

Chemistry B (Salters)

Advanced GCE A2 H435

Advanced Subsidiary GCE AS H035

Mark Schemes for the Units

January 2009

H035/H435/MS/R/09J

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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.

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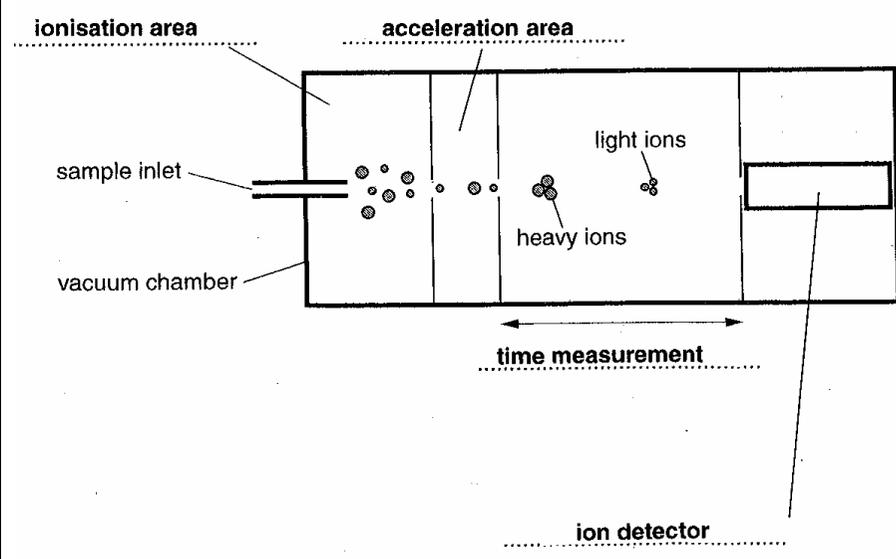
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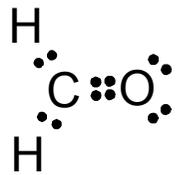
MARK SCHEME FOR THE UNITS

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F331

Question		Expected Answers			Marks	Additional Guidance												
1	a	C, B, A, D			3	4 correct (3) 2 correct (2) 1 correct (1)												
	b	i	<table border="1"> <thead> <tr> <th>sub-atomic particle</th> <th>mass/amu</th> <th>electrical charge</th> </tr> </thead> <tbody> <tr> <td>proton</td> <td>1</td> <td>+1</td> </tr> <tr> <td>neutron</td> <td>1</td> <td>0/zero</td> </tr> <tr> <td>electron</td> <td>negligible</td> <td>-1</td> </tr> </tbody> </table>	sub-atomic particle	mass/amu	electrical charge	proton	1	+1	neutron	1	0/zero	electron	negligible	-1		1	all correct (1) must have - sign
sub-atomic particle	mass/amu	electrical charge																
proton	1	+1																
neutron	1	0/zero																
electron	negligible	-1																
		ii	mass number is protons + neutrons / nucleons (1) ; A_r is average / mean (1) ; of (naturally occurring) isotopes (1) ;		3	allow cannot have fractional protons and neutrons do not allow sub-atomic particles												
	c	${}_{88}^{226}\text{Ra} \longrightarrow {}_2^4\text{He} + {}_{86}^{222}\text{Rn}$ Ra correct (1) ; Alpha / He correct (1) ; Rn correct (ecf on Z) (1) ;			3	If not alpha decay – zero con 1 mark if numbers are on wrong side (any one) con 1 mark if upper case used for second letter in symbol allow – He on LHS; 2+ charge on He												
	d	i	<i>any two from:</i> half life / decay constant has remained unchanged ; no loss / gain of parent isotope / original radioisotope same age as rock ; no loss / gain of daughter products/no daughter product at start ;		2	'original rock contained the parent isotope but not the daughter isotope' for this answer, allow one mark for idea of assuming no presence of daughter product from an alternative source allow no loss of gas do not allow half life/mass must be known												

		<p>ii</p>  <p>The diagram shows a cross-section of an ion mass spectrometer. On the left, a 'sample inlet' leads into a 'vacuum chamber'. The chamber is divided into three main sections: an 'ionisation area' where ions are created, an 'acceleration area' where they are sped up, and a detection region. 'light ions' and 'heavy ions' are shown as small circles moving from left to right. A 'time measurement' arrow indicates the distance from the end of the acceleration area to the 'ion detector' on the right.</p>	<p>4</p>	<p>one mark for each correct label; ionisation area (1) ; acceleration area (1) ; ion detector (1) ; time measurement (1) ;</p> <p>allow paraphrases/shortened phrase eg detector</p>
<p>Total</p>		<p>16</p>		

Question			Expected Answers	Marks	Additional Guidance
2	a	i	coloured / bright / rainbow / visible spectrum (background)(1) ; black <u>lines</u> (1) ; getting closer at higher frequency(1) ;	3	do not allow spectrum of light allow getting closer at shorter / smaller / lower wavelength ORA
		ii	black/dark background(1) ; coloured/bright <u>lines</u> (1) ;	2	note: check above before awarding on this part for ecf's e.g. a (i) may have got first two marking points wrong way round (zero) but answered this part as a reverse argument therefore scores two (effectively one mistake penalised in a (i)).
	b	i	 <p>two lone pairs on oxygen (1) ; two crosses and two dots between C and O (1) ; dot and cross between <u>each</u> C and H (1) ;</p>	3	must look like pairs too many electrons on C atom cons second mark allow other variations of dots/crosses eg squares/triangles etc. note: expected answer on left does not show difference clearly enough to score 2 nd and 3 rd marking points.
		ii	bond angle between 118 -122 ^o (1) ; 3 sets (AW) of electrons (1) ; around C atom (1) ; repel as far as possible/minimise electronic energy / repulsion (1) ; planar/flat molecule (1) ;	5	Please tick marks awarded allow regions/areas of (high) of electron density allow reference to central atom do not allow atoms repel but allow bonds repel.... (already penalised on second marking point unless clear that bonds refer to pairs of electrons - in which case both points scored) ignore triangular / trigonal con pyramidal structure (diagram or words)
Total				13	

Question		Expected Answers	Marks	Additional Guidance
3	a	<p>any two from:</p> <p>sustainable/renewable ;</p> <p>biodegradable ;</p> <p>avoids wasting/using up fossil fuels ;</p> <p>Less CO ;</p> <p>carbon neutral/no net emission of CO₂ / AW ;</p>	2	<p>do not allow any answers in terms of expense</p> <p>do not allow produces less pollution / no SO₂ / high octane number / less CO₂ / less global warming</p>
	b	i	2	<p>note: 1.2 x 4.18 x 25 = 125.4 scores (1)</p> <p>equation can be implied by correct working</p>
		ii	4	<p>ecf's carry through but examiners will need to check through working before deciding whether ecf marks can be awarded.</p> <p>for sig fig mark rounding must be correct from candidates answer</p> <p>sign - independent mark</p> <p>-401 scores all four marks</p>
		iii	2	<p>do not allow answers in terms of operator error unless describing heat loss</p>

	c	i	bonds broken: C-C; C-H; C-O; (O-H) (1) ; O=O (1) ; bonds made: O-H; C=O (1) ;	3	O-H bond as bond <u>broken</u> not required allow named references to bonds i.e. the O to O bond in oxygen do not allow C-O for a bond <u>made</u> allow CO bond/C triple bond O if referring to carbon monoxide
	c	ii	energy in / endothermic to break reactant bonds (1) ; more energy given out / exothermic to form product bonds (1) ;	2	ignore references to number of double bonds formed more bonds formed cons second mark note: second marking point now runs two marking points from previous mark schemes into one
	d		measures tendency / (AW), to autoignite / pre-ignite / knock (1) ; high value means low auto ignition (1) ; efficient / prevents damage to engine (1) ;	3	first two marking points can come from one statement do not allow stops/prevents auto ignition or two explosions/sparks
			Total	18	

Question			Expected Answers	Marks	Additional Guidance
4	a	i	F(1); G(1);	2	
		ii	appropriate skeletal part (1): ie 'R' group(s);	1	circle must cover all R group but allow starting or final C missed must not include C of ester group do not allow left side vertical carbons
		iii	Skeletal (1);	1	allow variable spelling as long as recognisable
		iv	C ₃ H ₈ O ₃ (any order) (1);	1	extras con mark unless clearly working eg 3C ₃ H ₈ O ₃ scores zero
	b	i	volume = 19 x 24 = 456dm ³ (1);	1	
		ii	(O atom in structure allows) combustion more thorough / complete therefore carbon dioxide produced (1); QWC mark = any of combustion / combust(s) / oxidised / oxidized / oxidation CO is toxic / poisonous / correct description of why it is toxic (ora) (1); fuel more efficient (AW) (1);	3	note: QWC mark is not a separate marking point. Appropriate word has to be spelt correctly to score first mark. do not allow harmful/bad for you (too vague) acid rain and greenhouse gas con toxic mark ignore photochemical smog
	c	i	air / atmosphere;	1	
		ii	N ₂ (g) + O ₂ (g) → 2NO(g) equation (1); state symbols (1);	2	allow multiples/halves state symbol mark independent as long as correct for species shown
		iii	need to break NN bond / NN bond / stable N ₂ molecule very high bond enthalpy / high E _A / very strong(1);	1	must refer to nitrogen bond (or imply) ignore references to oxygen but con reference to other bond types
			Total	13	

Grade Thresholds

Advanced GCE Chemistry B (Salters) (H035/H435)
January 2009 Examination Series

Unit Threshold Marks

Unit		Maximum Mark	A	B	C	D	E	U
F331	Raw	60	46	41	36	32	28	0
	UMS	90	72	63	54	45	36	0

For a description of how UMS marks are calculated see:

http://www.ocr.org.uk/learners/ums_results.html

Statistics are correct at the time of publication.

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