

COMPONENT 1 - Concepts in Chemistry

FOUNDATION TIER

MARK SCHEME

GENERAL INSTRUCTIONS

Recording of marks

Examiners must mark in red ink.

One tick must equate to one mark (apart from the questions where a level of response mark scheme is applied).

Question totals should be written in the box at the end of the question.

Question totals should be entered onto the grid on the front cover and these should be added to give the script total for each candidate.

Marking rules

All work should be seen to have been marked.

Marking schemes will indicate when explicit working is deemed to be a necessary part of a correct answer.

Crossed out responses not replaced should be marked.

Credit will be given for correct and relevant alternative responses which are not recorded in the mark scheme.

Extended response question

A level of response mark scheme is used. Before applying the mark scheme please read through the whole answer from start to finish. Firstly, decide which level descriptor matches best with the candidate's response: remember that you should be considering the overall quality of the response. Then decide which mark to award within the level. Award the higher mark in the level if there is a good match with both the content statements and the communication statements.

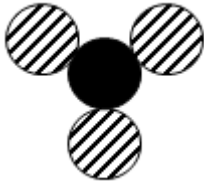
Marking abbreviations

The following may be used in marking schemes or in the marking of scripts to indicate reasons for the marks awarded.

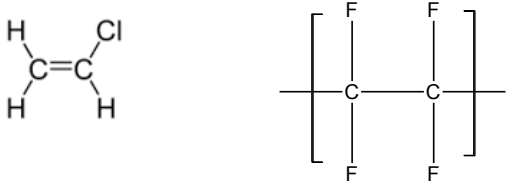
cao = correct answer only
ecf = error carried forward
bod = benefit of doubt

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
1	(a)	(i)		C		1		1		1
		(ii)		caffeine 'spot' not present in urine samples			1	1		1
		(iii)		Distance moved by paracetamol is 3 (1) 0.3 (1) Correct answer with no working (2)	1	1		2		2
(b)	(i)	I		4			1	1		
		II		1			1	1		
		III		1			1	1		
		IV		1			1	1		
		(ii)		fractional distillation	1			1		
				Question 1 total	2	2	5	9	0	4

Question			Marking details		Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)	(i)		Line connecting points as follows: iron oresource of iron limestoneremove impurities cokefuel / forms carbon monoxide hot airsource of oxygen All four correct 3 marks Any two correct 2 marks Any one correct 1 mark	3			3		
		(ii)	I	Iron (1) Carbon dioxide (1)	2			2		
			II	Reduction	1			1		
	(b)	(i)		It increases up to 0.8% carbon then decreases (2) If not awarded, credit (1) for increases then decreases			2	2	2	
		(ii)		high-carbon steel			1	1	1	
	(c)	(i)	I	Displacement reaction (1)	1			1		1
			II	Iron reacts with copper(II) sulfate to form iron(II) sulfate/copper (1) Iron is more reactive than copper (1)	1	1		2		2
		(ii)		FeSO ₄ and Cu – both needed		1		1		1
		(iii)		= 80.6 g (1) Mass has not left or entered the beaker / same number of atoms in the beaker (1)			2	2	1	
	Question 2 total					8	4	3	15	4

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)	Magnesium atom loses two electrons (1) Oxygen atom gains two electrons (1) If not awarded, credit (1) for magnesium loses electrons and oxygen gains electrons		2		2		
	(b)	(i)	 N atom at centre with three H atoms independently attached. Shape is not important but do not accept atoms incorrectly joined e.g. in a chain		1		1		
		(ii)	N_2O Accept ON_2		1		1		
	(c)	(i)	Any two from O_2 / He / Ne	1			1		
		(ii)	Any two from CO_2 / CH_4 / SO_2	1			1		
	(d)	(i)	K^+ (1) O^{2-} (1)		2		2		
		(ii)	$\text{Mg}(\text{OH})_2$		1		1		
	(e)		$23 + 35.5 + 3(16)$ (1) 106.5 (1) Correct answer only 2 marks		2		2	2	
			Question 3 total	2	9	0	11	2	0

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)	Ethanol is the better fuel because it gives the greater temperature rise			1	1		1
		(ii)	Some heat escaped to the room (1) Second mark for any of following (1) Heat absorbed by beaker Heat escaped because there is no lid Heat escaped through beaker			2	2		2
		(iii)	Both formulae correct – CO ₂ and H ₂ O (1) Correctly balanced - 2CO ₂ + 4H ₂ O (1) Must have correct formulae for this mark to be awarded	1			2	1	
	(b)	(i)	C ₂ H ₅ OH		1		1		
		(ii)	$ \begin{array}{c} \text{H} & \text{H} & \text{OH} \\ & & \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\ & & \\ \text{H} & \text{H} & \text{H} \end{array} $ or $ \begin{array}{c} \text{H} & \text{OH} & \text{H} \\ & & \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\ & & \\ \text{H} & \text{H} & \text{H} \end{array} $		1		1		
			Question 4 total	1	3	3	7	1	3

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
5	(a)		alloy composite composite alloy All four correctly circled (2) Any two correctly circled (1)	2			2		
	(b)		Gives a stronger material	1			1		
	(c)	(i)	Mass = 1.5×3 (1) Mass = 4.5 (1) Correct answer with no working (2)	1	1		2	2	
		(ii)	csa = $52.5/350\ 000$ (1) csa = 0.00015 (or 1.5×10^{-4}) (1) Correct answer with no working (2)		2		2	2	
	(d)		C=C bond opens (1) Ethene molecules / monomers join together (1) Long chain / polymer forms (1)	3			3		
	(e)		 (1) (1)		2		2		
			Question 5 total	7	5	0	12	4	0


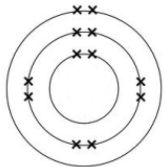
Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)	Amount of carbon dioxide / sulfur dioxide has decreased (1) Amount of nitrogen has increased (1) Contains oxygen / amount of oxygen has increased (1)	3			3		
		(ii)	Volcanoes released carbon dioxide [and water] (1) Plants used carbon dioxide during photosynthesis producing oxygen (1)		2		2		
	(b)	(i)	Gradual increase in carbon dioxide before 1900 (1) Large increase in carbon dioxide after 1900 (1) Increased industrialisation / huge increase in amount of fossil fuels burned (1)	1		2	3	2	
		(ii)	Increasing / changing concentration increases greenhouse effect / global warming (1) Increases mean atmospheric temperature (1) Increases mass of polar ice melting (1)	3			3		
			Question 6 total	7	2	2	11	2	0

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)	(i)		pH increased (1) Acidity decreased (1)	1	1		2		
		(ii)		B (1) Can record data several times over a period of time / continuously (1)	1 1			2		2
	(b)	(i)		Emissions decreasing (1) Levels below international targets (1)			2	2		
		(ii)		More electricity generated (1) Sensible explanation e.g. cold winter therefore more electricity used for heating (1)		1	1	2		
				Question 7 total	3	2	3	8	0	2

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
8	(a)	(i)		Sulfuric acid	1			1		1
		(ii)		Carbon dioxide	1			1		1
		(iii)		Water	1			1		1
	(b)	(i)		2.25		1		1		1
		(ii)		$\frac{2.25}{6.25} \times 100$ (1) 36 (1) Allow ecf	1					
		(iii)		Turns blue (1) Water bubbles / boils / reacts exothermically (1) Copper(II) sulfate is rehydrated / recombines with water (1)	3			3		3
				Question 8 total	7	2	0	9	2	9

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
9	(a)	(i)	m.p. 100°C and b.p. 880°C Both needed for (1)			1	1	1	
		(ii)	The element is a metal since metals have high melting points and boiling point		1		1		
	(b)		<p>Indicative content</p> <p>We start with a solid in which particles are closely packed and fixed in place. (AO1)</p> <p>Time 0-1 min - As temperature increases vibrations increase but the particles cannot break free of each other (AO2)</p> <p>Between 1-5 min the energy supplied allows particles to break free from a rigid structure - the substance is melting (AO2)</p> <p>In a liquid, particles are still close packed but are no longer in a fixed structure and can move around (AO1)</p> <p>Between 5-8 min we have a liquid (AO2) in which the particles gain more and more energy and move faster but remain close together (AO1)</p> <p>Between 8-12 min the energy is supplied to overcome forces of attraction between particles. The element is boiling. (AO2)</p> <p>The particles break free of each other forming a gas in which particles are widely spaced. (AO1)</p> <p>5 – 6 marks: Accurately describes solids, liquids and gases using particle theory. States energy is absorbed when substance melts or boils. Explains what is happening to particles in each region of the graph using particle theory. <i>There is a sustained line of reasoning which is coherent, substantiated and logically structured. The information included in the response is relevant to the argument.</i></p>	3	3		6		

			<p>3 – 4 marks: Describes in some detail solids, liquids and gases using particle theory. Understands energy is needed for melting and boiling. Explains what is happening to particles in (at least) the regions of the graph where melting or boiling is occurring using particle theory. <i>There is a line of reasoning which is partially coherent, supported by some evidence and with some structure. Mainly relevant information is included in the response but there may be some minor errors or the inclusion of some information not relevant to the argument.</i></p> <p>1 – 2 marks: Basic description of solids, liquids and gases. Recognises energy is needed to bring about a state change <i>There is a basic line of reasoning which is not coherent, supported by limited evidence and with very little structure. There may be significant errors or the inclusion of information not relevant to the argument.</i></p> <p>0 marks: No attempt made or no response worthy of credit.</p>						
			Question 9 total	3	4	1	8	1	0

Question				Marking details			Marks available				
							AO1	AO2	AO3	Total	Maths
10	(a)			$^{40}_{20}\text{Ca}$ (1) 18 (1)	10 (1)	9 (1) 20 (1)		5	5		
	(b)	(i)						1	1		
		(ii)						1	1		

Question			Marking details	Marks available					
				A01	A02	A03	Total	Maths	Prac
	(c)	(i)	Atomic weights (1) Patterns of reactivity (1)	2			2		
		(ii)	Any three of the following Must have explanation as well as observation K and Cu occupy their own spaces–have different properties (1) Gaps filled – new elements discovered (1) Additional group – noble gases discovered (1) Transition metals placed together – have similar properties (1)	3			3		
			Question 10 total	5	7	0	12	0	0

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
11	(a)	(i)	Scales: Both axes (1) Plotting: All correct (2) Any 8 correct (1) Line: Smooth curve through all points (1) Judgement by eye		4		4	4	
		(ii)	Graph rises as acid and alkali react in a neutralisation reaction (1) Which is exothermic (1) Temperature falls after alkali used up and exothermic reaction no longer occurring (1)			3	3		3
	(b)	(i)	pH / universal indicator	1			1		1
		(ii)	Colour change as acid added (1) Description of colour change (1) e.g. purple to green to red	2			2		2
			Question 11 total	3	4	3	10	4	6

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
12	(a)	(i)	11.1 (2) $4/36 \times 100$ Award (1) for 4/36 Allow ecf		2		2	2	
		(ii)	Low atom economy (1) and any one from: (1) Not efficient process/ Not economic process/ Not a 'green' process / O ₂ is a waste product ...			2	2		
	(b)		Straight line from (0,0) of lower gradient (1) Line to 0.2 g after 10 minutes (1)			2	2	2	2
	(c)		raw material is water ...renewable natural resource (1) combustion product is waterdoes not contribute to global warming (1)		2		2		
			Question 12 total	0	4	4	8	4	2