

Wednesday 30 May 2012 – Afternoon

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

A218/02 Unit 4: Ideas in Context (Higher Tier)

Candidates answer on the Question Paper.
A calculator may be used for this paper.

Duration: 45 minutes

OCR supplied materials:

- Insert (inserted)

Other materials required:

- Pencil
- Ruler (cm/mm)




Candidate forename		Candidate surname	
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Centre number						Candidate number				
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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 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 **40**.
- A list of physics equations is printed on page 2.
- The Periodic Table is printed on the back page.
-  Where you see this icon you will be awarded marks for the quality of written communication in your answer.
- This document consists of **12** 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 starts on page 4

PLEASE DO NOT WRITE ON THIS PAGE

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 (°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 = °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]
Turn over

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.

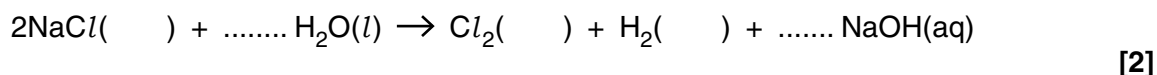
.....

 [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/cm ³
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]

(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]

END OF QUESTION PAPER

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