.

percentage = _____ % [1]

- (ii) According to the information in the article, some of the mountaineers suffer from HYPOTHERMIA.

What is the MEAN core body temperature of the mountaineers with hypothermia?

Show your working.

mean = _____ $^{\circ}\text{C}$ [1]

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

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

[2]

(e) 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 is extracted by passing electricity through a solution of sodium chloride dissolved in water.

Sodium chloride is an ionic compound.

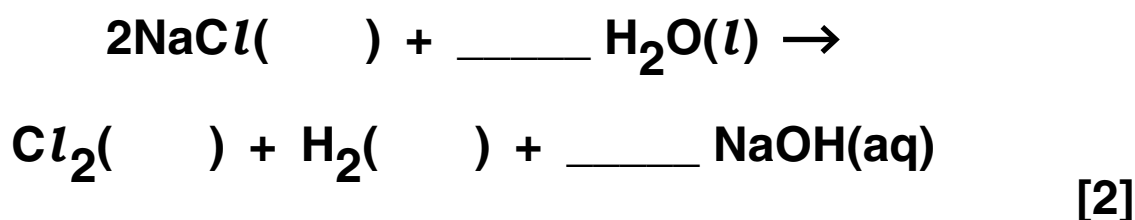
(i) Explain how sodium chloride solution conducts electricity.

_____ [2]

(ii) The equation shows what happens when electricity passes through the solution.

Complete the equation by

- adding numbers to balance the equation
- adding the missing state symbols.



(iii) One of the products of the reaction is chlorine.

What are the names of the OTHER two products of the reaction?

_____ and _____ [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]

(c) Chlorine, bromine and iodine all form ions with a single negative charge.

Use ideas about electron arrangements to explain why.

_____ [2]

(d) Iodine is extracted from sodium iodide in sea water.

Sodium bromide and sodium iodide react in a similar way with chlorine.

(i) Explain why chlorine can be used to extract iodine from sodium iodide.

Use information from the article to help you.

[1]

(ii) The table shows some information about the physical properties of group 7 elements.

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

How do these properties of group 7 elements change down the group?

[1]

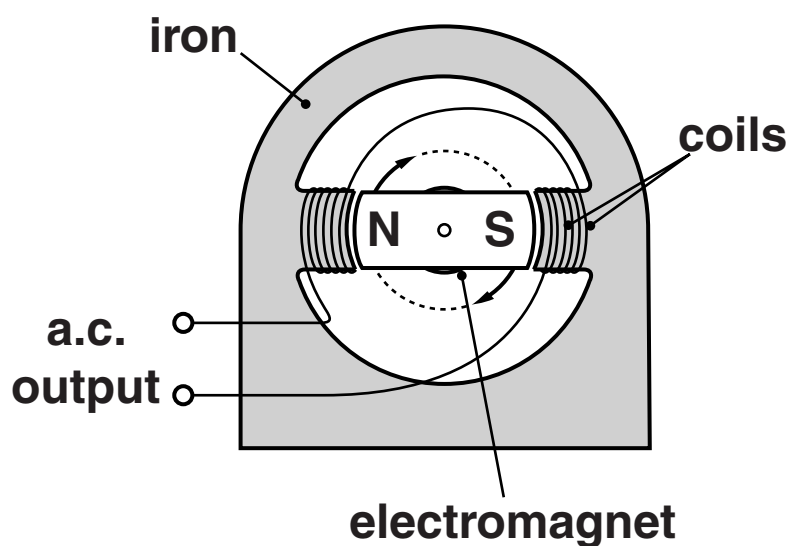
[Total: 13]

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

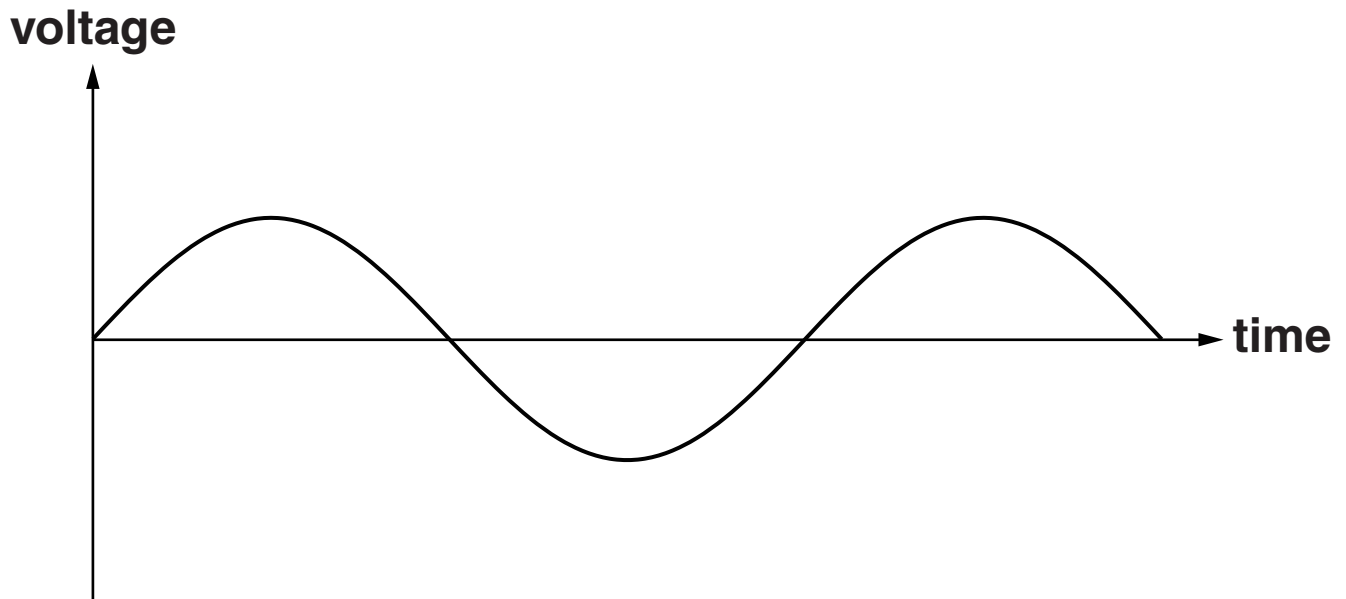
(a) Describe and explain how this generator produces electricity.

Use the diagram to help you.



[4]

- (b) The graph shows how the output of the generator changes with time.**



The magnet is now rotated twice as fast.

Draw the new output on the graph. [2]

- (c) Energy is lost from the cables of the National Grid.**

- (i) Explain how energy is lost from the cables.**

Your answer should include what happens inside the cables.

[3]

(ii) Why would it be beneficial to build new power stations in the south of the UK?

[2]

(d) A particular transformer joins two parts of the National Grid.

The ratio of the number of turns in its primary coil to the number of turns in its secondary coil is 11 to 16.

Different parts of the National Grid operate at different voltages.

Between which two voltages quoted in the article, is the transformer working?

Show a calculation that supports your answer.

the transformer converts _____ kV

into _____ kV

[2]

[Total: 13]

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