

Chemistry A

General Certificate of Secondary Education **A323/02**

Unit 3: Ideas in Context plus C7

Mark Scheme for June 2010

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by Examiners. It does not indicate the details of the discussions which took place at an Examiners' meeting before marking commenced.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the Report on the Examination.

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Guidance for Examiners

Additional Guidance within any mark scheme takes precedence over the following guidance.

1. Mark strictly to the mark scheme.
2. Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise.
3. Accept any clear, unambiguous response which is correct, e.g. mis-spellings if phonetically correct (but check additional guidance).
4. Abbreviations, annotations and conventions used in the detailed mark scheme:

/	= alternative and acceptable answers for the same marking point
(1)	= separates marking points
not/reject	= answers which are not worthy of credit
ignore	= statements which are irrelevant - applies to neutral answers
allow/accept	= answers that can be accepted
(words)	= words which are not essential to gain credit
<u>words</u>	= underlined words must be present in answer to score a mark
ecf	= error carried forward
AW/owtte	= alternative wording
ORA	= or reverse argument

E.g. mark scheme shows 'work done in lifting / (change in) gravitational potential energy' (1)

work done = 0 marks
work done lifting = 1 mark
change in potential energy = 0 marks
gravitational potential energy = 1 mark

5. Annotations:

The following annotations are available on SCORIS.

✓	= correct response
✗	= incorrect response
bod	= benefit of the doubt
nbod	= benefit of the doubt not given
ECF	= error carried forward
^	= information omitted
I	= ignore
R	= reject

6. If a candidate alters his/her response, examiners should accept the alteration.
7. Crossed out answers should be considered only if no other response has been made. When marking crossed out responses, accept correct answers which are clear and unambiguous.

E.g.

For a one mark question, where ticks in boxes 3 and 4 are required for the mark:

Put ticks (✓) in
the two correct
boxes.

<input type="checkbox"/>
<input type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

This would be
worth 0 marks.

Put ticks (✓) in
the two correct
boxes.

<input type="checkbox"/>
<input type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

This would be
worth one mark.

Put ticks (✓) in
the two correct
boxes.

<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

This would be
worth one mark.

8. The list principle:

If a list of responses greater than the number requested is given, work through the list from the beginning. Award one mark for each correct response, ignore any neutral response, and deduct one mark for any incorrect response, e.g. one which has an error of science. If the number of incorrect responses is equal to or greater than the number of correct responses, no marks are awarded. A neutral response is correct but irrelevant to the question.

9. Marking method for tick boxes:

Always check the additional guidance.

If there is a set of boxes, some of which should be ticked and others left empty, then judge the entire set of boxes.

If there is at least one tick, ignore crosses. If there are no ticks, accept clear, unambiguous indications, e.g. shading or crosses.

Credit should be given for each box correctly ticked. If more boxes are ticked than there are correct answers, then deduct one mark for each additional tick. Candidates cannot score less than zero marks.

E.g. If a question requires candidates to identify a city in England, then in the boxes

Edinburgh	<input type="checkbox"/>
Manchester	<input type="checkbox"/>
Paris	<input type="checkbox"/>
Southampton	<input type="checkbox"/>

the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third should be blank (or have indication of choice crossed out).

Edinburgh	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Manchester	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Paris	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Southampton	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Score:	2	2	1	1	1	1	0	0	0	NR

Question		Expected Answer	Mark	Additional Guidance	
1	a	<p>any two from: reference to using fertilisers (1) reference to using pesticides (1) cotton is bleached (using harmful chemicals) (1)</p>	[2]		
	b	they are easier to use/more convenient / they do not need to be washed / they are kinder to a baby's skin (1)	[1]	allow more comfortable for baby / less likely to leak do not allow economy answers	
	c	from getting the raw material used to make the product to the disposal of the product (1)	[1]	do not allow answers that start from making product from raw material	
	d	<p>description: electricity/detergent used for washing (1) explanation: generating electricity causes pollution / detergent released into rivers etc (1)</p>	[2]	<p>allow use of energy instead electricity allow any reasonable explanation of how this causes environmental impact</p>	
	e	<p>not everyone would collect used nappies for recycling / may be difficult to collect all used nappies (1) there are not enough recycling plants available / so many nappies are used that this would be difficult (1) there may not be enough demand for the materials produced by recycling (1)</p>	[3]	<p>three areas for marks:</p> <ul style="list-style-type: none"> • collection • huge volume • demand for products 	
	f	i	<p>forces (of attraction) between polymer chains/molecules are low (1) so little energy is needed to separate the chains/molecules (1)</p>	[2]	<p>for the first mark candidates must write about forces between chains/molecules not bonds for second mark allow reference to breaking bonds between chains/molecules as long as energy mentioned ignore references to short chains</p>
		ii	<p>decrease chain length / decrease crystallisation / add plasticizer / decrease density (1) to decrease forces/attraction between chains/molecules (1)</p>	[2]	<p>allow make branched polymer allow decreases number/strength of bonds between chains/molecules ignore references to less energy needed</p>
		Total		[13]	

Question		Expected Answer	Mark	Additional Guidance
2	a	sodium + ethanol (slow) fizzing / dissolves / gets smaller / moves slowly across the surface (1) sodium + water (fast) fizzing / dissolves (quickly) / gets smaller (quickly) / shoots around on surface / melts / produces flame (1) sodium + hexane no reaction (1) answer shows that reaction with water is more vigorous than that with ethanol (1)	[4]	one mark each for a valid observation for each of the three demonstrations if a mixture of valid and non-valid observations are made this loses the mark for that box plus one additional mark for a correct comparison of the same observation with ethanol and with water allow bubbling=fizzing=hydrogen/gas given off
	b	similarity: ethanol and water have O-H group/same functional group/oxygen and so react in a similar way (1) difference: hexane has only carbon and hydrogen atoms/does not have an O-H group/does not have oxygen and so does not react (1)	[2]	allow water and ethanol have polar bonds allow hexane is a hydrocarbon/has unreactive C-C and C-H bonds and so does not react to score the answers must refer to the reactions not just to the structures
	c	i	(high concentration of) ethanol kills yeast (1)	[1] allow the ethanol denatures/destroys the yeast allow ethanol denatures enzymes but do not allow kills enzymes
		ii	distillation (1) plus any two from: mixture is heated/evaporated/boiled (1) vapour cooled to condense it (1) ethanol has lower/different boiling point (so is collected on its own/separately) (1)	[3] allow fractional distillation allow explanation marks independent of name but do not give marks for a method that does not separate eg reflux ignore ethanol has low boiling point
			Total	[10]

Question			Expected Answer	Mark	Additional Guidance
3	a		energy level of reactants is higher than that of products (1) so energy/heat given out during the reaction (1)	[2]	allow energy level at end is lower than at beginning / energy level goes down / energy change is negative
	b		energy needed to start a reaction (1) energy needed to break bonds (1)	[2]	allow first mark for energy needed for a reaction to take place/begin / energy needed for successful collisions ignore reference to catalysts
	c	i	(2 x 805 =) 1610 (1) (4 x 464 =) 1856 (1) energy released = 3466 (1)	[3]	allow 3 marks for 3466 without working (even if not on answer line) ignore if go on to calculate 730 here
		ii	730 (1)	[1]	ignore sign (plus or minus) allow ecf from ci give mark for 730 without working
			Total	[8]	
4	a	i	4.8 (1) divided by 7.0 = 0.69 (1)	[2]	give 2 marks for correct answer without working do not allow 4.9 or 0.7 allow 0.68 or 0.685 or 0.686 (max 3 sf)
		ii	Rf value is always the same for each compound (1) distance travelled by spot/solvent front may be different on different chromatograms (1)	[2]	allow can be used to identify compound ignore reference to accuracy/precision
	b		stationary phase is paper and mobile phase is solvent / mobile phase moves up through stationary phase (1) for each compound there is a dynamic equilibrium between the two phases (1) how far each compound moves depends on its distribution between the two phases / if the compound is more soluble in the mobile phase it will move further up the paper (1)	[3]	for third mark allow compounds travel different distances because they have different solubility in phases / dynamic equilibrium is more to one side / spend different amounts of time in the two phases
			Total	[7]	

Question		Expected Answer	Mark	Additional Guidance
5	a	measure out 25.0 cm ³ of the stock solution (1) make up to 250 cm ³ with (distilled/deionised) water (1)	[2]	allow one mark for adding 1 part stock solution to 9 parts water ignore references to dilution to a tenth of stock concentration
	b	i	[1]	be careful not to give this mark just for getting 0.178 the mark is for the correct method used to get 0.178 do not allow a mark for eg $28.2 \times 6.3/100 = 0.178$
		ii	[3]	allow any correct method for working eg $40 \times 6.3/63 \times 28.2/1000$ allow 0.113 without working for 2 marks allow ecf from mass to concentration ie x40
		iii	[2]	ignore references to accuracy ignore references to outliers
		Total	[8]	
6	a	air makes the process (more) sustainable (1) because the supply of air is not limited / air is renewable (1) natural gas makes the process less/not sustainable (1) because it is finite/will one day run out/not renewable (1)	[4]	
	b	catalyst provides an alternative route (1) with a lower activation energy / less energy needed to begin the reaction / less energy needed to break bonds (1) QWC is for correct use of the term activation energy (1)	[2] [1]	do not allow marks for other explanations of how a catalyst works ignore references to collisions
	c	reactants/nitrogen and hydrogen that have not reacted are recycled (1) ammonia is removed so the system does not reach equilibrium/reverse reaction is not possible/pushes equilibrium to the right (1)	[2]	no mark simply for saying 85% recycled, must have idea that this gas has not reacted / goes back to react
		Total	[9]	

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