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F

GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE ADDITIONAL SCIENCE A

A218/01

Unit 4: Ideas in Context (Foundation Tier)

11LMP06005

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)

Tuesday 7 June 2011
Afternoon

Duration: 45 minutes

A218801

Candidate forename		Candidate surname	

Centre number						Candidate number				

MODIFIED LANGUAGE

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. Pencil may be used for graphs and diagrams only.
- 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).
- Answer **all** the questions.
- 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 two.
- 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.

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TWENTY FIRST CENTURY SCIENCE EQUATIONS

Useful Relationships

Explaining Motion

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

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

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

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

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

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

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

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

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Answer **all** the questions.

1 This question is based on the article 'Rocket science'.

(a) Use the graphs in the article to answer the following questions.

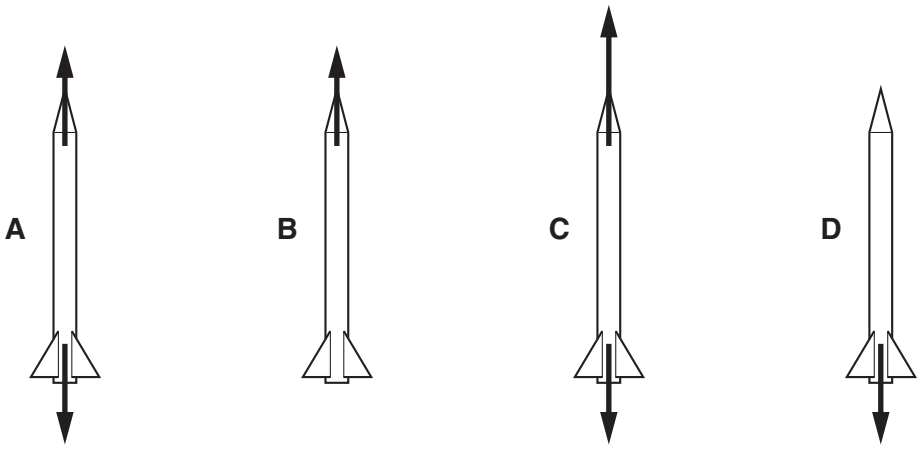
(i) How high does the rocket go?

answer = ... m **[1]**

(ii) At what time is the thrust biggest?

answer = ... seconds **[1]**

(b) These diagrams show thrust and weight forces acting on the rocket.



Which diagram, **A**, **B**, **C** or **D**, shows the forces on the rocket …

… before the rocket engine starts?

answer .....

… when the rocket is increasing its speed going up?

answer .....

[2]

(c) The thrust from the rocket engine is the driving force.

As the rocket goes up, which **two** forces together act as the counter force?

..... and ..... **[1]**

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(d) When the rocket engine is firing, the average upwards force on the rocket is 1800 N.

The rocket engine works for 7 seconds.

What is the change in momentum of the rocket during this time?

You must show your working.

change in momentum = ... Ns **[2]**

(e) After reaching its highest point the rocket falls back to the ground.

Complete the sentences about the energy changes as the rocket falls to the ground.

Use words from the list.

chemical **force** **gravitational potential** **kinetic**

As the rocket falls back to the ground, its ..... energy increases.

As the rocket falls back to the ground, its ..... energy decreases.

[2]

(f) **(i)** Explain how the rocket engine makes the rocket move.

Your answer should include

- the role of the exhaust gases
- the sizes and directions of the forces involved.

.....

.....

.....

.....

..... **[3]**

(ii) The rocket flies straight up.

At its highest point the rocket stops rising. It then falls.

What is the momentum of the rocket at its highest point?

momentum = ... kg m/s **[1]**

[Total: 13]

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2 This question is based on the article 'Brain power – the frontier of medical research into ageing'.

(a) The **cerebral cortex** is part of the human brain.

(i) Look at the article.

State **two** things that the cerebral cortex is involved in.

1 .....

2 ..... **[1]**

(ii) The cerebral cortex contains nerve cells called neurons.

What is the name of the **gap** between two neurons?

answer ..... **[1]**

(b) (i) Which of the following are part of a neuron (nerve cell)?

Put a (ring) around the **two** correct answers.

cytoplasm

effector

gland

membrane **[1]**

(ii) Name **two** types of neuron.

answer ..... and ..... **[1]**

(iii) Complete the sentences about neurons.

Use correct words from the list.

chemical

electrical

impulses

light

resting

stimulated

turned off

Neurons transmit ..... when they are ..... .

These are ..... signals. **[3]**

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(c) The **central nervous system** has two main parts.

One part is the brain.

What is the name of the other part?

..... **[1]**

(d) Professor Yankner studied the brains of thirty people.

The people were aged between 26 and 106 years.

Two people were over 100 years old.

What **percentage** of the group of people was over 100 years old?

Show your working.

answer = ... % **[2]**

(e) People do not remember all of their experiences.

Use the **information processing model**, including the diagram, to suggest why.

One mark is awarded for writing in sentences with correct spelling, punctuation and grammar.

.....

.....

.....

.....

..... **[2+1]**

(f) What may happen to **neuron pathways** in the brain when people become older?

.....

..... **[1]**

[Total: 14]

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3 This question is based on the article 'Copper – not just in mobile phones'.

(a) The article mentions several metals that are used to make mobile phones.

Some of the metals are extracted from their compounds by heating with carbon and some are extracted by electrolysis.

Complete the table to show which method is used for each metal.

Use these metals.

aluminium iron lithium zinc

extracted by heating with carbon	extracted using electrolysis

[2]

(b) From the article, give **one example** of an environmental problem caused by mining copper ore.

Give one method used by the mining industry to solve **this** problem.

environmental problem .....

.....

method to solve this problem .....

.....

[2]

(c) Copper mines produce large amounts of waste rock.

The amount of waste rock is much larger than the amount of copper produced.

Explain why.

..... **[1]**

(d) The 'electrolysis' process produces sulfuric acid.

Suggest how this sulfuric acid could be recycled in the process.

..... **[1]**

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(e) Both the 'blister' process and the 'electrolysis' process use large amounts of energy.

Each process uses the energy in different ways.

Use information from the flow diagrams to say how the energy is used in each process.

.....

.....

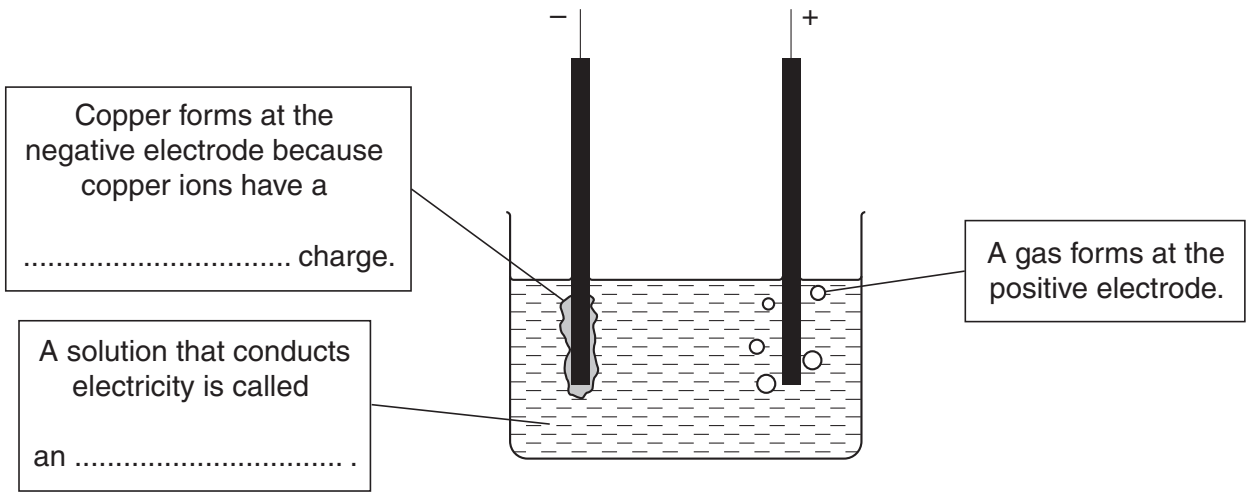
..... **[2]**

(f) The diagram shows the electrolysis of dilute copper sulfate solution.

Complete the labels on the diagram.

Use words from the list.

electron **electrolyte** **indicator** **negative** **neutral** **positive**



[2]

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(g) The table in the article shows some properties of copper.

Copper is easily bent into shape when making jewellery.

Which property in the table shows this?

Put a (ring) around the correct answer.

electrical conductivity **malleability** **melting point** **thermal conductivity**

[1]

(h) It is important that we recycle as much copper as possible rather than extract it from fresh ores.

Use information from the article to explain why.

.....

.....

.....

..... **[2]**

[Total: 13]

END OF QUESTION PAPER

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The Periodic Table of the Elements

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