edexcel
advancing learning, changing lives

Mark Schemes Summer 2008

IGCSE

IGCSE Chemistry (4335)

Edexcel Limited. Registered in England and Wales No. 4496750
Registered Office: One90 High Holborn, London WC1V 7BH

A PEARSON COMPANY

Edexcel is one of the leading examining and awarding bodies in the UK and throughout the world. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers.

Through a network of UK and overseas offices, Edexcel's centres receive the support they need to help them deliver their education and training programmes to learners.

For further information please call our Customer Services on + 44 1204 770 696, or visit our website at www.edexcel-international.org.uk.

Summer 2008

Publications Code UG020251

Contents

IGCSE CHEMISTRY 4335-1F MARK SCHEME

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
1 (a)	second box			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
1 (b)(i)	top box			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
1 (b)(ii)	middle box			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
1 (c)(i)	made up of/contains only one type of atom or something that cannot be broken down by chemical means			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
1 (c)(ii)	three/3			**(1)**

(Total 5 marks)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
2 (a)(i)	magnesium			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
2 (a)(ii)	gold			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
2 (b)(i)	magnesium/zinc is more reactive than iron OR magnesium displaces iron			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
2 (b)(ii)	zinc sulphate AND iron			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
2 (c)(i)	bulb / ammeter/buzzer			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
2 (c)(ii)	ions			**(1)**

(Total 6 marks)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
3 (a)(i)	lighted spill pop (dependent on correct test)			**1** **1** **(2)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
3 (a)(ii)	sodium hydroxide			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
3 (a)(iii)	green blue/purple			**1** **1** **(2)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
3 (b)	loses gains (give one mark if the first two are the wrong way round) high strong (dependent on having high correct)			**1** **1** **1** **1** **(4)**

(Total 9 marks)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
4 (a)(i)	bitumen			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
4 (a)(ii)	refinery gases			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
4 (a)(iii)	gasoline			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
4 (b)	kerosene diesel/gasoline/refinery gases bitumen			**1** **1** **1** **(3)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
4 (c)(i)	oxygen on left water on right carbon dioxide on right			**1** **1** **1** **(3)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
4 (c)(ii)	carbon monoxide			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
4 (c)(iii)	carbon			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
4 (d)(i)	giant momomers			**1** **1** **(2)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
4 (d)(ii)	middle box			**(1)**

(Total 14 marks)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
5 (a)(i)	fifth / last box			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
5 (a)(ii)	A E C D – fully correct gets three marks. If not fully correct then (to a maximum of two): both A and E before C – 1 mark D directly after C – 1 mark E directly before C – 1 mark			**(3)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
5 (a)(iii)	heat / warm			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
5 (b)(i)	yellow			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
5 (b)(ii)	red			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
5 (b)(iii)	neutralisation			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
5 (b)(iv)	water			**(1)**

(Total 9 marks)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
6 (a)	first box: nitrogen second box: oxygen third box: argon; carbon dioxide. one mark per gas in correct box. If gas used twice then no mark for that gas.			**(4)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
6 (b)(i)	black			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
6 (b)(ii)	CuO			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
6 (c)(i)	top box: hydrochloric acid bottom box: calcium carbonate			**(2)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
6 (c)(ii)	limewater/calcium hydroxide (solution)			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
6 (c)(iii)	fire extinguisher / fizzy drinks / dry ice as coolant or stage effects			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
6 (d)(i)	carbon			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
6 (d)(ii)	magnesium			**(1)**

(Total 12 marks)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
7 (a)(i)	electrolysis			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
7 (a)(ii)	graphite / carbon			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
7 (a)(iii)	– on left and + on right			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
7 (a)(iv)	aluminium oxide / alumina cryolite	accept correct formulae ignore bauxite		**1** **1** **(2)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
7 (a)(v)	electricity (ignore qualifications) / electrical energy (not energy alone)	Anode/ positive electrode replacement	Cathode /electrode replacement	**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
7 (b)(i)	oxygen			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
7 (b)(ii)	•carbon dioxide / carbon monoxide •graphite/carbon/electrode oxidised/burned/reacts with oxygen	accept correct formulae (ignore lower case)	lists equation	**1** **1** **(2)**

(Total 9 marks)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
8 (a)(i)	Any two from: •same or similar chemical properties / same functional group • gradation in physical properties •neighbouring/successive members differ by CH2	Gradation of specified physical property (eg: boiling point/bp(t), melting point/mp(t), viscosity)	NOT a specified chemical property different/ same physical properties	**(2)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
8 (a)(ii)	alkene			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
8 (a)(iii)	CnH2n	Any other letter in place of "n"		**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
8 (b)(i)	•(H) one electron shown •(C) two electrons in first shell and four in second shell	Accept any symbol for electrons.	Electrons on nucleus	**1** **1** **(2)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
8 (b)(ii)	•all five atoms and four shared pairs of electrons •no extra outer electrons.	IGNORE inner electrons		**1** **1** **(2)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
8 (b)(iii)	tetrahedral			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
8 (c)(i)	•(compounds with) same molecular formula •(but) different structural formulae /displayed formula/structure / atoms arranged differently (same) elements = 0 marks	Mark independently	same chemical formula Reject substances	**1** **1** **(2)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
8 (c)(ii)	Correct structures of butane and methylpropane. ALL bonds shown Penalise sticks with missing H once only			**1** **1** **(2)**

(Total 13 marks)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
9 (a)(i)	2			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
9 (a)(ii)	2.8.2			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
9 (b)(i)	any two from •effervescence / fizzing / bubbles • cloudiness / white precipitate /milky / white suspension •Ca get smaller / disappears (ignore dissolves). •Ca moves up and down	Ignore gas made ignore floats/moves	List	**(2)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
9 (b)(ii)	Ca(OH)2			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
9 (b)(iii)	•blue •alkali / OH^- / hydroxide / pH >7 (ignore base) •stated pH value in range 8-14		purple	**1** **1** **(2)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
9 (c)(i)	•grey / silver(y) •white			**1** **1** **(2)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
9 (c)(ii)	any two from •over/through water / downward displacement of water • (gas) syringe •upward delivery / downward displacement of air	a description of this suitable diagrams	gas cylinder	**(2)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
9 (c)(iii)	hydrogen + oxygen → water / steam	ignore heat	formulae	**(1)**

(Total 12 marks)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
10 (a)(i)	ammonia / NH3		Ammon**ium** NH_4	**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
10 (a)(ii)	chloride / Cl^-		Chlor**ine** Cl Cl_2	**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
10 (a)(iii)	copper(II) / Cu^{2+} / copper /cupric	cupper	Copper(I) Cuprous Cu^+	**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
10 (a)(iv)	iron(II) / Fe^{2+} / ferrous		Fe^{3+} Ferric Iron	**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
10 (b)(i)	CuSO4 / copper((II)) sulphate			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
10 (b)(ii)	• KNO_3 / potassium nitrate • lilac (dependent on correct compound) **OR** • CuSO4 / copper((II)) sulphate • green / blue-green (dependent on correct compound)	potassium/C pink copper/B	Purple blue	**(2)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
10 (c)(i)	yellow **precipitate/ppt/ppte**	**suspension**		**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
10 (c)(ii)	$AgNO_3(aq) + LiI(aq) \rightarrow AgI(s) + LiNO_3(aq)$ $LiI(aq) + AgNO_3(aq)$ formulae of products state symbols of products (dependent on correct product formulae)	if all correct but balanced wrongly, award 2 marks		**(3)**

(Total 11 marks)

PAPER TOTAL 100 MARKS

IGCSE CHEMISTRY 4335-2H MARK SCHEME

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
1 (a)(i)	electrolysis			**(1)**
1 (a)(ii)	graphite / carbon			**(1)**
1 (a)(iii)	– on left and + on right			**(1)**
1 (a)(iv)	aluminium oxide / alumina cryolite	accept correct formulae ignore bauxite		**1** **1** **(2)**
1 (a)(v)	electricity (ignore qualifications) / electrical energy (not energy alone)	anode/positive electrode replacement	cathode /electrode replacement	**(1)**
1 (b)(i)	oxygen			**(1)**
1 (b)(ii)	•carbon dioxide / carbon monoxide •graphite/carbon/electrode oxidised/burned/reacts with oxygen	accept correct formulae (ignore lower case)	lists equation	**1** **1** **(2)**
				9
2 (a)(i)	Any two from: •same or similar chemical properties / same functional group • gradation in physical properties •neighbouring/successive members differ by CH2	gradation of specified physical property (eg: boiling point/bp(t), melting point/mp(t), viscosity)	NOT a specified chemical property different/ same physical properties	**(2)**
2 (a)(ii)	alkene			**(1)**
2 (a)(iii)	CnH2n	any other letter in place of "n"		**(1)**
2 (b)(i)	•(H) one electron shown •(C) two electrons in first shell and four in second shell	aAccept any symbol for electrons.	electrons on nucleus	**1** **1** **(2)**
2 (b)(ii)	•all five atoms and four shared pairs of electrons •no extra outer electrons.	IGNORE inner electrons		**1** **1** **(2)**
2 (b)(iii)	tetrahedral			**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
2 (c)(i)	•(compounds with) same molecular formula •(but) different structural formulae /displayed formula/structure / atoms arranged differently (same) elements = 0 marks	mark independently	same chemical formula. Reject substances.	**1** **1** **(2)**
2 (c)(ii)	Correct structures of butane and methylpropane. ALL bonds shown Penalise sticks with missing H once only			**1** **1** **(2)**
				13
3 (a)(i)	2			**(1)**
3 (a)(ii)	2.8.2			**(1)**
3 (b)(i)	any two from •effervescence / fizzing / bubbles • cloudiness / white precipitate /milky / white suspension •Ca get smaller / disappears (ignore dissolves). •Ca moves up and down	ignore gas made ignore floats/moves	List	**(2)**
3 (b)(ii)	Ca(OH)2			**(1)**
3 (b)(iii)	•blue •alkali / OH^- / hydroxide / pH >7 (ignore base) •stated pH value in range 8-14		purple	**1** **1** **(2)**
3 (c)(i)	•grey / silver(y) •white			**1** **1** **(2)**
3 (c)(ii)	any two from •over/through water / downward displacement of water • (gas) syringe •upward delivery / downward displacement of air	a description of this suitable diagrams	gas cylinder	**(2)**
3 (c)(iii)	hydrogen + oxygen → water / steam	ignore heat	formulae	**(1)**
				12
4 (a)(i)	ammonia / NH3		ammon**ium** NH_4	**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
4 (a)(ii)	chloride / Cl^-		chlor**ine** Cl Cl_2	**(1)**
4 (a)(iii)	copper(II) / Cu^{2+} / copper /cupric	cupper	copper(I) cuprous Cu^+	**(1)**
4 (a)(iv)	iron(II) / Fe^{2+} / ferrous		Fe^{3+} ferric iron	**(1)**
4 (b)(i)	CuSO4 / copper((II)) sulphate			**(1)**
4 (b)(ii)	• KNO_3 / potassium nitrate • lilac (dependent on correct compound) **OR** • CuSO4 / copper((II)) sulphate • green / blue-green (dependent on correct compound)	potassium/C pink copper/B	purple blue	**(2)**
4 (c)(i)	yellow **precipitate/ppt/ppte**	suspension		**(1)**
4 (c)(ii)	$AgNO_3(aq) + LiI(aq) \rightarrow AgI(s) + LiNO_3(aq)$ $LiI(aq) + AgNO_3(aq)$ formulae of products state symbols of products (dependent on correct product formulae)	if all correct but balanced wrongly, award 2 marks		**(3)**
				11
5 (a)(i)	diffusion			**(1)**
5 (a)(ii)	• mention of particles (if particles named, must be correct) in correct context • moving (randomly)	(accept molecules/ ions) **move** (from high to low concentration)		**1** **1** **(2)**
5 (b)(i)	• (blue) ppt – colour not needed but penalise ppt if colour is wrong • deep/dark/royal blue • solution / dissolves	ignore changes to colour of solution	dark/royal/ deep blue ppt	**1** **1** **1** **(3)**
5 (b)(ii)	$[Cu(H2O)2(NH3)4]^{2+}$ / $[Cu(NH_3)_4(H_2O)_2]^{2+}$	formulae without []		**(1)**
				7

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
6 (a)(i)	Any three from •float/on surface •fizz/bubble (ignore gas) •move/dart about •melt/form sphere/ball •Na gets smaller / disappears (ignore dissolves)	ignore references to flames / igniting		**(3)**
6 (a)(ii)	2Na + 2H2O →2 NaOH + H2 •correct formulae •balancing (dependent on first mark being awarded)	Na(OH) any multiple		**(2)**
6 (a)(iii)	Moves/bubbles faster/(more) violent/more vigorous/catches fire/flame/ explodes		reaction faster/ it is faster	**(1)**
6 (b)(i)	•sodium loses electron(s) • oxygen gains electrons •correct number of electrons for each atom marks could be gained by suitable additions to printed diagram	indication of 2 Na and 1 O	any reference to sharing /covalent gives O	**(3)**
6 (b)(ii)	•strong attractive forces / bonds (regardless of what these are between) •between **<u>ions</u>** •require a lot of energy to overcome / difficult to break (regardless of what these are between)		second mark not given if atoms / molecules / intermolecular	**1** **1** **1** **(3)**
6 (b)(iii)	•strong**er** attractive forces / bonding •magnesium ion 2+, sodium ion 1+ / magnesium loses 2 electrons, sodium loses 1 electron/magnesium ions are smaller or have bigger charge or are more highly charged (must state or imply comparison between Mg and Na)	ignore more bonds/ intermolecular forces	MgO Covalent = 0 delocalised electrons = 0	**1** **1** **(2)**
				14

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
7 (a)	any five from: •add magnesium carbonate to acid •stir/mix •excess magnesium carbonate • filter / centrifuge and decant •heat or evaporate filtrate and stop evaporation at a suitable point / heat filtrate and leave to cool / leave filtrate to evaporate or to crystallise or for suitable time / place in oven below 100 °C •dry crystals with (filter) paper /desiccator	Ignore indicators •If use sodium carbonate (or other soluble carbonate)only points 2,5,6 •If use other insoluble carbonate, all bar first point. •Wrong method of prep. Then get 5 and 6 only.	heat to dryness, can not get 5 or 6	**(5)**
7 (b)(i)	•colourless •to pink	if just state "pink" with no start colour, then score 1	purple / red	**1** **1** **(2)**
7 (b)(ii)	•0.150 x 0.00870 •=0.00131 correct answer scores 2 (moles)	incorrect or failure to convert volume to dm^3 gives max 1 accept 2 to 4 sig figs (0.001305)	wrong numbers used = 0	**1** **1** **(2)**
7 (b)(iii)	(ii) ÷ 2 = 0.000653 (moles)	cq on b(ii) accept 2 to 4 sig figs (0.006525)		**(1)**
7 (b)(iv)	(iii) ÷ 0.025 = 0.0261 (mol dm^{-3})	cq on b(iii) accept 2 to 4 sig figs (0.02612)		**(1)**
				11
8 (a)(i)	•add (named) acid •bubbles/effervescence/fizzing OR gas produced turns limewater milky	2nd mark possible only if acid added		**1** **1** **(2)**
8 (a)(ii)	2NaOH + CO2 → Na2CO3 + H2O formulae = 1 balancing = 1 (only if formulae correct)	accept any multiple		**(2)**
8 (b)	•no change / remains clear •carbon dioxide reacted /removed(by sodium hydroxide) / formed sodium carbonate /			**1** **1** **(2)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
8 (c)(i)	•Mr NaHCO3 = 84 •moles = 4.2 ÷ 84 •= 0.05(0) ignore any units Correct answer scores 3 If M_r incorrect, max 2 (107 gives 0.039; 168 gives 0.025)			**1** **1** **1** **(3)**
8 (c)(ii)	(i) ÷ 2 = 0.025 ignore any units	cq		**(1)**
8 (c)(iii)	(ii) x 24 (dm^3) =0.6 unit not required but penalise incorrect units.	cq	answer in cm^3	**(1)**
				11
9 (a)	any in range 40 to 100			**(1)**
9 (b)(i)	H2 + Cl2 →2HCl formulae = 1 balancing = 1 (only if formulae correct) accept any multiples		CL	**(2)**
9 (b)(ii)	water: • paper becomes red (NOT orange) • acidic / H^+ ions produced methylbenzene: • no change / orange • no H+ ions formed / not acidic /does not ionise (indep. of colour)	red/orange ignore refs to being neutral	orange Ionizes alone green references to acidity of methyl benzene	**1** **1** **1** **1** **(4)**
				7
10 (a)(i)	galvanising / sacrificial protection			**(1)**
10 (a)(ii)	railings / cars /bridges / buckets / watering cans / lamp posts etc.	accept ships/boats even though zinc blocks and not a continuous layer used	bikes	**(1)**
10 (a)(iii)	•zinc more reactive (than iron) • zinc reacts/corrodes/oxidises in preference to /before /instead of iron	It is more reactive than iron	It is more reactive zinc rusts protective coating of zinc oxide	**1** **1** **(2)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
10 (b)	• make solution of nickel nitrate • add metal • if reaction occurs then metal is more reactive than nickel OR • work down from top of list until no reaction occurs / work up from bottom of list until reaction does occur.	displacement reaction without making a solution is max 2	reaction with anything else (such as HCl(aq)) is zero react with metal (for 2nd mark)	**1** **1** **1** **(3)**
10 (c)(i)	Reduced because gain of electrons	reduced because oxidation state decreases		 **(1)**
10 (c)(ii)	•Q=1.5 x 160 = 240(coulombs) •Faradays = 240÷96000 = 0.0025 (cq) •Moles Ni = 0.0025÷2 = 0.00125 (cq) • mass Ni = 0.00125 x 59 = 0.074 (g) (0.0737 or 0.07375) (cq). (0.0025 x 59 is max 3) units not required Final answer correct = 4 marks	Accept 2 or more sig figs (1 sig fig max 3) Accept use of 96500 0.00249 0.001245 0.07337	 incorrect use of kg or mg	**1** **1** **1** **1** **(4)**
				12
11 (a)(i)	•appropriate catalyst alumina/aluminium oxide/porous pot/(conc) phosphoric acid / conc sulphuric acid.) •heat / high temperature	ignore references to pressure 150 – 1000°C	aluminium	**1** **1** **(2)**
11 (a)(ii)	• correct energy level for endothermic (higher) and one from • products marked with correct names/formulae Mark independently	Ignore any activation energies shown		**1** **1** **(2)**
11 (a)(iii)	•Increased •endothermic (left to right) or description of endothermic / ΔH is positive	ignore references to rate	if decreased or stays the same = zero	**1** **1** **(2)**

<table>
<tr><th>Question Number</th><th>Correct Answer</th><th>Acceptable Answers</th><th>Reject</th><th>Mark</th></tr>
<tr><td>11 (b)</td><td>•correct structure with minimum 4 carbons
•continuation bonds shown (not just dots) (brackets not required)</td><td>Ignore “n” subscripts</td><td>any structure with C=C or based on wrong repeat unit = 0</td><td>1
1

(2)</td></tr>
<tr><td>11 (c)</td><td>If calculate empirical first:
•Correct empirical formula with some correct working = 3
<table>
<tr><td>division by A_r</td><td>38.7/12 = 3.23</td><td>9.70/1 = 9.70</td><td>51.6/16 = 3.23</td></tr>
<tr><td>division by smallest</td><td>3.23 / 3.23 = 1</td><td>9.70 / 3.23 = 3</td><td>3.23 / 3.23 = 1</td></tr>
<tr><td>empirical</td><td colspan="3">CH_3O</td></tr>
</table>
•Correct molecular formula (with any correct working)= 2
<table>
<tr><td>mass of empirical</td><td>31</td></tr>
<tr><td>molecular</td><td>$C_2H_6O_2$</td></tr>
</table>
If calculate molecular first
<table>
<tr><td>mass of each element</td><td>38.7 x .62 = 24</td><td>9.70 x 62 = 6</td><td>51.6 x .62 = 32</td></tr>
<tr><td>division by A_r</td><td>24 / 12 = 2</td><td>6 / 1 = 6</td><td>32 / 16 = 2</td></tr>
<tr><td></td><td colspan="3">$C_2H_6O_2$</td></tr>
</table>
correct molecular with some working = 3

Correct empirical = 2</td><td>If A_r incorrect/ use Z in place of A_r then lose first mark

If NO working shown, then max 1 each for the two answers regardless of order of answers</td><td>If first step totally wrong, zero.</td><td>1
1
1

2

1
1
1

2

(5)</td></tr>
<tr><td></td><td></td><td></td><td></td><td>13</td></tr>
</table>

PAPER TOTAL 120 MARKS

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
1 (a)	B E D F	b e d f	Any other answers	**1** **1** **1** **1** **(4)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
1 (b)	F A C	f a c	Any other answers	**(1)**

(Total 5 marks)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
2 (a)	22.65 1.30 *(zero needed for mark)* 21.35			**1** **1** **1**
				(3)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
2 (b) (i)	ticks under 23.10 and 23.20			
				(1)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
2 (b) (ii)	$\frac{23.10 + 23.20}{2}$ 23.15 (answer must be to 2 dp)			**1** **1**
				(2)

(Total 6 marks)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
3 (a)	mass / weight / amount / number of moles (surface) area / size (of chips)			**1** **1**
				(2)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
3 (b) (i)	3 did not do experiment for 1 minute / did not record time / waited for bubbles to stop / waited for reaction to end	 OWTTE		**1** **1**
				(2)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
3 (b) (ii)	two correct column headings: concentration (of acid) mass of gas lost/given off carbon dioxide/CO_2 two correct units: % g / grams	 weight	 amount	**1** **1**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
3 (b) (ii)	six values correctly inserted			**2**
				(4)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
3 (c) (i)	vertical scale of 1 cm rep 0.1 g six points correctly plotted (straight) line of best fit ignoring anomalous point			**1** **2** **1**
				(4)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
3 (c) (ii)	0.44 / 50 circled or otherwise identified			**1**
				(1)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
3 (c) (iii)	cotton wool not put in flask/ acid (spray) escaped acid too concentrated / too much acid temperature too high gas collected for longer than 1 minute malachite pieces smaller / bigger surface area			
				(2)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
3 (c) (iv)	vertical line from 70 % to line of best fit 0.47	 between 0.46 and 0.48		**1** **1**
				(2)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
3 (d) (i)	mass (of CO_2 given off) increases as concentration (of acid) increases / mass (of CO_2 given off) decreases as concentration (of acid) decreases direct proportion / equivalent wording such as "mass doubles when concentration doubles"			**1** **1**
				(2)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
3 (d) (ii)	more collisions between particles / equivalent wording such as "particles bump into each other more" correct reference to frequency or time, eg "collisions are more frequent", particles bump into each other more often", "more collisions in a given time"		references to energy	**1** **1**
				(2)

(Total 21 marks)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
4 (a)(i)	40.5	40,5 40.50 40,50	Any other answers	**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
4 (a)(ii)	10.5 16.8	10.50 16.80	Any other answers	**1** **1** **(2)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
4 (a)(iii)	$\frac{100 \times 10.5}{16.8}$ 62.5 cq on 4(a)(ii)			**1** **1** **(2)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
4 (b) (i)	six points correctly plotted smooth curve of best fit			**2** **1**
				(3)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
4 (b) (ii)	SEE NOTES			
				(1)
Notes	• If a vertical line is drawn from the intersection (within 1 small square), then award mark if the answer is within 1 ºC • If no vertical line drawn from the intersection, then decide what the answer should be, and award mark if within 1ºC • Ignore °C			

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
4 (c)	(solubility) stays the same increase(d) decrease(d)	Any other answers with the same meaning, eg for "stays the same", accept unchanged, does not change, remains constant eg for "increased", accept bigger, greater, larger, more eg for "decreased", accept smaller, less, lower		**1** **1** **1** **(3)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
4 (d)(i)	add ice (to the beaker or water) / cool the water in a fridge	use water from fridge put tube in ice	add ice to tube add ice to mixture add ice to salt add ice to solution do experiment in fridge do experiment in cold room	**(1)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
4 (d)(ii)	water boils at 100 (°C) / (120 °C is) above boiling point of water	Any answer with same meaning, eg boiling point of water is 100 °C this temperature is higher than the boiling point of water Accept boiling temperature, bp and bpt in place of boiling point	Any other answers	**(1)**

(Total 14 marks)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
5 (a)	Q / chlorine / Cl_2 S / ammonia / NH_3 T / hydrogen / H_2 *Award 1 mark each for any two*	q s t	Cl H	**(2)**

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
5 (b)	P / carbon dioxide / CO_2 R / sulphur dioxide / SO_2	p r	Any other answers	**1** **1** **(2)**

(Total 4 marks)

PAPER TOTAL 50 MARKS

Further copies of this publication are available from
Edexcel UK Regional Offices at www.edexcel.org.uk/sfc/feschools/regional/
or International Regional Offices at www.edexcel-international.org/sfc/academic/regional/

For more information on Edexcel qualifications, please visit www.edexcel-international.org/quals
Alternatively, you can contact Customer Services at www.edexcel.org.uk/ask or on + 44 1204 770 696

Edexcel Limited. Registered in England and Wales no.4496750
Registered Office: 190 High Holborn, London WC1V 7BH