

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS  
GCSE**

**A152/01**

**TWENTY FIRST CENTURY SCIENCE  
ADDITIONAL SCIENCE A**

**Modules B5 C5 P5 (Foundation Tier)  
DATA BOOKLET**

**TUESDAY 22 JANUARY 2013: Morning**

**DURATION: 1 hour**

**plus your additional time allowance**

**MODIFIED ENLARGED 24pt**

<b>Candidate forename</b>		<b>Candidate surname</b>	
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<b>Centre number</b>						<b>Candidate number</b>				
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# **TWENTY FIRST CENTURY SCIENCE EQUATIONS**

## **USEFUL RELATIONSHIPS**

### **THE EARTH IN THE UNIVERSE**

$$\text{distance} = \text{wave speed} \times \text{time}$$

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

### **SUSTAINABLE ENERGY**

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

$$\text{power} = \text{voltage} \times \text{current}$$

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

# EXPLAINING MOTION

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

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time taken}}$$

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

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

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

$$\text{amount of energy transferred} = \text{work done}$$

$$\text{change in gravitational potential energy} = \text{weight} \times \text{vertical height difference}$$

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

## **ELECTRIC CIRCUITS**

$$\text{power} = \text{voltage} \times \text{current}$$

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

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

## **RADIOACTIVE MATERIALS**

$$\text{energy} = \text{mass} \times [\text{speed of light in a vacuum}]^2$$

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# TWENTY FIRST CENTURY SCIENCE DATA SHEET

## QUALITATIVE ANALYSIS

### TESTS FOR IONS WITH A POSITIVE CHARGE

ION	TEST	OBSERVATION
<b>calcium <math>\text{Ca}^{2+}</math></b>	<b>add dilute sodium hydroxide</b>	<b>a white precipitate forms; the precipitate does not dissolve in excess sodium hydroxide</b>
<b>copper <math>\text{Cu}^{2+}</math></b>	<b>add dilute sodium hydroxide</b>	<b>a light blue precipitate forms; the precipitate does not dissolve in excess sodium hydroxide</b>
<b>iron(II) <math>\text{Fe}^{2+}</math></b>	<b>add dilute sodium hydroxide</b>	<b>a green precipitate forms; the precipitate does not dissolve in excess sodium hydroxide</b>

<b>iron(III)</b> <b>Fe<sup>3+</sup></b>	<b>add dilute sodium hydroxide</b>	<b>a red-brown precipitate forms; the precipitate does not dissolve in excess sodium hydroxide</b>
<b>zinc</b> <b>Zn<sup>2+</sup></b>	<b>add dilute sodium hydroxide</b>	<b>a white precipitate forms; the precipitate dissolves in excess sodium hydroxide</b>

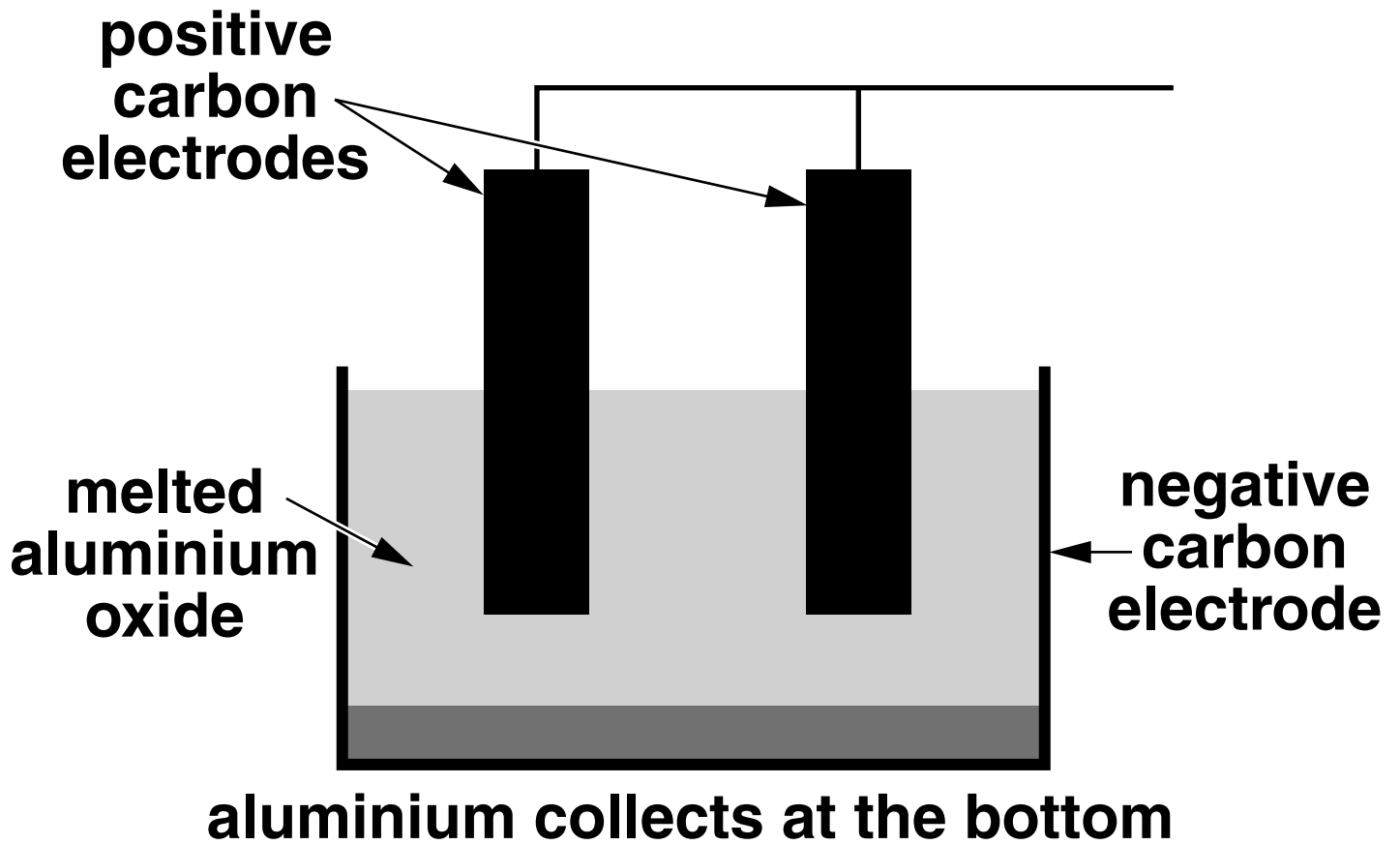
## TESTS FOR IONS WITH A NEGATIVE CHARGE

ION	TEST	OBSERVATION
chloride $\text{Cl}^-$	add dilute nitric acid, then add silver nitrate	a white precipitate forms
bromide $\text{Br}^-$	add dilute nitric acid, then add silver nitrate	a cream precipitate forms
iodide $\text{I}^-$	add dilute nitric acid, then add silver nitrate	a yellow precipitate forms



<b>carbonate</b> <b><math>\text{CO}_3^{2-}</math></b>	<b>add dilute acid</b>	<b>the solution effervesces; carbon dioxide gas is produced (the gas turns lime water from colourless to milky)</b>
<b>sulfate</b> <b><math>\text{SO}_4^{2-}</math></b>	<b>add dilute acid, then add barium chloride or barium nitrate</b>	<b>a white precipitate forms</b>

**Insert A: Question 2 (b) The diagram shows a cell used in the process of aluminium refinery.**



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