

IGCSE Chemistry 4335 / 2H

Mark Scheme (Final)

November 2007

IGCSE

IGCSE Chemistry (4335/2H)

General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question Number	Question	
1	(a)	
	Acceptable Answers	Reject
	(i) C / F	
	(ii) A and B	
	(iii) E	
	Notes	
		Mark
		(1)
		(1)
		(1)

Question Number	Question	
1	(b)	
	Acceptable Answers	Reject
	Poly((ethene)).	
	Accept polythene/Polyethylene	
	correct repeat unit	
	$\begin{array}{c} \text{H} \\ \\ -\text{C}- \\ \\ \text{H} \end{array}$	Or any multiple length (2 + carbons)
	continuation bonds ____ or	
 (only if first mark awarded)	
	Notes	
	Ignore 'brackets' and 'n' or other subscripts	
		Mark
		(1)
		(1)
		(1)

Total 6 marks

Question Number	Question																
2	(a)																
	Acceptable Answers	Reject															
	<table border="1"> <thead> <tr> <th>Particle</th> <th>Relative mass</th> <th>Relative charge</th> </tr> </thead> <tbody> <tr> <td>Electron</td> <td>$\frac{1}{1840}$ $\frac{1}{2000}$ $\frac{1}{1850}$</td> <td>-1</td> </tr> <tr> <td></td> <td>$\frac{1}{1836}$</td> <td></td> </tr> <tr> <td>Neutron</td> <td></td> <td>0 / nil</td> </tr> <tr> <td>Proton</td> <td>1</td> <td></td> </tr> </tbody> </table>	Particle	Relative mass	Relative charge	Electron	$\frac{1}{1840}$ $\frac{1}{2000}$ $\frac{1}{1850}$	-1		$\frac{1}{1836}$		Neutron		0 / nil	Proton	1		
Particle	Relative mass	Relative charge															
Electron	$\frac{1}{1840}$ $\frac{1}{2000}$ $\frac{1}{1850}$	-1															
	$\frac{1}{1836}$																
Neutron		0 / nil															
Proton	1																
	Notes																
	Ignore negligible																
		Mark															
		(4)															

Question Number	Question		
2	(b)		
	Acceptable Answers	Reject	Mark
	(i) helium / carbon / nitrogen / oxygen / neon / magnesium / silicon / sulphur / calcium		(1)
	(ii) silicon		(1)
	(iii) hydrogen		(1)
	Notes Max penalty 1 if give symbols for all 3 rather than names		

Question Number	Question		
2	(c)		
	Acceptable Answers	Reject	Mark
	7		
	Notes		(1)

Question Number	Question		
2	(d)		
	Acceptable Answers	Reject	Mark
	(i) full / complete ignore saturated		(1)
	(ii) unreactive/inert/do not undergo reactions		(1)
	Notes		

Total 10 marks

Question Number	Question		
3	(a)		
	Acceptable Answers	Reject	Mark
	zinc is less reactive than magnesium Magnesium is more reactive than Zinc Notes Or correct reference to positions in reactivity series	<u>It</u> is more reactive	(1)

Question Number	Question	
3	(b)	
	Acceptable Answers	Reject
	(i) $\text{Fe} + \text{CuSO}_4 \rightarrow \text{FeSO}_4 + \text{Cu}$ reagents products Notes incorrect balancing = -1 be generous with cases (ii) (dark) grey (1) to pink-brown (1) blue (1) to green (1) Notes Ignore additional information	
		Mark
		(1) (1) (2) (2)

Question Number	Question	
3	(c)	
	Acceptable Answers	Reject
	hydrogen more reactive than copper hydrogen less reactive than iron Notes Hydrogen between Fe + Cu for both marks	Iron(II) or Copper (II)
		Mark
		(1) (1)

Total 9 marks

Question Number	Question	
4	(a)	
	Acceptable Answers	Reject
	(i) enthalpy / (heat) energy change (ii) increases/goes up Notes Mark independently. Ignore reference to bonds.	
		Mark
		(1) (1)

Question Number	Question	
4	(b)	
	Acceptable Answers	Reject
	Water Notes	Formulae
		Mark
		(1)

Question Number	Question	
4	(c)	
	Acceptable Answers	Reject
	<ul style="list-style-type: none"> • stir (allow heat) • excess magnesium carbonate • filter • evaporate/heat/window-ledge • crystallisation point • Cool • final separation (decant/filter/tweezers) • Suitable method of drying. Allow use of oven but not if T > 100 °c; filter paper - mark dependant on crystals being separated. <p>Notes If heated to dryers then no further marks given (evaporating stage) If excess acid, max 3 Max 5</p>	
		(5)

Total 9 marks

Question Number	Question	
5	(a)	
	Acceptable Answers	Reject
	(i) shared electron pair all other electrons correct (ignore inner shells even if wrong)	
	(ii) bottom box crossed	
	Notes	
		(1) (1) (1)

Question Number	Question	
5	(b)	
	Acceptable Answers	Reject
	(i) H^+/H_3O^+ other ions negate	
	(ii) no acid made / no Hydrogen ions stays covalent/does not ionize	
	Notes	
		(1) (1)

Question Number	Question		
5	(c)		
	Acceptable Answers	Reject	
	(i) red/ orange bleached/ white		(1) (1)
	(ii) same number of electrons / same electronic configurations 'Same protons' negates Notes		(1)

Question Number	Question		
5	(d)		
	Acceptable Answers	Reject	Mark
	add sodium hydroxide (solution)/ammonia solution/ ammonium hydroxide green ppt/solid/suspension Orange/brown/orange-brown/foxy brown/rusty brown/red-brown ppt/ solid/suspension Notes If miss out ppt then give 1 mark for 2 correct colours result marks only given if test correct	Powder/crystals/bits Orange/rusty/red	(1) (1) (1)

Total 11 marks

Question Number	Question		
6	(a)		
	Acceptable Answers	Reject	Mark
	(i) sugar / carbohydrate		(1)
	(ii) CH ₂ O		(1)
	Notes Ignore glucose		

Question Number	Question		
6	(b)		
	Acceptable Answers	Reject	Mark
	solution / dissolve in water yeast = 1 20 - 40 °C no air / oxygen Notes Any other condition = 1 Max 2		(2)

Question Number	Question		
6	(c)		
	Acceptable Answers	Reject	Mark
	(i) $C_2H_4 + H_2O \rightarrow C_2H_5OH$		(1)
	(ii) phosphoric acid steam / heat / high temperature / temperature range 250-350°C high pressure / pressure range 60-70 atm		(2)
	Notes (ii) max 2		

Question Number	Question		
6	(d)		
	Acceptable Answers	Reject	Mark
	shortage/cost of (crude) oil/ petroleum availability of sugar (cane)	Petrol glucose	(1) (1)
	Notes		

Question Number	Question		
6	(e)		
	Acceptable Answers	Reject	Mark
	(i) sodium/ Na		(1)
	(ii) sodium ethoxide		(1)
	(iii) ionic		(1)
	Notes		

Total 12 marks

Question Number	Question	
7	(a)	
	Acceptable Answers	Reject
	(i) S ₈	
	(ii) (I) covalent (bonding)/bonds between atoms	
	(II) van der Waals'/intermolecular forces/bonds between molecules	
	Notes	
		Mark
		(1)
		(1)
		(1)

Question Number	Question	
7	(b)	
	Acceptable Answers	Reject
	(i) 2SO ₂ + O ₂ = 2SO ₃ ACCEPT → all formulae correct balancing	
	(ii) 450 °C / temperature in range 400-500 °C 1-2 atm (<i>accept atmospheric pressure</i>) vanadium(V) oxide (catalyst)/ vanadium oxide	
	Notes	
		Mark
		(1)
		(1)
		(1)
		(1)
		(1)

Question Number	Question	
7	(c)	
	Acceptable Answers	Reject
	(i) SO ₃ + H ₂ O → H ₂ SO ₄	
	(ii) fish harmed/ killed stonework eaten away/ OWTTE iron rusts (more quickly)	Damages buildings
	Notes	
	(ii) max 2	
		Mark
		(1)
		(2)

Total 11 marks

Question Number	Question		
8	(a)		
	Acceptable Answers	Reject	Mark
	(i) giant/regular structure/lattice of positive ions delocalised electrons/free electrons/sea of electrons/	Nuclei Molecules/covalent/ionic = 0/2	(1) (1)
	(ii) can be beaten/hammered/rolled into (thinner) shape		(1)
	(iii) layers (of atoms/ions) slide over each other	Molecules/covalent/ionic = 0/2	(1)
	Notes		(1)

Question Number	Question		
8	(b)		
	Acceptable Answers	Reject	Mark
	(shared/bonding) pair of electrons attracted to fluorine nuclei		(1) (1)
	Notes		

Question Number	Question		
8	(c)		
	Acceptable Answers	Reject	Mark
	2,7 2.8		(1) (1)
	Notes		

Question Number	Question		
8	(d)		
	Acceptable Answers	Reject	Mark
	(ion) 2 and 8 • or × shown on diagram 2+ shown		(1) (1)
	Notes		

Question Number	Question		
8	(e)		
	Acceptable Answers	Reject	Mark
	Mg ion / Mg ²⁺ has higher charge (than Na ion / Na ⁺) stronger attraction between ions/ stronger <u>ionic</u> bonds		(1) (1)
	Notes		

Total 13 marks

Question Number	Question		
9	(a)		
	Acceptable Answers	Reject	Mark
	decreases increases increases no change		
	Notes		(4)

Question Number	Question		
9	(b)		
	Acceptable Answers	Reject	Mark
	rate increases (reactant) particles closer together/more particles in given volume molecules/particles collide more frequently/ more collisions per second	Rate same/rate decreases = 0/3 atoms	(1) (1) (1)
	Notes If no mention of particles/molecules max 1 for explanation		

Question Number	Question		
9	(c)		
	Acceptable Answers	Reject	Mark
	recycled / put back into reactor	Used again	(1)
	Notes		

Question Number	Question		
9	(d)		
	Acceptable Answers	Reject	Mark
	(i) oxidation / redox/ accept exothermic		(1)
	(ii) platinum / rhodium/ Pt/ Rh		(1)
	(iii) $2\text{NO} + \text{O}_2 \rightarrow 2\text{NO}_2$		(1)
	all formulae correct		(1)
	balancing		
	Notes		

Question Number	Question		
9	(e)		
	Acceptable Answers	Reject	Mark
	NH_4NO_3		(1)
	Notes		

Question Number	Question		
9	(f)		
	Acceptable Answers	Reject	Mark
	phosphorus	Phosphate	(1)
	potassium		(1)
	Notes		

Total 15 marks

Question Number	Question		
10	(a)		
	Acceptable Answers	Reject	Mark
	brick red/ orange - red	Red / orange	
	Notes		(1)

Question Number	Question		
10	(b)		
	Acceptable Answers	Reject	Mark
	water / H ₂ O		
	Notes		(1)

Question Number	Question		
10	(c)		
	Acceptable Answers	Reject	Mark
	(i) $M_r = 74$ $n \text{ Ca(OH)}_2 = 14.8 \div 74 = 0.2$ (ECF)		(1) (1)
	(ii) $n \text{ HNO}_3 = 2 \times 0.2 = 0.4$ (ECF) $V = 0.4 \div 1.6 = 0.25$ (dm ³) $= 250 \text{ cm}^3$		(1) (1) (1)
	(iii) $M_r = 164$ $m = 0.05 \times 164 = 8.2 \text{ g}$		(1) (1)
	Notes Penalise 1 sf in (iii)		

Question Number	Question		
10	(d)		
	Acceptable Answers	Reject	Mark
	Ca(NO ₃) ₂ + Na ₂ CO ₃ → CaCO ₃ + 2NaNO ₃ all formulae correct balancing white precipitate/solid/ suspension accept ionic equation		(1) (1) (1)
	Notes		

Total 12 marks

Question Number	Question		
11	(a)		
	Acceptable Answers	Reject	Mark
	(i) (<i>on diagram</i>) - in left and + in right		(1)
	(ii) H ⁺ gain of electrons	oH ⁻ = 0/2	(1) (1)
	(iii) (<i>on diagram</i>) horizontal line in right-hand tube about halfway between given line and top of tube		(1)
	(<i>explanation</i>) for same number of electrons in I and II 2 moles/molecules of hydrogen formed for 1 mole/molecule of oxygen	If wrong level 0/3	(1) (1)
	Notes		

Question Number	Question		
11	(b)		
	Acceptable Answers	Reject	Mark
	(i) 0.2(0)		(1)
	(ii) 0.2×24 = 4.8 (dm ³)		(1) (1)
	Notes		

Question Number	Question		
11	(c)		
	Acceptable Answers	Reject	Mark
	(i) 0.2(0)		(1)
	(ii) 0.2×32 = 6.4 (g)		(1) (1)
	Notes Penalise 1 sf in ii		

Total 12 marks

Paper total 120 marks