PEARSON EDEXCEL IGCSE CHEMISTRY · 4CH1

CHEMISTRY



MARK SCHEME

SECTION 2: INORGANIC CHEMISTRY (PACK 4)

SCORE	PERCENTAGE
/201	%

STEMUP

These questions belong to Pearson Edexcel, not to us.

The examination questions, mark schemes and examiner comments in this pack were written and published by Pearson Edexcel. They are past assessment materials, reproduced here so that students can revise from them.

What we do not own

STEMUP is not affiliated with Pearson Edexcel and does not own, and makes no claim to own, any of the question, mark scheme or examiner report material in this pack. Pearson Edexcel has not endorsed, approved or been involved in the production of it. Pearson Edexcel and the qualification titles used here belong to their respective owners and appear for identification only.

Where to find the originals

Pearson Edexcel publishes its past papers, mark schemes and examiner reports. Always check the current specification at qualifications.pearson.com before you revise, because content and wording can change between series.

If you hold the rights to any material in this pack and would like it amended or removed, contact admin@stemup.co.uk and we will act on it.

Mark Scheme

Q1.

Question number	Answer	Notes	Marks
(a) (i)	OH^-	**ALLOW** $HO^-/OH^{-1}/OH^{1-}$ **ALLOW** lower case letters	1
(ii)	Any value between 0 and 3 inclusive		1
(b)	An explanation that links the following two points **M1** polystyrene is an insulator **M2** less heat (energy) will be lost	 **ALLOW** no heat (energy) will be lost	2
(c)	temperature in °C at end: 22.0 temperature in °C at start: 17.7 temperature change in °C: 4.3 1 mark each	**ALLOW** 22 If initial and final temperatures are reversed deduct 1 mark **ALLOW** ECF on temperature change	3

(d)	• give the expression for Q • substitute correct numbers into $Q = mc\Delta T$ • evaluation in J • conversion to kJ Example calculation **M1** $Q = mc\Delta T$ **M2** 50 x 4.2 x 5.2 **M3** 1092 (J) **M4** 1.1 (kJ)	 **M2** subsumes **M1** **ALLOW** ECF for **M3** and **M4** on incorrect values in **M2** **ACCEPT** answers correctly rounded to 2 or more sig figs 1.1, 1.09, 1.092 without working scores 4 1100, 1090, 1092 without working scores 3 0.546, 0.55 without working scores 3 546, 550 without working scores 2 **ALLOW** use of 4.18 giving an answer of 1.0868	4 Total 11

Q2.

Question number	Answer	Notes	Marks
(a) (i)	C_7H_{16}	Penalise incorrect use of case and subscripts	1
(ii)	(surfacing) roads/roofs	**ALLOW** other correct uses	1
(iii)	A description that makes reference to the following three points		3
	M1 gasoline has a **lighter** colour /ORA	**ACCEPT** reference to specific colours e.g. gasoline is colourless/ bitumen is black	
	M2 gasoline has a **lower** boiling point /ORA	statements must be comparisons	
	M3 gasoline has a **lower** viscosity /ORA		
(b) (i)	An explanation that links the following four points		4
	M1 water vapour/steam condenses	**ALLOW** turns to liquid	
	M2 (because) the ice (and water) is below 100°C/ the boiling point of water	**ALLOW** (because) the ice (and water) are cold /at a low temperature/ at 0 °C	
	M3 carbon dioxide is still a gas/ does not condense (in the U-tube)		
	M4 (because) the ice (and water) is above - 78 °C/ the sublimation point of carbon dioxide		
(ii)	A description including the following two points		2
	M1 anhydrous copper(II) sulfate is white		
	M2 (when water is present) it turns blue		
			Total 11

Q3.

Question number	Answer	Notes	Marks
(a) (i)	Any one from: to increase the rate of reaction to give the particles enough energy to react	 ALLOW because copper does not react with oxygen when copper is cold ALLOW so that copper will react with oxygen	1
(ii)	because Ar does not (readily) gain / lose / share electrons	ACCEPT argon has a full outer shell / valence shell of electrons	1
(iii)	copper(II) oxide	ALLOW copper oxide REJECT copper(I) oxide	1
(b) (i)	results are the same (at the end)	ALLOW results stop decreasing	1
(ii)	M1 volume oxygen = 20 cm^3 M2 total volume = 253 cm^3 M3 (20÷253)×100 = 7.9%	 ALLOW correct evaluation from M1 and M2 ALLOW any number of significant figures REJECT incorrect rounding Correct answer of 7.9% with or without working scores 3	3
(iii)	Any one from: there is a leak in the apparatus temperature was not the same for all readings the apparatus was not left to cool (to room temperature)	 IGNORE not all oxygen reacted	1
			Total for question = 8 marks

Q4.

Question number	Answer	Notes	Marks
(a) (i)	Any one of the following M1 bright/white light **OR** bright/white flame M2 white solid/powder/ash	 **ALLOW** grey solid/powder /ash **ALLOW** white smoke	1
(ii)	$2Mg + O_2 \rightarrow 2MgO$	**REJECT** charges on Mg and/or O_2 **ACCEPT** $2Mg^{2+}O^{2-}$ **ALLOW** multiples and fractions **IGNORE** state symbols even if incorrect	1
(b)	M1 (volume of oxygen =) 100 – 28 **OR** 72 (cm^3) M2 (volume of air at start =) 275 + 100 **OR** 375 (cm^3) M3 72 ÷ 375 x 100 **OR** 19.2 (%) M4 19 (%)	Correct answer without working scores 4 **ALLOW** ECF throughout Use of 275 gives an answer of 26 scores 3 Alternative method M1 (volume of air left=) 275 + 28 **OR** 303 (cm^3) M2 303 ÷ 375 x 100 **OR** 80.8 (%) M3 100 – 80.8 **OR** 19.2 M4 19 (%)	4

(c)	(i)	M1 bubble/pass/add carbon dioxide/gas into limewater M2 (limewater) turns cloudy/milky	 **ALLOW** white precipitate **M2** dependent on mention of limewater **REJECT** addition of extra reagent for both marks	2
	(ii)	An explanation that links two of the following three points M1 carbon dioxide is a greenhouse gas M2 (that causes) climate change/ global warming M3 oceans becoming more acidic	 **ACCEPT** description of greenhouse effect **REJECT** reference to the ozone layer for M1 **ACCEPT** a result of climate change (e.g. melting of polar icecaps/flooding /wildfires) **IGNORE** reference to acid rain	2
				Total 10

Q5.

Question number	Answer	Notes	Marks
(a) (i)	argon / helium	**ACCEPT** Ar / He	1
(ii)	nitrogen	**ACCEPT** N_2	1
(iii)	carbon dioxide	**ACCEPT** CO_2	1
(iv)	carbon dioxide	**ACCEPT** CO_2	1
(b) (i)	$S + O_2 \rightarrow SO_2$		1
(ii)	acid rain	**ACCEPT** an adverse effect of acid rain e.g. kills fish, damages plants, corrodes limestone/marble buildings/statues etc. **IGNORE** toxic/pollutant	1 **Total 6**

Q6.

Question number	Answer	Additional guidance	Mark
(a)	The atoms of both elements have one electron in the outer shell	accept highest energy level in place of outer shell	**1**

Question number	Answer	Additional guidance	Mark
(b)(i)	A description that makes reference to any two of the following points: • sodium floats/moves across the water (1) • sodium melts (1) • sodium disappears/gets smaller (1) • effervescence/fizzing/bubbles/gas given off (1) • white trail (1)	accept forms a ball accept sodium dissolves ignore name of gas	**2**

Question number	Answer	Additional guidance	Mark
(b)(ii)	An explanation that makes reference to the following points: • (final colour is) purple/blue (1) • because the solution is alkaline (1)	accept sodium hydroxide forms/ solution has high pH	2

Question number	Answer	Mark
(b)(iii)	D (12)	1

Question number	Answer	Mark
(c)	Lithium	1

Question number	Answer	Additional guidance	Mark
(d)	Potassium catches fire	accept lilac/purple/violet flame	1

Question number	Answer	Additional guidance	Mark
(e)	$2Rb + 2H_2O \rightarrow 2RbOH + H_2$ (1)	accept multiples and fractions	1

(Total for question = 9 marks)

Q7.

Question number	Answer	Notes	Marks
(a) (i)	Any 3 from **M1** effervescence/bubbles/fizzing **M2** moves **M3** floats **M4** disappears/gets smaller **M5** vapour trail/steam	 moves on surface scores **M2** and **M3** **ALLOW** dissolves **IGNORE** melts/heat produced **IGNORE** any reference to indicators	3
(ii)	An explanation that links the following two points **M1** the universal indicator turns purple/blue **M2** (because) OH^-/hydroxide ions are present	 **ALLOW** an alkaline solution /an alkali is produced / a solution of high pH is formed	2
(iii)	$2Li + 2H_2O \rightarrow 2LiOH + H_2$ **M1** all formulae correct **M2** balancing of correct formulae	**ALLOW** multiples and fractions **M2** dep on **M1**	2

(b)	(i)	An explanation that links the following two points **M1** to remove any other ions/chemicals/ impurities/ contaminants/ compounds/substances (that may be on the wire) **M2** (so that) they do not interfere with/mask the colour of the flame	 **ALLOW** (so that) they do not affect the result (of the test) **ALLOW** (remove substances) that could colour the flame	2
	(ii)	**D** yellow A is incorrect as sodium ions do not give a green flame B is incorrect as sodium ions do not give a lilac flame C is incorrect as sodium ions do not give a red flame		1

Question number	Answer	Notes	Marks
(c) (i)	K^+ and SO_4^{2-}		1
(ii)	An explanation that links the following four points **M1** (potassium sulfate) has a giant (ionic) structure /lattice **M2** electrostatic attraction between oppositely charged ions **M3** (ionic bonds or forces / attractions between ions) are strong **M4** a large amount of energy is needed to overcome the forces/break the bonds	ionic bonds are strong scores M3	4
			Total 15

Q8.

Question number	Answer	Notes	Marks
(a)	to keep out of contact/prevent reaction with air/oxygen/water/moisture	ALLOW they react with air/oxygen/water/moisture	1
(b) (i)	similarity: both fizz/move on surface/ produce flame	ALLOW both melt/form a ball/produce a gas/ produce hydrogen/form an alkaline solution	2
	difference caesium: faster/more violent reaction	ACCEPT reverse argument for potassium ALLOW caesium explodes	
(ii)	$2Cs + 2H_2O \rightarrow 2CsOH + H_2$ M1 all symbols/formulae correct M2 correctly balanced	ACCEPT fractions and multiples M2 DEP M1	2

(c) (i)	a lid/cover		1
(ii)	explanation linking either M1 stir solution M2 to obtain more accurate (maximum) temperature OR M1 measure temperature of sodium hydroxide M2 to check if different to/same as temperature of (hydrochloric) acid	ALLOW reference to even temperature throughout/ heat evenly distributed OWTTE ALLOW take an average of temperature of sodium hydroxide and temperature of (hydrochloric) acid for 2 marks	2

Question number	Answer	Notes	Marks
(d) (i)	M1 correct temperature change/△T M2 correct substitution into Q = m x c x △T M3 correct evaluation Example calculation: M1 △T = (26.5 – 19.9) OR 6.6 M2 Q = 100 x 4.2 x 6.6 M3 = 2800 (J)	 M2 ECF M1 M3 ECF M2 IGNORE any sign ALLOW 2770, 2772 correct answer without working scores 3	3
(ii)	M1 answer to M3 from (i) ÷ 0.05 M2 correct evaluation in kJ/mol with negative sign expected answer M1 2800 ÷ 0.05 OR 56000 (J) M2 - 56 (kJ/mol)	 2770 gives 55400 2772 gives 55440 negative sign required ACCEPT -55.4 ACCEPT -55.44 ACCEPT -55 correct answer without working scores 2	2
		(Total for Question = 13)	

Q9.

Question number	Answer	Notes	Marks
(a)	alkali metals		1
(b) (i)	**D** potassium sinks A is incorrect as a colourless solution forms B is incorrect as a lilac flame is seen C is incorrect as effervescence occurs		1
(ii)	may explode /break the trough/ cause a fire	**ALLOW** (too) dangerous	1
(iii)	OH^-	**ALLOW** HO^- /OH^{1-} /OH^{-1}	1
(iv)	$2K + 2H_2O \rightarrow 2KOH + H_2$ **M1** correct formulae **M2** balancing of correct formulae	**ALLOW** multiples and fractions **IGNORE** state symbols even if incorrect **M2** dep on **M1**	2
(c)	An explanation that links the following four points **M1** giant structure/lattice **M2** strong electrostatic attraction **M3** between (oppositely charged) ions **M4** large amount of energy needed to overcome the forces of attraction/break the bonds	 **ALLOW** strong (ionic) bonds No **M2** or **M3** if mention of covalent or metallic bonds /intermolecular forces	4
			Total 10

Q10.

Question number	Answer	Notes	Marks
(a) (i)	**B** 5 A is incorrect as 1 is the pH of a strong acid C is incorrect as 7 is the pH of a neutral solution D is incorrect as 9 is the pH of a weak alkali		1
(ii)	**D** acids are proton donors A is incorrect as alkalis contain OH^- ions not acids B is incorrect as acids do not donate electrons C is incorrect as bases are proton acceptors not acids		1
(b) (i)	(thermal) decomposition		1
(ii)	$PbCO_3 \rightarrow PbO + CO_2$	**ALLOW** multiples	1

Question number	Answer	Notes	Marks
(c) (i)	liquid (shown in table)	**ALLOW** if liquid written in space under question **ALLOW** l or L	1
(ii)	An explanation which links any six of the following points **M1** silicon dioxide has a giant (covalent) structure **M2** covalent bonds are (very) strong **M3** (in silicon dioxide) many/all the covalent bonds need to be broken **M4** a large amount of / more energy is required to break the bonds (in silicon dioxide) **M5** silicon(IV) chloride has a simple molecular structure **M6** the forces between the molecules/intermolecular forces (in silicon(IV) chloride) are weak **M7** little / less energy is needed to overcome the forces in silicon(IV) chloride	No **M3 or M4** if reference to overcoming / breaking intermolecular forces in silicon dioxide No **M6 or M7** if any reference to weak covalent bonds or breaking of covalent bonds in silicon(IV) chloride A statement such as 'more energy is needed to break the bonds in silicon dioxide than to overcome the forces in silicon(IV) chloride' scores **M4** and **M7**	6 **Total 11**

Q11.

Question number		Answer	Notes	Marks
(a)	(i)	halogens		1
	(ii)	**B** bromine A is incorrect as astatine is a solid at room temperature C is incorrect as fluorine is a gas at room temperature D is incorrect as iodine is a solid at room temperature		1
	(iii)	**C** green A is incorrect as chlorine is not brown B is incorrect as chlorine is not colourless C is incorrect as chlorine is not red		1
	(iv)	M1 (damp) litmus paper M2 bleached	**ALLOW** universal indicator paper/ pH paper **ALLOW** turns white **ACCEPT** (damp) blue litmus paper turns red and then bleached for both marks.	2
(b)	(i)	M1 use of 56 and 35.5 in calculation M2 162.5	 91.5 without working scores 1 correct answer without working scores 2	2
	(ii)	$2\,Fe + 3\,Cl_2 \rightarrow 2\,FeCl_3$	**ALLOW** multiples and fractions	1
				Total 8

Q12.

Question number	Answer	Notes	Marks
(a) (i)	fluorine has the fewest number of shells / energy levels	**ALLOW** fluorine has the fewest number of electrons **IGNORE** references to protons, neutrons, atomic number and mass number	1
(ii)	**C** **C** is the correct answer because iodine is in period 5 therefore has 5 shells and group 7 therefore has 7 electrons in its outer shell. A is incorrect because arsenic has 5 shells and 4 electrons in its outer shell. B is incorrect because selenium has 4 shells and 6 electrons in its outer shell. D is incorrect because the number of shells and number of electrons in the outer shell in iodine have been reversed.		1
(b) (i)	M1 does not need heating M2 reacts very quickly	 must imply quicker reaction than chlorine	2
(ii)	M1 as the atoms get bigger M2 the reactivity decreases	 **ACCEPT** reverse argument	2
			6

Q13.

Question number	Answer	Notes	Marks
(a)	**M1** copper(II) carbonate is green **M2** copper(II) carbonate is insoluble/cannot form a solution OWTTE	**IGNORE** is not white/is a different colour	2
(b)	Description including six of following points (Test for potassium ions) **M1** flame test **M2** lilac flame (Test for carbonate ions) **M3** add acid (to mixture of solids/solution) **M4** (pass/bubble) gas/carbon dioxide into limewater **M5** which goes cloudy/milky / white ppt forms (Test for iodide ions) **M6** (add dilute nitric acid followed by) silver nitrate (solution) **M7** yellow ppt/solid	 **ALLOW** description of flame test **ALLOW** any named acid **IGNORE** references to concentration **M4** DEP on **M3** **M5** DEP on mention of limewater **M7** DEP on mention of silver nitrate	6

Q14.

Question number	Answer	Marks
(a) (i)	**B** bromine A is incorrect as astatine is a solid C is incorrect as chlorine is a gas D is incorrect as iodine is a solid	1
(ii)	**C** chlorine (as it is pale green) A is incorrect as astatine is black B is incorrect as bromine is brown C is incorrect as iodine is dark grey	1
(iii)	**A** astatine B is incorrect as bromine is more reactive than astatine C is incorrect as chlorine is more reactive than astatine D is incorrect as iodine is more reactive than astatine	1

(b) (i)	**M1** (colourless solution turns) brown **M2** (solution stays) brown / no change	 **ALLOW** no reaction	2
(ii)	bromine would not react with (sodium) bromide / bromine cannot displace itself OWTTE	**ALLOW** bromine cannot react with itself **ALLOW** both contain bromine/same element/same halogen **ALLOW** because no reaction would occur **REJECT** bromine cannot displace bromide	1
(iii)	$Br_2 + 2NaI \rightarrow 2NaBr + I_2$	**ACCEPT** correct ionic equation $Br_2 + 2I^- \rightarrow 2Br^- + I_2$ **ALLOW** multiples and fractions	1

Question number	Answer	Notes	Marks
(c)	A description that makes reference to the following 6 points Test for cation **M1** add sodium hydroxide (solution) **M2** if blue precipitate forms solution contains copper(II) ion(s) / contains Cu^{2+} / is a copper compound **M3** if green precipitate forms solution contains iron(II) ion(s) / contains Fe^{2+} / is an iron compound	 **ALLOW** ammonia solution **IGNORE** qualifiers **REJECT** other colours **IGNORE** qualifiers **REJECT** other colours If no reagent or incorrect reagent but correct M2 and M3 score 1 **ALLOW** **M1** flame test or description of flame test	

		M2 if blue-green (flame) solution contains copper(II) ion(s) / contains Cu^{2+} / is a copper compound No **M3** for this test **ALLOW** **M1** addition of suitable metal above Cu in reactivity series **M2** brown/pink/pink-brown solid forms No **M3** for this test	6

	Test for anion **M4** add silver nitrate (solution) **M5** if white precipitate forms solution contains chloride ion(s) / contains Cl^- / is a chloride **M6** if cream precipitate forms solution contains bromide ion(s) / contains Br^- / is a bromide	**IGNORE** addition of nitric acid **REJECT** addition of hydrochloric acid for **M4** If no reagent or incorrect reagent but correct M5 and M6 score 1 **ALLOW** **M4** add chlorine water (to solution) **M5** if turns orange/yellow/brown solution contains bromide ion(s) / contains Br^- / is a bromide No **M6** for this test	**Total 13**

Q15.

Question number	Answer	Notes	Marks
(a)	M1 solid M2 dark grey / black		2
(b) (i)	Example calculation M1 (51 × 79) + (49 × 81) **OR** 7998 M2 7998 ÷ 100 M3 80.0	80.0 with no working scores 3 79.9 with no working scores 1 79.98 or 80 with no working scores 2	3
(ii)	same electron configuration	**ALLOW** same (total) number of electrons **IGNORE** same number of electrons in the outer shell **IGNORE** references to same number of protons	1
(c) (i)	An explanation that links the following three points M1 the order of reactivity is chlorine (most), bromine and iodine (least) M2 chlorine (is most reactive because it) displaces bromine and iodine/ oxidises bromide and iodide (ions) / reacts with sodium bromide and sodium iodide M3 bromine (is less reactive than chlorine since it) only displaces iodine / only oxidises iodide (ions) / only reacts with sodium iodide	**ACCEPT** bromine is only displaced by chlorine and iodine is displaced by chlorine and bromine scores M2 and M3 **ALLOW** chlorine has two reactions, bromine has one reaction and iodine no reactions for 1 mark out of M2 and M3 Deduct 1 mark for incorrect use of ine	3

		and ide e.g. bromine displaces iodide	
(ii)			1
	bromine cannot displace itself / bromine does not react with sodium bromide OWTTE	**ALLOW** there would be no reaction	2
(iii)			
	M1 bromine is reduced and iodide (ions)/I^- is oxidised		
	M2 bromine gains electrons and iodide (ions)/I^- loses electrons	Deduct 1 mark for mention of iodine (ions) being oxidised or losing electrons	
	OR		
	M1 bromine gains electrons so is reduced		
	M2 iodide (ions) /I^- loses electrons so is oxidised	**REJECT** iodine (ions) loses electrons so is oxidised	

12 marks

Q16.

Question number	Answer	Notes	Marks
(a)	copper		1
(b)	glucose/water		1
(c)	air		1
(d)	nitrogen/oxygen		1
(e)	copper		1
(f)	oxygen and sulfur	in either order	1
		(Total for Question = 6)	

Q17.

Question number	Answer	Additional guidance	Mark
(a)	• 35 (1) • 41 (1)	final answer consequential on syringe readings	**2**

Question number	Answer	Additional guidance	Mark
(b)	• Calculation of volume of oxygen used • Calculation of original volume of air • Calculation of percentage Example calculation: 80 − 43 = 37 (cm^3) (1) 100 + 10 + 80 = 190 (cm^3) (1) $\frac{(37 \times 100)}{190}$ (= 19.47%) = 19% (1)	accept 19.47% or 19.5%	**3**

question number	answer	mark
(c)	• Decreased (1) • Decreased (1) • No effect (1)	**3**

(Total for question = 8 marks)

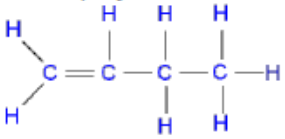
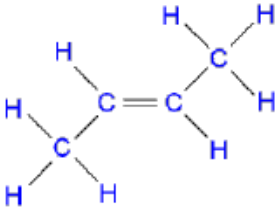
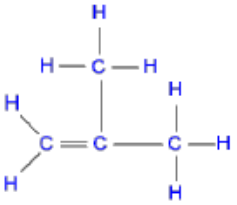
Q18.

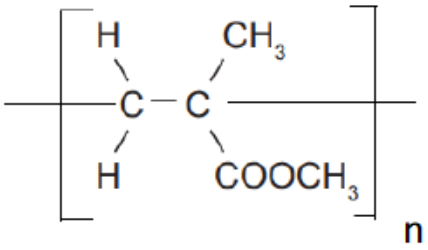
Question number	Answer	Notes	Marks
(a) (i)	carbon dioxide/a gas is given off/escapes	**REJECT** incorrect gas	1
(ii)	to prevent acid/ liquid/ solution/ spray from leaving the flask OWTTE		1
(iii)	An explanation that links two of the following **M1** (insoluble) calcium sulfate will form **M2** which will form a coating/ layer on the marble chips **M3** slowing down/ preventing/ stopping the reaction	 M3 dep on M1 or M2	2

(b)	(i)	An explanation that links the following four points **M1** the curve is steep(est) at the start **M2** because the (acid) concentration is high(est) **M3** the curve becomes less steep as the solution/ acid is becoming more dilute **M4** the curve levels off/ stops going up when the acid has all been used up **OR** **M1** the curve is steep(est) at the start **M2** because the reaction is fast(est) at the start **M3** the curve becomes less steep because the reaction slows down **M4** the curve levels off/stops going up when the acid has all been used up	**ALLOW** there are the most (acid) particles in solution **ALLOW** the curve becomes less steep as there are fewer acid particles/particles in solution **IGNORE** references to particles of marble chips **IGNORE** references to energy	4
	(ii)	M1 curve drawn starting at the origin and below the original curve M2 curve levels off at 0.27 g + or – half a small square		2

Question number	Answer	Notes	Marks
(c)	An explanation that links the following four points **M1** the rate of reaction increases/ the reaction is faster/ the reaction speeds up and any three from **M2** because the particles gain (kinetic) energy /move faster **M3** there are more collisions per unit time **M4** more collisions/particles have energy greater than the activation energy **M5** more collisions are successful	there are more frequent successful collisions scores **M3** and **M5**	4 **Total 14**

Q19.

Question number	Answer	Notes	Marks
(a) (i)	explanation linking M1 (molecules/compounds) having same molecular formulae M2 but different structural/displayed formulae	 ALLOW different structures ALLOW different arrangement of atoms	2
(ii)	M1 displayed formula of but-1-ene  M2 displayed formula of but-2-ene 	IGNORE bond angles ALLOW displayed formula of methylpropene 	2

Question number	Answer	Notes	Marks
(b) (i)	explanation linking M1 molecule is unsaturated as contains (carbon to carbon) double bond M2 molecule not a hydrocarbon as contains oxygen	 ACCEPT does not contain hydrogen and carbon only	 2
(ii)	addition		1
(iii)	 M1 correct repeat unit structure M2 extension bonds, brackets and n	 n can be anywhere after bracket extension bonds do not have to go through brackets M2 DEP M1 or near miss	2

Question number	Answer	Notes	Marks
(c) (i)	M1 calculation of mass of octane M2 calculation of Mr of C_8H_{18} and CO_2 M3 link between mass/mol C_8H_{18} and mass/mol CO_2 M4 calculation of mass CO_2 in g M5 calculation of mass CO_2 in kg Example calculation: M1 50 x 700 = 35000 (g) M2 M_r of C_8H_{18} = 114 and M_r CO_2 = 44 M3 114g C_8H_{18} produces (8 x 44 =) 352 (g) CO_2		5

	M4 35000 g C_8H_{18} produces $\frac{35000 \times 352}{114}$ = 108070.2 (g) CO_2 M5 = 108 (kg) Alternative method using mol: M1 50 x 700 = 35000 (g) M2 M_r of C_8H_{18} = 114 and Mr CO_2 = 44 M3 n (C_8H_{18}) = $\frac{35000}{114}$ = 307.0175 mol so n (CO_2) = 8 x 307.0175 = 2456.14 mol M4 mass CO_2 = 2456.14 x 44 = 108070.2 (g) M5 = 108 (kg)	ALLOW 2 sig fig or more in M4 and M5 ALLOW 2 sig fig or more in M3 M4 and M5 MARK CSQ in both methods correct answer without working scores 5	
(ii)	global warming/climate change	IGNORE greenhouse effect	1
			(Total for Question = 15)

Q20.

Question number	Answer	Notes	Marks
(a)	74		1 Cler
(b) (i)	**M1** flame test	**ALLOW** any description of a flame test	2 Grad
	M2 (flame colour is) red	**ALLOW** crimson or crimson red **M2** is dependent on **M1**	
(ii)	**M1** add (dilute) hydrochloric acid	**ALLOW** any acid **IGNORE** refs to concentration **REJECT** additional reagents	3 Exp
	M2 bubble the <u>gas/CO_2</u> produced through limewater / test the <u>gas/CO_2</u> with limewater	**ALLOW** calcium hydroxide	
	M3 which turns cloudy / milky / white precipitate	**M3** is dependent on use of limewater	
(c)	$Li_2O + CO_2$		1 Grad
		Total for question	7