OCR
Oxford Cambridge and RSA

Accredited

GCSE (9–1) Combined Science B (Twenty First Century Science)

H

J260/06 Chemistry (Higher Tier)

Sample Question Paper

Date – Morning/Afternoon

Version 2

Time allowed: 1 hour 45 minutes

You must have:
- a ruler (mm/cm)
- the Data Sheet

You may use:
- a scientific or graphical calculator

First name	
Last name	
Centre number	
Candidate number	

INSTRUCTIONS
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Complete the boxes above with your name, centre number and candidate number.
- Answer **all** the questions.
- Write your answer to each question in the space provided.
- Additional paper may be used if required but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

INFORMATION
- The total mark for this paper is **95**.
- The marks for each question are shown in brackets **[ ]**.
- Quality of extended responses will be assessed in the question marked with an asterisk (*).
- This document consists of **20** pages.

Answer **all** the questions.

1 **(a)** The atomic model has changed over time.

Draw lines to join each **scientist** to their **model**.

Scientist	Model
Bohr	Plum pudding model
Dalton	Solid sphere
Thomson	Electrons in shells

[2]

(b) We now know that all atoms contain protons, neutrons and electrons.

(i) Complete the table to show the relative charges on protons, neutrons and electrons.

	Relative charge
Proton	
Neutron	
Electron	

[2]

(ii) Mendeleev organised elements into the first Periodic Table. He left gaps in the table.

Describe the basis of the arrangement of elements in Mendeleev's Periodic Table.

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

(iii) Why was Mendeleev's decision to leave gaps correct?

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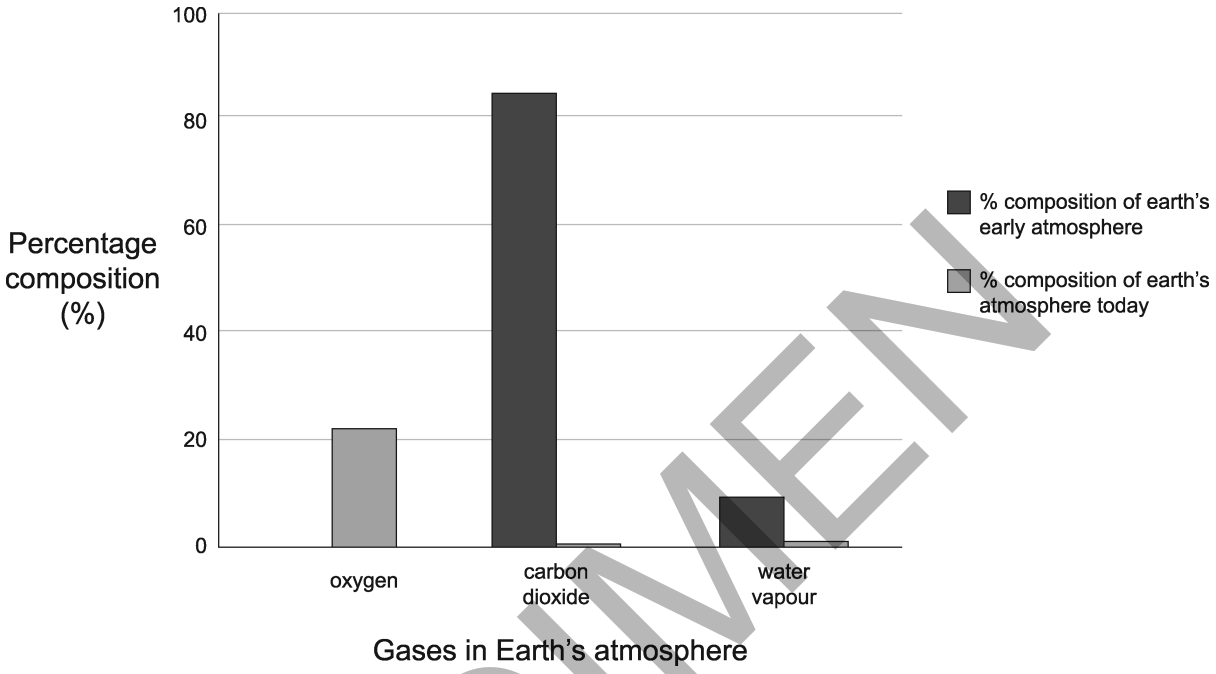
..... **[2]**

2 Scientists think that the composition of the early atmosphere changed slowly over many billions of years.

Scientists estimated the composition of the early atmosphere on Earth. The graph shows the percentage of gases in the early atmosphere and the atmosphere today.



(a)* Describe **how** and **why** the levels of these gases have changed between these two periods, leading to the formation of the oxygen-rich atmosphere we have today.

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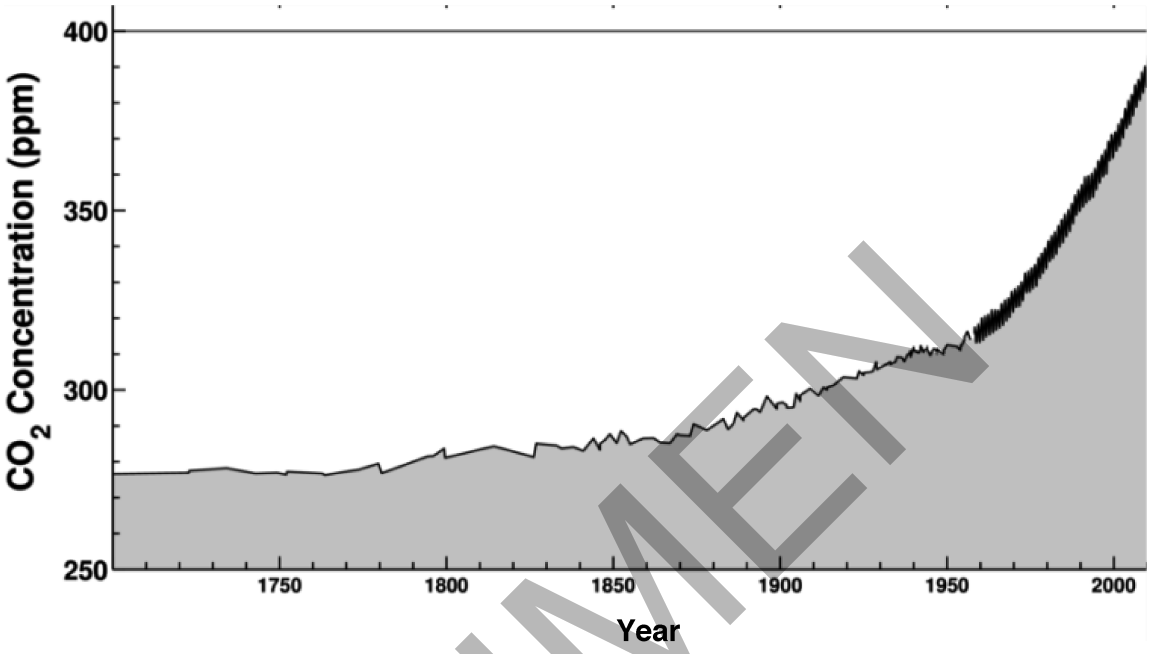
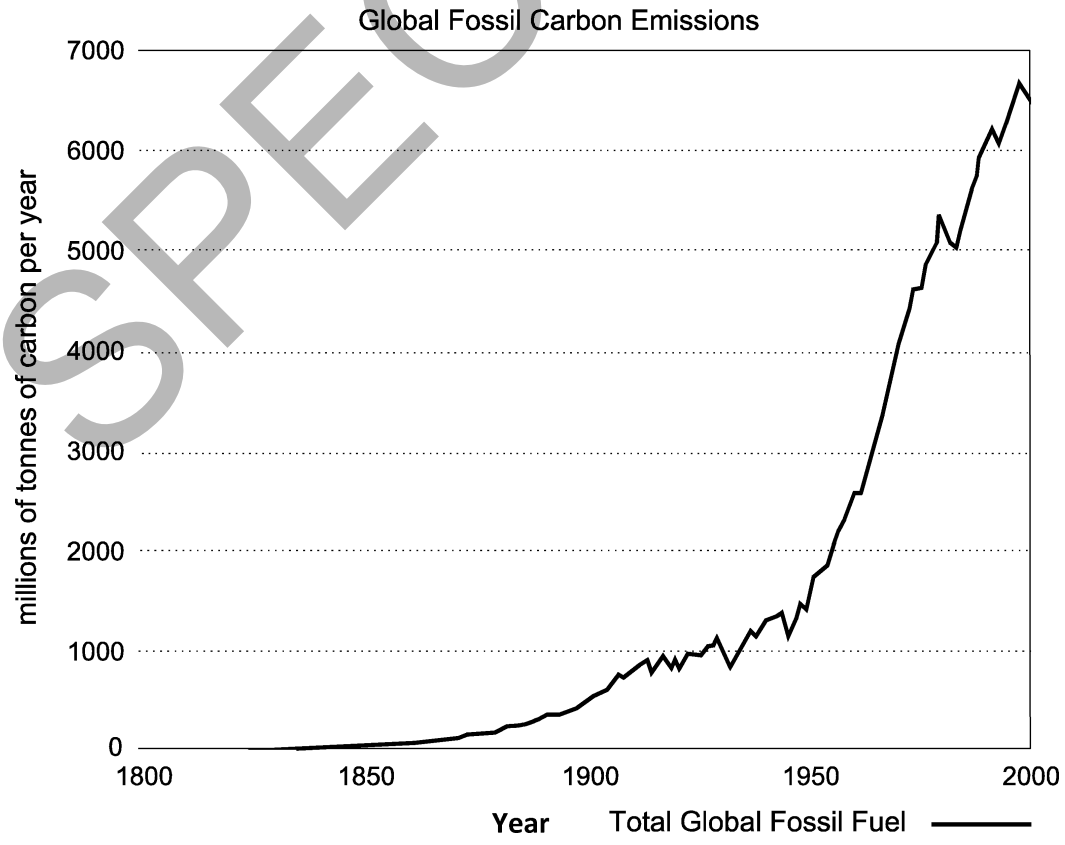
..... **[6]**

(b) Scientists are concerned about the changes in the levels of carbon dioxide in the modern atmosphere.

The graph below shows how the carbon dioxide in the Earth's atmosphere has changed in recent times.



The graph below shows the carbon emissions from fossil fuels over a similar period.



(i) Some scientists have identified correlations about factors which may affect the carbon dioxide levels in our atmosphere.

Describe the correlation between global carbon emissions and the level of carbon dioxide in the atmosphere shown by the graphs.

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

(ii) Scientists are worried about the amount of carbon dioxide in our atmosphere. Carbon dioxide contributes to the greenhouse effect.

Describe how carbon dioxide contributes to the greenhouse effect.

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..... **[4]**

3 A mine in Canada mines a lead ore called galena. Galena has the chemical formula of PbS.

The first stage of the process involves concentrating the galena using froth flotation.

(a) The next process is smelting. This is a two stage process.

First, the concentrated galena is reacted with air at high temperatures to form lead(II) oxide.

The word equation for this reaction is:

lead sulfide + oxygen → lead(II) oxide + sulfur dioxide

Write a balanced symbol equation for this reaction.

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

(b) Lead metal is extracted from the lead oxide by heating it with carbon.

$$2PbO + C \rightarrow 2Pb + CO_2$$

(i) Explain what has happened to the lead in this reaction.

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

(ii) What is the maximum mass of lead that can be extracted from 1.116 kg of lead(II) oxide?

Mass of lead = ……g **[4]**

(iii) Why is carbon used to extract lead from its ore but **not** aluminium?

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

(c) Amaya and James live near a lead mine that produces millions of tonnes of lead ore.

They found out some facts about the mine.

Employment at the mine	1000 persons
Lead found in house dust in houses local to the mine	1000 $\mu g/m^2$
Amount of rock blasted out to obtain one tonne of lead	10 tonnes
Toxicity of lead	High

(i) Amaya has just bought a new house in the area.

Explain one **advantage** and one **disadvantage** of living near the lead mine.

Advantage .....

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Disadvantage .....

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

(ii) Amaya and James talk about the processing of the lead at the mine.

Some of the waste from processing lead ore is toxic. I think we should close the mine until the process can be made completely safe.

James

Suggest reasons that Amaya could give for not closing the mine.

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

(d) The waste material from the ore still contains some lead and can contaminate the surrounding soil.

One way of cleaning up contaminated soil is to use phytoextraction.

Describe how phytoextraction can be used to clean up the contaminated soil.

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

4 Sodium is an element in Group 1 of the Periodic Table.

Chlorine is in Group 7 of the Periodic Table.

(a) Chlorine has two main isotopes:

- chlorine-35 with an atomic mass of 35
- chlorine-37 with an atomic mass of 37.

The percentage abundance of these isotopes is shown in the table below.

Isotope	Percentage abundance (%)
Chlorine-35	75.8
Chlorine-37	24.2

Show that the relative atomic mass of chlorine is 35.5 to **1** decimal place.

[2]

(b) (i) Sodium reacts with chlorine gas to form a salt.

Write a balanced symbol equation for the reaction.

Include state symbols in your answer.

[3]

(ii) The salt formed has a very high melting point.

Explain how the bonding and structure accounts for this high melting point.

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

5 Kareen is investigating the reaction of magnesium ribbon with hydrochloric acid.

When magnesium and hydrochloric acid react, a gas is formed.

The equation for this reaction is as below.

magnesium + hydrochloric acid → magnesium chloride + hydrogen

$$Mg + 2HCl \rightarrow MgCl_2 + H_2$$

(a) Kareen wants to investigate the effect of concentration of acid on the reaction when hydrochloric acid reacts with magnesium.

He uses the following equipment:

- Conical flask
- Cotton wool
- Balance
- Stop watch
- Hydrochloric acid of different concentrations
- Magnesium ribbon
- Measuring cylinder

Describe how Kareen would do this investigation.

You may include a diagram in your answer.

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..... **[4]**

(b) Kareen uses 0.116 g of magnesium each time in his experiment.

- He measures the time until all the magnesium is used up.
- He uses both magnesium ribbon and magnesium powder.

Here are his results:

Concentration of hydrochloric acid (mol/dm^3)	1.5	1.0	0.5
Reaction time using magnesium ribbon (seconds)	88	165	209
Reaction time using magnesium powder (seconds)	55	93	121

(i) From Kareen's results, describe the effect of concentration on the rate of reaction.

Use information from the table in your answer.

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

(ii) The mean rate of reaction for the magnesium ribbon with 1.5 mol/dm^3 hydrochloric acid is 1.32×10^{-3}g/s.

Calculate the mean rate of reaction for the magnesium powder with 1.5 mol/dm^3 hydrochloric acid.

Give your answer in standard form and to **3** significant figures.

Mean rate of reaction = ……g/s **[4]**

(iii) Magnesium powder reacts more quickly than magnesium ribbon.

Explain why.

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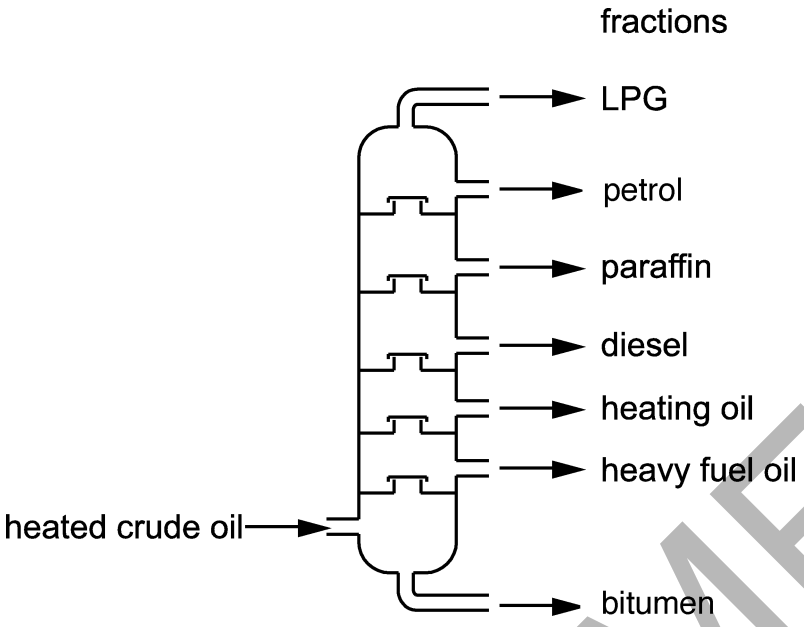
..... **[2]**

6 Crude oil is used as a source of fuels. It is separated into many fractions by fractional distillation.

The diagram below shows a fractionating column.



(a) Describe **how** crude oil is separated using a fractionating column.

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..... **[4]**

(b) The table below shows the percentage of each fraction in crude oil.

The fractions are listed in increasing order of carbon chain length.

fraction	% in crude oil	% needed
LPG	4	4
petrol	5	22
heating oil	9	5
diesel	19	23
paraffin	13	8
fuel oil and bitumen	50	38

The table shows that only about a quarter of the petrol needed is supplied by fractional distillation of crude oil.

Explain how an oil refinery uses cracking to increase the production of petrol.

Use information from the table in your answer.

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

7 Self-heating food packs are available on the internet. They warm food using a chemical reaction.

The packs often use the reaction between calcium oxide and water shown below.

$$CaO(s) + H_2O(l) \rightarrow Ca(OH)_2(s)$$

This reaction gives out heat.

(a) Draw and label a reaction profile for this reaction. Label the activation energy.

[3]

(b) Explain the relationship between activation energy and catalysts.

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

8 Jane is a chemistry technician in a secondary school.

She has found some bottles of hydrochloric acid where the labels have fallen off.

She decides to do a titration of the contents against 1.0 mol/dm^3 sodium hydroxide to find the concentration of the acid in each bottle.

(a) The balanced symbol equation for this reaction is:

$$NaOH + HCl \rightarrow NaCl + H_2O$$

(i) Jane found that 30 cm^3 of sodium hydroxide neutralised 25 cm^3 of the acid from one of the bottles.

Calculate the concentration of the acid from this bottle.

Concentration = ... mol/dm^3 **[4]**

(ii) Jane works out that the concentration of acid in one of the other bottles is 2.0 mol/dm^3.

She wishes to make 500 cm^3 of 0.1 mol/dm^3 hydrochloric acid from this acid to fill up the bottles in the laboratory.

Calculate the volume of the 2.0 mol/dm^3 acid she would have to use.

Volume = ... cm^3 **[3]**

(b) Students react together the 0.1 mol/dm^3 hydrochloric acid with calcium carbonate to make the soluble salt calcium chloride.

The students make a dry sample of the calcium chloride crystals.

Describe how they do this.

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..... **[4]**

(c) The balanced symbol equation for this reaction is:

$$2HCl + CaCO_3 \rightarrow CaCl_2 + H_2O + CO_2$$

The students wish to calculate the maximum amount of calcium chloride they could make from 200 cm^3 of 0.1 mol/dm^3 hydrochloric acid.

Calculate the maximum mass of calcium chloride they could make.

Give your answer to **three** significant figures.

Maximum mass of calcium chloride = ... g **[6]**

(d) Hydrochloric acid is a strong acid.

Ethanoic acid is a weak acid.

The equations for the acids in solution are:

$$HCl \rightarrow H^+ + Cl^-$$

$$CH_3COOH \rightleftharpoons CH_3COO^- + H^+$$

Explain the differences in these acids and their pH.

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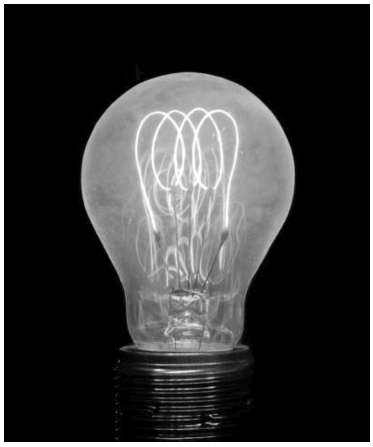
..... **[3]**

9 Early light bulbs used carbon paper filaments. When electricity is passed through the bulb the carbon paper filaments become very hot. The energy from the electricity transfers to heat and light in the bulb.



(a) The first bulbs invented by Sir Joseph Swan used carbon paper filaments in air.

These worked well but burned up quickly.

Explain why these bulbs did not last very long.

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

(b) In 1879, Thomas Edison discovered that using a carbon filament in a glass bulb filled with argon improved the design of the original bulbs. He found that this bulb lasted 40 hours.

Explain how using a glass bulb filled with argon solved the problem Joseph Swan had with his light bulb.

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

10 Scientists are assessing the environmental impact of different types of shopping bags.

They carry out Life Cycle Assessments (LCA) for three different types of bags.

Their results are recorded in the table below.

	Totals for 1000 bags for the whole LCA		
	paper (30% recycled fibre)	biodegradable plastic	polythene
Energy use (MJ)	2620	2070	763
Fossil fuel use (kg)	23.2	41.5	14.9
Municipal solid waste (kg)	33.9	19.2	7.0
Greenhouse gas emissions (kg CO_2)	80	180	40
Fresh water use (litres)	4520	4580	260

By evaluating the information in the table, decide which of the three materials is best to use for shopping bags.

Explain your choice.

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

END OF QUESTION PAPER

OCR
Oxford Cambridge and RSA

…day June 20XX – Morning/Afternoon

GCSE (9–1) Combined Science B (Twenty First Century Science)

J260/06 Chemistry (Higher Tier)

SAMPLE MARK SCHEME

Duration: 1 hour 45 minutes

MAXIMUM MARK 95

DRAFT

This document consists of 20 pages

MARKING INSTRUCTIONS

PREPARATION FOR MARKING

SCORIS

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *scoris assessor Online Training*; *OCR Essential Guide to Marking*.

2. Make sure that you have read and understood the mark scheme and the question paper for this component. These are posted on the RM Cambridge Assessment Support Portal http://www.rm.com/support/ca

3. Log-in to scoris and mark the **required number** of practice responses ("scripts") and the **required number** of standardisation responses.

   YOU MUST MARK 10 PRACTICE AND 10 STANDARDISATION RESPONSES BEFORE YOU CAN BE APPROVED TO MARK LIVE SCRIPTS.

MARKING

1. Mark strictly to the mark scheme.

2. Marks awarded must relate directly to the marking criteria.

3. The schedule of dates is very important. It is essential that you meet the scoris 50% and 100% (traditional 50% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.

4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone, email or via the scoris messaging system.

5. Work crossed out:
   a. where a candidate crosses out an answer and provides an alternative response, the crossed out response is not marked and gains no marks
   b. if a candidate crosses out an answer to a whole question and makes no second attempt, and if the inclusion of the answer does not cause a rubric infringement, the assessor should attempt to mark the crossed out answer and award marks appropriately.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there then add a tick to confirm that the work has been seen.

7. There is a NR (No Response) option. Award NR (No Response)
   - if there is nothing written at all in the answer space
   - OR if there is a comment which does not in any way relate to the question (e.g. 'can't do', 'don't know')
   - OR if there is a mark (e.g. a dash, a question mark) which isn't an attempt at the question.

   Note: Award 0 marks – for an attempt that earns no credit (including copying out the question).

8. The scoris **comments box** is used by your Team Leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**

   If you have any questions or comments for your Team Leader, use the phone, the scoris messaging system, or email.

9. Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.

10. For answers marked by levels of response:

Read through the whole answer from start to finish, using the Level descriptors to help you decide whether it is a strong or weak answer. The indicative scientific content in the Guidance column indicates the expected parameters for candidates' answers, but be prepared to recognise and credit unexpected approaches where they show relevance. Using a 'best-fit' approach based on the skills and science content evidenced within the answer, first decide which set of level descriptors, Level 1, Level 2 or Level 3, best describes the overall quality of the answer. Once the level is located, award the higher or lower mark:

The higher mark should be awarded where the level descriptor has been evidenced and all aspects of the communication statement (in italics) have been met.
The lower mark should be awarded where the level descriptor has been evidenced but aspects of the communication statement (in italics) are missing.

In summary:

The skills and science content determines the level.
The communication statement determines the mark within a level.

Level of response question on this paper is 2(a).

11. **Annotations**

Annotation	Meaning
DO NOT ALLOW	Answers which are not worthy of credit
IGNORE	Statements which are irrelevant
ALLOW	Answers that can be accepted
( )	Words which are not essential to gain credit
__	Underlined words must be present in answer to score a mark
ECF	Error carried forward
AW	Alternative wording
ORA	Or reverse argument

12. **Subject-specific Marking Instructions**

INTRODUCTION

Your first task as an Examiner is to become thoroughly familiar with the material on which the examination depends. This material includes:

- the specification, especially the assessment objectives
- the question paper
- the mark scheme.

You should ensure that you have copies of these materials.

You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New Examiners**.

Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

The breakdown of Assessment Objectives for GCSE (9–1) in Combined Science B:

	Assessment Objective
AO1	**Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.**
AO1.1	Demonstrate knowledge and understanding of scientific ideas.
AO1.2	Demonstrate knowledge and understanding of scientific techniques and procedures.
AO2	**Apply knowledge and understanding of scientific ideas and scientific enquiry, techniques and procedures.**
AO2.1	Apply knowledge and understanding of scientific ideas.
AO2.2	Apply knowledge and understanding of scientific enquiry, techniques and procedures.
AO3	**Analyse information and ideas to interpret and evaluate, make judgements and draw conclusions and develop and improve experimental procedures.**
AO3.1	Analyse information and ideas to interpret and evaluate.
AO3.1a	Analyse information and ideas to interpret.
AO3.1b	Analyse information and ideas to evaluate.
AO3.2	Analyse information and ideas to make judgements and draw conclusions.
AO3.2a	Analyse information and ideas to make judgements.
AO3.2b	Analyse information and ideas to draw conclusions.
AO3.3	Analyse information and ideas to develop and improve experimental procedures.
AO3.3a	Analyse information and ideas to develop experimental procedures.
AO3.3b	Analyse information and ideas to improve experimental procedures.

Question			Answer	Marks	AO element	Guidance
1	(a)		Bohr linked to electrons in shells ✓ Dalton linked to solid sphere ✓ Thomson linked to plum pudding model ✓	2	1.1	One mark if one correct Two marks if two or three correct
	(b)	(i)	Proton +1 ✓ Neutron neutral or 0 ✓ Electron -1 ✓	2	1.1	One mark if two correct Two marks if three correct
		(ii)	Atomic mass ✓ Properties ✓	2	1.1	
		(iii)	Gaps are for undiscovered elements ✓ He predicted properties / new elements matched his predictions / new elements had the properties he predicted ✓	2	1.1	

Question			Answer	Marks	AO element	Guidance
2	(a)*		Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question. **Level 3 (5–6 marks)** Correctly describes how and why the water vapour condenses to make the oceans **And** Correctly describes how and why the carbon dioxide decreases initially after the formation of the oceans **And** Correctly links to a description how and why an oxygen rich atmosphere developed due to photosynthesising organisms producing oxygen and absorbing carbon dioxide leading to a decrease in carbon dioxide and increase in oxygen in the atmosphere *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated* **Level 2 (3–4 marks)** Correctly describes how and why the water vapour condenses to make the oceans **And** Correctly describes how and why the carbon dioxide decreases initially after the formation of the oceans *There is a line of reasoning presented with some structure. The information presented*	**6**	**2 x 3.1a** **2 x 3.2b** **2 x 2.1**	**Indicative scientific points may include** **AO3.1a links to levels of the gases** For example: • Water vapour decreases • Carbon dioxide decreases • Oxygen increases **AO3.2b linked to a conclusion why these gases changed** For example • Dissolving in the oceans • Forming sedimentary rocks • By photosynthesis • Earth starts hot, cools • Water condenses to form oceans **AO2.1 Links description of oxygen rich atmosphere to appearance of plants** For example: • First bacteria appeared (cyanobacteria) • These photosynthesised • Made carbon dioxide into glucose and released oxygen into the atmosphere • Slowly the oxygen increased and the carbon dioxide levels decreased

Question			Answer	Marks	AO element	Guidance
			is relevant and supported by some evidence. **Level 1 (1–2 marks)** Correctly describes that the water vapour decreases with a valid reason **Or** Correctly identifies that the carbon dioxide decreases with a valid reason **Or** Correctly identifies that oxygen increases with a valid reason *The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.* **0 marks** No response or no response worthy of credit.			
	(b)	**(i)**	Carbon dioxide increases over the period ✓ Carbon emissions from fossil fuels increases ✓	**2**	**2.2**	
		(ii)	CO_2 builds in the atmosphere around the earth ✓ Radiation from the sun enters through the atmosphere some is absorbed by the earth and some of this radiation is reflected by the earth ✓ Radiation instead of going into space is reflected back to the earth by the CO_2 in the atmosphere ✓	**4**	**2.1**	

Question			Answer	Marks	AO element	Guidance
			Causing the earth to increase in temperature ✓			

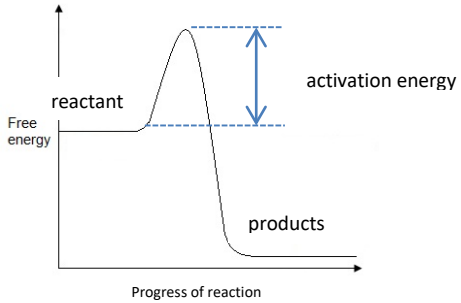
Question			Answer	Marks	AO element	Guidance
3	(a)		$2PbS + 3O_2 \longrightarrow 2PbO + 2SO_2$ ✓✓✓	3	1.1 1.1 1.2	One mark for correct reactants One mark for correct products One mark for correct balancing
	(b)	(i)	The lead has been reduced because it has gained an electron/ lost oxygen ✓	1	2.1	
		(ii)	**FIRST CHECK THE ANSWER ON THE ANSWER LINE if = 1036(g) award four marks** RFM for PbO = 207.2 + 16.0 = 223.2 ✓ 1.116kg = 1116 g ✓ 1116 ÷ 223.2 = 5 ✓ 5 x 207.2 = 1036 (g) ✓	4	2.1	**ALLOW** 1.036 kg **DO NOT ALLOW** 1.036
		(iii)	**Any one from:** Lead is less reactive than carbon ✓ Aluminium is more reactive than carbon ✓	2	1.1	

Question			Answer	Marks	AO element	Guidance
			Therefore carbon will displace the lead from the lead oxide but not aluminium compounds ✓			
	(c)	(i)	Disadvantages: noise / traffic / possible toxicity / dust Because this could damage health/ damage quality of life AW ✓ Advantages: work/jobs / improved transport links / more facilities available Because enables communities to develop / gives livelihood / enhances quality of life AW ✓	2	3.2a	
		(ii)	Idea that it cannot be made completely safe / would take time for the mining company to improve safety ✓ Boosts local economy / benefits outweigh risks ✓	2	3.2a	
	(d)		Choose (lead tolerant) plants that will grow on Contaminated soil such as some varieties of grasses ✓ Plant plants on the contaminated soil ✓ Plants absorb the lead as they grow therefore removing the lead from the soil ✓	3	1.1	

Question			Answer	Marks	AO element	Guidance
4	(a)		For 100 atoms: 75.8 have RAM=35 24.2 have RAM=37 $\frac{75.8 \times 35 + 24.2 \times 37}{100}$ = 35.484 ✓ = 35.5 to 1 d.p.✓	2	1.2	
	(b)	(i)	2Na(s) ✓ + Cl_2(g) ✓ → 2NaCl(s) ✓	3	1.1 1.1 1.2	One mark for state symbols One mark for correct chemical symbols One mark for correct balancing
		(ii)	Salt formed of ions in a giant ionic structure ✓ Attraction between oppositely charged ions is stronger than the attraction between the same charged ions ✓ Therefore large amounts of energy is required to overcome the attractions ✓	3	1.1	

Question			Answer	Marks	AO element	Guidance
5	(a)		Description of use of the equipment: • conical flask on balance with cotton wool in top of flask ✓ • hydrochloric acid and magnesium ribbon in the flask ✓ Variables: • same amount of magnesium ribbon and same volume of acid each time ✓ • vary concentration of acid ✓	4	1.2 1.2 2.2 2.2	Up to two marks for a correct diagram
	(b)	(i)	The more concentrated the acid the shorter time it takes for the magnesium to be used up ✓ For magnesium ribbon the reaction takes 77 s at 1.5 M acid but 201 s at 0.5 M ✓ Or For magnesium powder the reaction takes 48s at 1.5M but 117s at 0.5M ✓	2	3.1a 3.1b	
		(ii)	**FIRST CHECK THE ANSWER ON THE ANSWER LINE** **If = 2.13 x10^{-3} (g/s) award four marks** Mass of Mg in 55 s = 0.116 g Mass used in 1 s = 0.116 ÷ 55 ✓ Mean rate = 0.002109 ✓ = 2.11 x 10^{-3} (g/s) ✓✓	4	2.2	One mark for answer given to 3 sig. figs.
		(iii)	Magnesium powder larger surface area ✓ therefore Larger area for collisions with the acid therefore faster reaction as more (successful) collisions per second ✓	2	2.1	

Question			Answer	Marks	AO element	Guidance
6	(a)		Tall column with condensers coming off at different heights ✓ Column heated at the bottom so hot at the bottom and cool at the top ✓ Because substances in crude oil have different boiling points ✓ Substances with high boiling points condense at the bottom and substances with low boiling points condense at the top ✓	4	1.2 1.2 1.1 1.2	
	(b)		Cracking breaks long carbon molecules into short molecules like petrol ✓ Could use fractions paraffin, fuel and bitumen and heating oil to crack as these are excess to the need ✓	2	1.1 3.1b	

Question			Answer	Marks	AO element	Guidance
7	(a)			3	2.2	**ALLOW** symbols for reactants and products One mark for drawing the profile One mark for reactants and products in the correct places One mark for correct identification of activation energy
	(b)		Catalysts lower the activation energy ✓ By finding a less energetic pathway so increasing the rate of the reaction ✓	2	1.1	

Question			Answer	Marks	AO element	Guidance
8	(a)	(i)	**FIRST CHECK THE ANSWER ON THE ANSWER LINE if = 1.2(mol/dm^3) award four marks** Amount of NaOH = 30 ÷ 1000 x 1 ✓ = 0.3M ✓ therefore Concentration of HCl = 0.3 ÷ 25 x 1000 ✓ = 1.2(mol/dm^3) ✓	4	2.2	
		(ii)	**FIRST CHECK THE ANSWER ON THE ANSWER LINE if = 25 (cm^3) award three marks** 2/0.1 = 20 times dilution ✓ 500/20 ✓ = 25 (cm^3) ✓	3	2.2	
	(b)		Filter the mixture to remove excess calcium carbonate ✓ then Evaporate excess water to concentrate the solution ✓ then Leave to crystallise ✓ then Filter the crystals and dry in an oven ✓	4	1.2	
	(c)		**FIRST CHECK THE ANSWER ON THE ANSWER LINE if = 0.585 (g) award six marks** Ratio = 2:1✓ Amount of hydrochloric acid = 200 ÷1000 x 0.1 = 0.02M ✓✓ Therefore amount of calcium chloride = 0.02 ÷ 2 = 0.01 M ✓ RFM of calcium chloride = 58.5 ✓ Therefore amount of calcium chloride = 58.5 x 0.01 = 0.585(g) ✓	6	2.1 2.1 x 2 2.1 1.2 2.1	
	(d)		Hydrochloric acid is fully ionised ✓ whereas Ethanoic acid is only partially ionised ✓ So for the same concentration hydrochloric acid will have a lower pH than ethanoic acid ✓	3	1.1	

Question			Answer	Marks	AO element	Guidance
9	(a)		Because when the filament got hot the carbon reacted with the oxygen in the air and burned away ✓	1	2.1	
	(b)		Argon is in Group 0 ✓ It is very unreactive ✓ Therefore the carbon will not react with it when it gets hot ✓	3	1.1 1.1 2.1	

Question			Answer	Marks	AO element	Guidance
10			Polythene ✓ Because it **(any two from)** Uses least energy ✓ Uses least fossil fuel ✓ Produces least solid waste ✓ Gives least greenhouse gases ✓ Uses least water ✓	**3**	**3.2a** **3.1b x 2**	

Summary of updates

Date	Version	Change
May 2018	2	We've reviewed the look and feel of our papers through text, tone, language, images and formatting. For more information please see our assessment principles in our "Exploring our question papers" brochures on our website