OCR
RECOGNISING ACHIEVEMENT

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A218/01

GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE

ADDITIONAL SCIENCE A

Unit 4: Ideas in Context (Foundation Tier)

FRIDAY 23 MAY 2008

Afternoon

Time: 45 minutes

Candidates answer on the question paper.
Additional materials (enclosed):
Insert

Calculators may be used.
Additional materials: Pencil
Ruler (cm/mm)

CUP/T48672

Candidate Forename		Candidate Surname	
Centre Number		Candidate Number	

INSTRUCTIONS TO CANDIDATES

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided.

INFORMATION FOR CANDIDATES

- The number of marks for each question 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 a mark for the quality of written communication in your answer.

FOR EXAMINER'S USE		
Qu.	**Max.**	**Mark**
1	**14**	
2	**13**	
3	**13**	
TOTAL	**40**	

This document consists of **10** printed pages, **2** blank pages and an insert.

EQUATIONS

Useful Relationships

Explaining Motion

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

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

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

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

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

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

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

Electric Circuits

$$\text{resistance} = \frac{\text{voltage}}{\text{current}}$$

$$\frac{V_p}{V_s} = \frac{N_p}{N_s}$$

$$\text{energy transferred} = \text{power} \times \text{time}$$

$$\text{power} = \text{potential difference} \times \text{current}$$

$$\text{efficiency} = \frac{\text{energy usefully transferred}}{\text{total energy supplied}} \times 100\%$$

The Wave Model of Radiation

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

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Question 1 starts on page 4

Answer **all** the questions.

This question is based on the article 'Tufa towers at Mono Lake, California'.

1 **(a)** Salt crystals form around the edges of the lake.

(i) Explain how the salt crystals form.

.....

..... [2]

(ii) The amount of salt crystals that form varies through the year.

Give **two** reasons why.

1 .....

2 ..... [2]

(iii) The lake water contains sodium, potassium, magnesium, sulfate, chloride and carbonate ions.

One solid salt that forms is sodium chloride.

Give the name of one **other** salt that forms.

..... [1]

(b) The towers of tufa rock are formed when calcium ions from the hot springs react with carbonate ions in the lake water. Calcium carbonate forms.

Complete the word equation for this reaction by filling in the boxes.

calcium ions	+		→	

[1]

(c) Calcium carbonate is an ionic solid.

The table shows some information about ions dissolved in the lake water and ions in solid calcium carbonate.

Complete the table.

	ions dissolved in the lake water	**ions in solid calcium carbonate**
movement of ions	move freely around other ions and water molecules	
arrangement of ions	random arrangement	

[2]

(d) Joe visits the lake and carries out some experiments.

(i) He finds that the water is a good electrical conductor.

Explain how water that contains dissolved ionic compounds conducts electricity.

.....

..... [2]

(ii) Joe wants to check the pH of the water.

Give **two** ways that Joe could do this.

1 .....

2 ..... [2]

(iii) What would you expect the pH of the **alkaline** lake water to be?

Put a (ring) around the correct answer.

2 **5** **7** **10**

[1]

(iv) Joe is worried about handling the lake water because he knows it is alkaline.

Suggest a safety precaution that Joe should take when working with the lake water.

.....

..... [1]

[Total: 14]

This question is based on the article 'Bendy lampposts save lives'.

2 (a) (i) Read the statements below about collision times at low speeds.

They compare bendy lampposts with rigid steel lampposts.

Which **one** of the statements is correct?

Put a tick (✓) in the correct box.

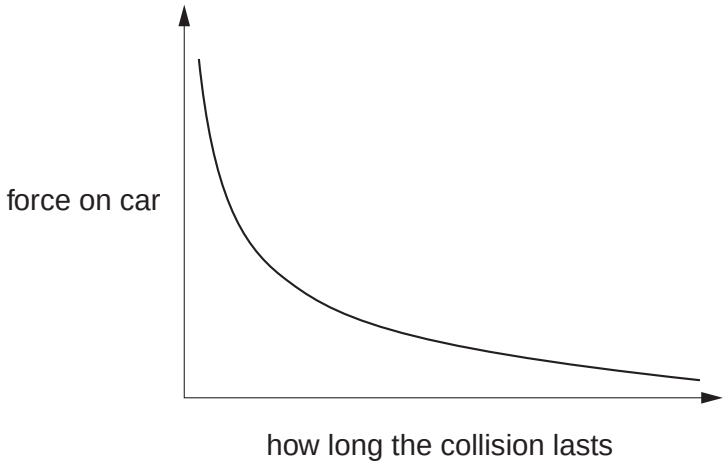
The collision time with a bendy lamppost is longer. ☐

The collision time with a bendy lamppost is shorter. ☐

The collision time is the same. ☐

[1]

(ii) The graph shows how the force on the car changes with how long the collision lasts.



Describe how the force changes with how long the collision lasts.

.....

..... [1]

(iii) Suggest **two** safety features that are built into **cars** that also help to reduce injuries.

1 .....

2 ..... [2]

(b) When the very **first breakable** lampposts were invented a reporter said:

> 'The danger of a broken post hitting a pedestrian or another car means they are unlikely to be used in towns.'

Why is this less of a problem for the **newer** lampposts?

.....

..... [2]

(c) When a car hits a lamppost it has energy of motion.

(i) What is the name for this energy of motion?

..... [1]

(ii) During the collision, some of the energy goes to the lamppost and some to sound and heat.

How does the **total** amount of energy before the collision compare to the **total** amount of energy after the collision?

..... [1]

(d) The article says that the momentum of the car can be reduced by 30%.

(i) What **two** measurements do scientists need to make to calculate momentum?

How do you use the measurements to calculate momentum?

One mark is for a clear, ordered answer.

.....

.....

.....

..... [3+1]

(ii) Any collision involves two forces.

One force changes the momentum of the car.

What does the other force do?

.....

..... [1]

[Total: 13]

This question is based on the article 'Cot deaths linked to brain abnormality'.

3 **(a)** Babies, like all living organisms, respond to many stimuli.

(i) Which stimulus described in the article does the baby respond to?

.....

..... [1]

(ii) How does a normal baby respond to this stimulus?

..... [1]

(b) The response by the baby is an example of an involuntary reflex action.

(i) Suggest an advantage to the body of **involuntary** reflexes.

.....

..... [1]

(ii) Describe **two** other examples of simple involuntary reflexes found in newborn babies.

.....

..... [2]

(c) Describe **two** differences between the brains of babies who died of SIDS and the brains of the other babies.

.....

.....

..... [2]

(d) Serotonin is released into synapses.

(i) What is a synapse?

.....

..... [1]

(ii) Information is transmitted across synapses using chemicals.

How is information transmitted along neurons?

..... [1]

(e) The pictures show scans through part of the brain called the cerebral cortex.

Describe **two** functions of the cerebral cortex.

.....

.....

..... [2]

(f) Kinney and Paterson thought that a lack of receptors for serotonin was responsible for SIDS.

Look at the article about cot deaths and suggest **two** reasons why the evidence is not conclusive.

.....

.....

..... [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.