

**GENERAL CERTIFICATE OF SECONDARY EDUCATION
TWENTY FIRST CENTURY SCIENCE
ADDITIONAL SCIENCE A**

A218/01

Unit 4: Ideas in Context (Foundation Tier)

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

OCR Supplied Materials:

- Insert (inserted)

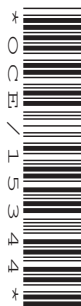
Other Materials Required:

- Pencil
- Ruler (cm/mm)

Wednesday 9 June 2010

Afternoon

Duration: 45 minutes



Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use 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. 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 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.
- This document consists of **12** pages. Any blank pages are indicated.

TWENTY FIRST CENTURY SCIENCE EQUATIONS**Useful Relationships****Explaining Motion**

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

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

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

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

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

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

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

Electric Circuits

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

$$\frac{\text{voltage across primary coil}}{\text{voltage across secondary coil}} = \frac{\text{number of turns in primary coil}}{\text{number of turns in secondary coil}}$$

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

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

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

The Wave Model of Radiation

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

3

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Question 1 starts on page 4

PLEASE DO NOT WRITE ON THIS PAGE

Answer **all** the questions.

This question is based on the article ‘The analogue to digital switchover’.

- 1 (a) Why will nobody in the UK be able to receive analogue TV signals after 2012?

..... [1]

- (b) Draw diagrams to show the difference between an analogue signal and a digital signal.

analogue signal:

digital signal:

[2]

- (c) One reason for the switch to digital is that the TV signals can be received with better quality.

Complete the sentences to explain this.

Choose the best words from this list.

amplified colour noise pattern quality reduced

When the signal travels it changes as it picks up

This reduces the of the signal.

The digital signal is only ‘off and on’ so it is usually possible to clean up the signal

to get the original

In the analogue signal the changes are along with the original TV signal.

[4]

5

- (d) A television converts the signal to pictures and sound.

One of the frequencies of the sound is 660 hertz.

In air the sound has a wavelength of 0.5 m.

Calculate the speed at which the sound travels in air.

You must show your working.

speed = m/s [2]

- (e) (i) Radio waves are a good way of transmitting terrestrial TV signals **through the atmosphere**.

Explain why.

.....
 [1]

- (ii) Radio waves are **not** used to send TV signals from satellites.

What type of electromagnetic wave is used to send signals from satellites?

Suggest a reason why this type of radiation is used instead of radio waves.

type of electromagnetic wave

reason

..... [2]

- (iii) The receiving dish for a satellite TV signal only works if it is made of metal.

Explain why it is made of metal.

.....
 [1]

[Total: 13]

This question is based on the article 'A fact of life – IVF and its application'.

- 2 (a) During 2006 in the United Kingdom, 668 000 live babies were born.

The article says that one in every 80 babies born is conceived using IVF.

How many IVF babies were born in the UK in 2006?

Show your working.

answer [2]

- (b) Each baby develops from an embryo.

The cells in each embryo contain genes.

- (i) Where are the genes found in the cell?

answer [1]

- (ii) How many different types of bases are found in each gene?

answer [1]

- (iii) All embryo cells contain identical genes.

As embryo cells develop they become specialised.

Complete the sentences about the genes in a **specialised** cell.

Use the best words from this list.

sugar

inactive

fertilised

proteins

old

A specialised cell only produces the specific it needs.

This is because many genes in a specialised cell are

[2]

- (c) Embryos can also be used to produce unspecialised stem cells.

Give **two** uses of stem cells.

.....
 [2]

- (d) (i) Look at the information in the article about the IVF process.

The process involves six stages.

Put a tick (✓) in **one box in each row** to show whether each stage involves **only mitosis**, **only meiosis** or **neither mitosis nor meiosis**.

stage	only mitosis	only meiosis	neither mitosis nor meiosis
1 Fertility drugs stimulate the woman's ovaries to develop several mature egg cells.			
2 Egg cells are removed from the woman's ovaries.			
3 Sperm cells and egg cells are incubated together in a Petri dish.			
4 A sperm cell fertilises the egg cell.			
5 The fertilised egg (zygote) divides to form an embryo.			
6 The embryo is placed into the woman's womb so that she may become pregnant.			

[2]

- (ii) Give one **similarity** and one **difference** between the way a zygote is formed in IVF and 'normal' fertilisation.

similarity

difference [2]

- (iii) The egg and sperm cells each contain 23 chromosomes.

How many chromosomes does the zygote contain?

answer [1]

[Total: 13]

This question is based on the article 'Making useful salts'.

- 3 (a) The article says that the 'parent acid' for calcium phosphate is phosphoric acid.

Name the 'parent acids' needed to make the following salts.

sodium nitrate: acid

zinc chloride: acid

[2]

- (b) Ben works as a chemist for a company that makes salts. He makes some magnesium chloride.

He reacts solid magnesium carbonate with a dilute acid.

This is the equation for the reaction.



Look at the equation.

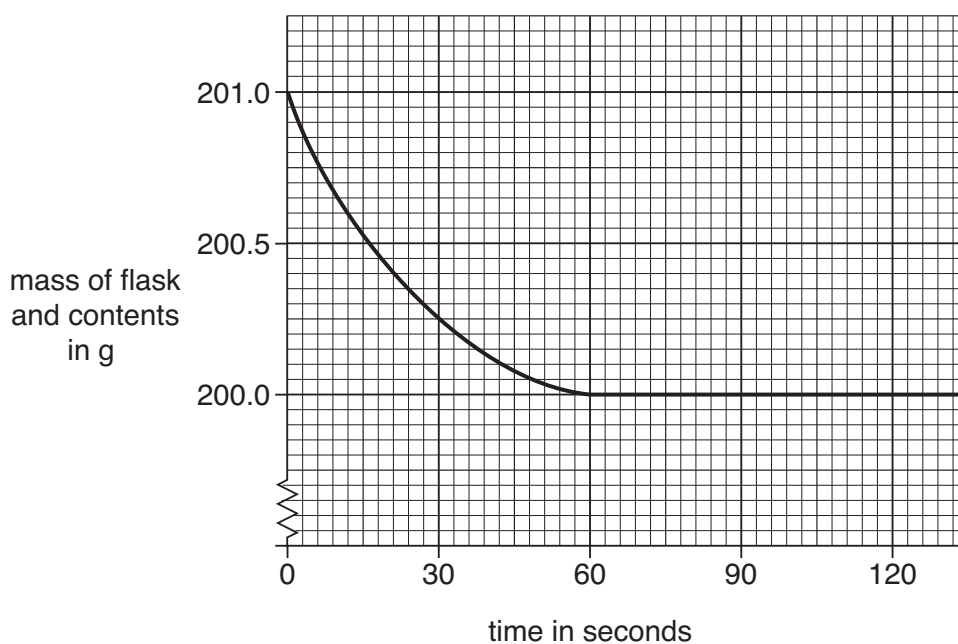
Give the **name** of the gas that is made during the reaction.

..... [1]

- (c) Ben adds large lumps of magnesium carbonate to the dilute acid in a flask.

He uses a data logger to record the mass of the flask and its contents.

The graph shows how the mass changes during the reaction.



- (i) How does the mass change during the first 30 seconds?

..... [1]

- (ii) Why does the mass change in this way?

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

- (iii) How long does it take for the reaction to stop?

..... [1]

- (iv) Ben thinks the reaction is too slow.

He decides to change his experiment to make it faster.

Suggest **one** way that Ben could speed up the reaction.

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

- (d) Look at the flow chart in the article.

Ben wants to make some sodium salts.

He uses the flow chart to decide on the best method to use.

- (i) Ben knows that sodium metal reacts with acid.

However, he decides that it is not a good idea to add sodium metal to an acid.

Suggest a reason why.

..... [1]

- (ii) Ben knows that sodium oxide and sodium carbonate are very soluble in water.

Use the flow chart to suggest the best method for making sodium salts.

best method [1]

10

(e) Ben wants to make some copper sulfate crystals.

Copper is an unreactive metal.

Copper carbonate and copper oxide do not dissolve in water.

Ben has some dilute sulfuric acid.

Describe how Ben could make some copper sulfate crystals.

Your answer should include

- the name of the chemical you would add to the sulfuric acid
- a list of instructions to show the main steps in the experiment
- how you would get clean, dry crystals after the reaction.



One mark is for correct spelling, punctuation and grammar.

.....

.....

.....

.....

.....

.....

..... [4+1]

[Total: 14]

END OF QUESTION PAPER

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The Periodic Table of the Elements

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1	2	3	4	5	6	7	0
1 H hydrogen 1							4 He helium 2
Key relative atomic mass atomic symbol name atomic (proton) number							
7 Li lithium 3	9 Be beryllium 4						20 Ne neon 10
23 Na sodium 11	24 Mg magnesium 12						35.5 Cl chlorine 17
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
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
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
[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
							[272] Rg roentgenium 111
							[271] Ds darmstadtium 110
							[268] Mt meitnerium 109
							[271] Ds darmstadtium 110
							[272] Rg roentgenium 111
							[277] Hs hassium 108
							[264] Bh bohrium 107
							[266] Sg seaborgium 106
							[262] Db dubnium 105
							[261] Rf rutherfordium 104
							[227] Ac* actinium 89
							[226] Ra radium 88
							[223] Fr francium 87
							[222] Rn radon 86
							[210] At astatine 85
							[209] Po polonium 84
							127 I iodine 53
							128 Te tellurium 52
							122 Sb antimony 51
							119 Sn tin 50
							112 Cd cadmium 48
							108 Ag silver 47
							106 Pd palladium 46
							103 Rh rhodium 45
							101 Ru ruthenium 44
							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
							32 S sulfur 16
							31 P phosphorus 15
							16 O oxygen 8
							19 F fluorine 9
							12 C carbon 6
							14 N nitrogen 7
							11 B boron 5
							27 Al aluminium 13
							28 Si silicon 14
							32 S sulfur 16
							35.5 Cl chlorine 17
							40 Ar argon 18
							4 He helium 2
							20 Ne neon 10
							35.5 Cl chlorine 17
							40 Ar argon 18
							84 Kr krypton 36
							131 Xe xenon 54
							[222] Rn radon 86
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* 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.