OCR
RECOGNISING ACHIEVEMENT

F

GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE ADDITIONAL SCIENCE A

A218/01

Unit 4: Ideas in Context (Foundation Tier)

OCE/15344

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

A218801

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

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

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

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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]

(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.

$$MgCO_3 + 2HCl \rightarrow MgCl_2 + CO_2 + H_2O$$

Look at the equation.

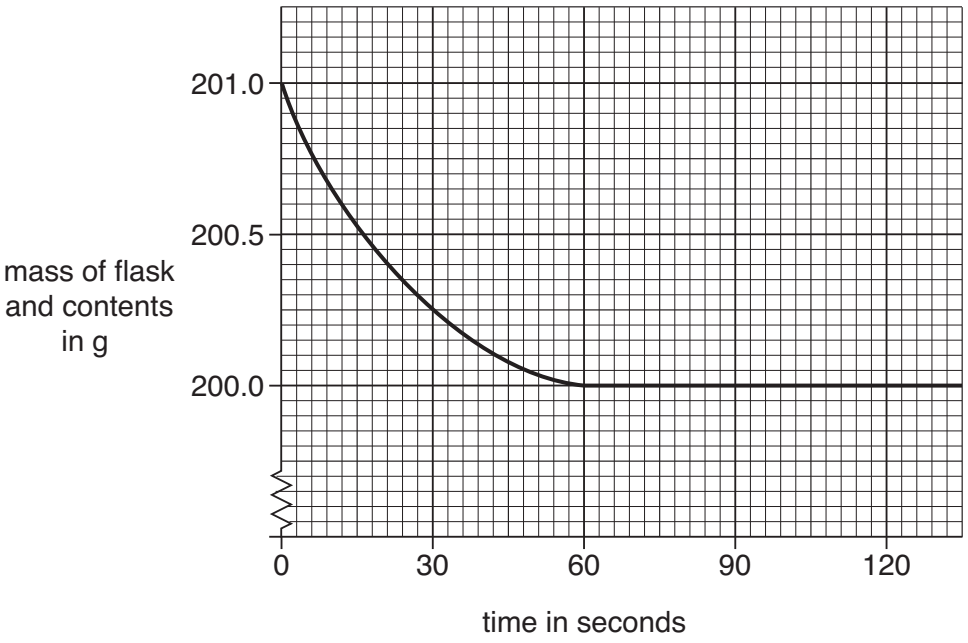
Give the **name** of the gas that is made during the reaction.

..... **[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]**

(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

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.