Pearson

Mark Scheme (Results)

November 2020

Pearson Edexcel GCSE
In Chemistry (1CH0) Paper 2F

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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
- Mark schemes have been developed so that the rubrics of each mark scheme reflects the characteristics of the skills within the AO being targeted and the requirements of the command word. So for example the command word 'Explain' requires an identification of a point and then reasoning/justification of the point.

Explain questions can be asked across all AOs. The distinction comes whether the identification is via a judgment made to reach a conclusion, or, making a point through application of knowledge to reason/justify the point made through application of understanding. It is the combination and linkage of the marking points that is needed to gain full marks.

When marking questions with a 'describe' or 'explain' command word, the detailed marking guidance below should be consulted to ensure consistency of marking.

Assessment Objective		**Command Word**	
Strand	**Element**	**Describe**	**Explain**
AO1*		An answer that combines the marking points to provide a logical description	An explanation that links identification of a point with reasoning/justification(s) as required
AO2		An answer that combines the marking points to provide a logical description, showing application of knowledge and understanding	An explanation that links identification of a point (by applying knowledge) with reasoning/justification (application of understanding)
AO3	1a and 1b	An answer that combines points of interpretation/evaluation to provide a logical description	
AO3	2a and 2b		An explanation that combines identification via a judgment to reach a conclusion via justification/reasoning
AO3	3a	An answer that combines the marking points to provide a logical description of the plan/method/experiment	
AO3	3b		An explanation that combines identifying an improvement of the experimental procedure with a linked justification/reasoning

*there will be situations where an AO1 question will include elements of recall of knowledge directly from the specification (up to a maximum of 15%). These will be identified by an asterisk in the mark scheme.

Question number	Answer	Mark
1(a)(i)	**A** argon This is the only correct answer. **B** is incorrect because butane is not found in the air **C** is incorrect because chlorine is not found in the air **D** is incorrect because hydrogen is only found in the air in extremely small amounts	**(1)**

Question number	Answer	Mark
1(a)(ii)	**C** 21 This is the only correct answer. **A**, **B** and **D** are incorrect	**(1)**

Question number	Answer	Additional guidance	Mark
1(b)	carbon dioxide	allow CO_2	**(1)**

Question number	Answer	Additional guidance	Mark
1(c)	An explanation linking any two • Earth cooled (1) • water (vapour) condensed (1) • oceans formed /seas formed/ rainfall (1)	allow temperature decreased	**(2)**

Question number	Answer	Mark
1(d)(i)	allow 2 for correct answer with or without working change in concentration = 410.83 - 407.96 (= 2.87) (1) = 3 (1)	**(2)**

Question number	Answer	Additional guidance	Mark
1(d)(ii)	volcanic activity / burning of fossil fuels / deforestation / respiration	allow more vehicles on road ignore global warming / ice-caps melting / farming	**(1)**

(Total for Question 1 = 8 marks)

Question number	Answer	Mark
2(a)	An explanation linking • metal (1) • good conductor (of electricity) (1)	**(2)**

Question number	Answer	Mark
2(b)(i)	**D** 100 **D** is the only correct answer because 17 / 0.16 ≈ 100 **A**, **B** and **C** are incorrect because 17 / 0.16 ≈ 100	**(1)**

Question number	Answer	Additional guidance	Mark
2(b)(ii)	allow 2 for correct answer with or without working surface area of 1 side of cube = 9 x 9 (1) (= 81 (nm^2)) total area of cube = 6 x (9 x 9) (1) (= 486 (nm^2))	allow 9 x 9 (1) x 9 (= 729 (nm^2)) allow 6 x 9 (1) (= 54 (nm^2))	**(2)**

Question number	Answer	Mark
2(b)(iii)	damages cells/heart problems/get into the bloodstream/pass into cells/catalysing harmful reactions/harmful to aquatic life	**(1)**

(Total for Question 2 = 6 marks)

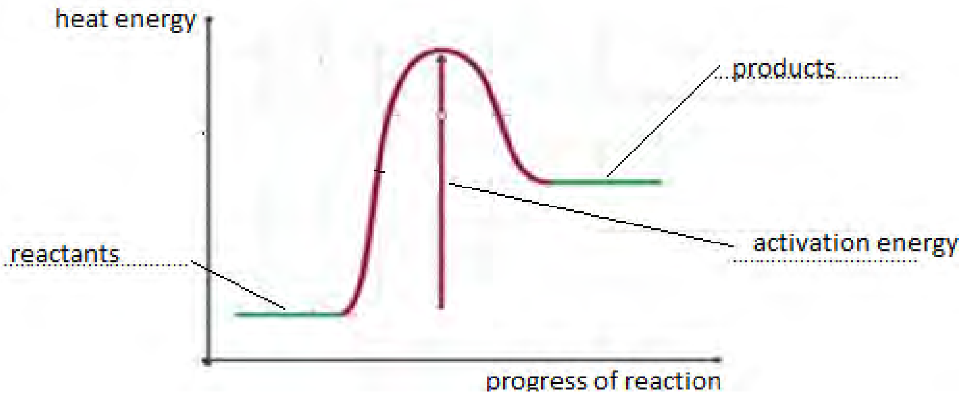
Question number	Answer	Additional guidance	Mark
3(a)(i)	potassium iodide + lead nitrate (1) → lead iodide + potassium nitrate (1) left hand side (1) right hand side (1)	ignore formulae	**(2)**

Question number	Answer	Additional guidance	Mark
3(a)(ii)	(mass conserved because) the numbers are the same/nothing is lost/nothing is gained	allow same mass / same weight / same amount	**(1)**

Question number	Answer	Additional guidance	Mark
3(b)(i)	measuring cylinder / (volumetric) pipette / burette	ignore dropping pipette / beaker	**(1)**

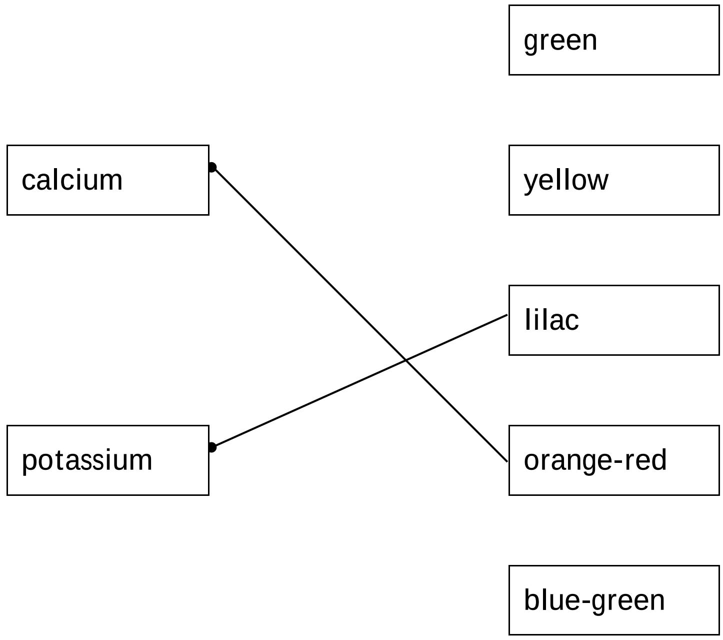
Question number	Answer	Additional Guidance	Mark
3(b)(ii)	measure the initial temperature (of the water)	allow subtract initial temperature from final temperature OR vice versa allow temperature before mixing	**(1)**

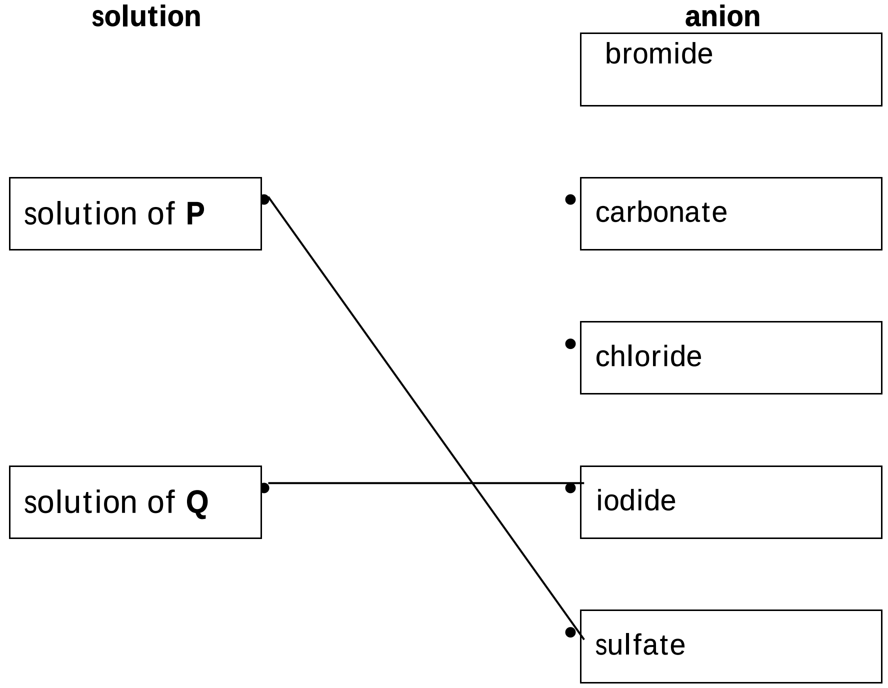
Question number	Answer	Additional Guidance	Mark
3(b)(iii)	insulator / reduces heat transfer / poor conductor of heat	ignore references to heat loss	**(1)**

Question number	Answer	Mark
3(b) (iv)	• any one label correct (1) • all three labels correct (1) 	(2)

(Total for Question 3 = 8 marks)

Question number	Answer	Additional guidance	Mark
4(a)(i)	A description including • put (clean) wire into solid (1) • hold (wire) in (Bunsen) flame (1)	put (damp) splint into solid (1) hold splint in (Bunsen) flame (1) ignore: hold over flame reject use of yellow flame	**(2)**

Question number	Answer	Mark
4(a)(ii)	**metal ion** **flame colour**  Each line 1 mark Do not award mark if more than one line join the left hand boxes with those on the right	**(2)**

Question number	Answer	Mark
4(b)(i)	 Each line 1 mark Do not award mark if more than one line join the left hand boxes with those on the right	**(2)**

Question number	Answer	Mark
4(b)(ii)	3 / three	**(1)**

Question number	Answer	Additional Guidance	Mark
4(c)(i)	• green (1) • precipitate / (insoluble) solid (1)	allow any shades of green *e.g.* light green, grey green, blue green but no other colours (1)	**(2)**

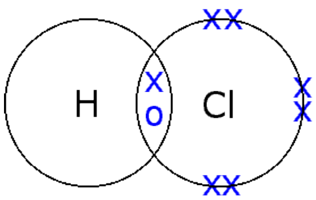
Question number	Answer	Mark
4(c)(ii)	**C** sodium sulfate **A**,**B** and **D** are incorrect because they are not products of the reaction	**(1)**

(Total for Question 4 = 10 marks)

Question number	Answer	Additional Guidance	Mark
5(a)	use of fume-cupboard / fume hood	allow adequate ventilation gloves (to prevent skin absorption) ignore breathing apparatus, gas mask, mask, PPE	(1)

Question number	Answer	Additional guidance	Mark
5(b)(i)	hydrogen + chlorine → hydrogen chloride	answer must contain a "+" between reactants allow reactants on LHS in either order allow $H_2 + Cl_2 \rightarrow 2HCl$ allow multiples on balanced equation ignore state symbols	(1)

Question number	Answer	Mark
5(b)(ii)	(turns) red /pink	(1)

Question number	Answer	Additional guidance	Mark
5(b)(iii)		6 electrons drawn in outer shell of Cl (1) ignore inner shells of electrons even if incorrect	(1)

Question number	Answer	Additional guidance	Mark
5(b)(iv)	covalent	ignore other words reject ionic / metallic	(1)

Question number	*Answer*	Additional guidance	Mark
5(c)	chlorine is more reactive than bromine / chlorine can displace bromine	ignore "chlorine is more reactive" alone	(1)

Question number	Answer	Additional guidance	Mark
5(d)(i)	(lamp) does not light up / unlit / 'nothing'	ignore turn off / no reaction	**(1)**

Question number	Answer	Additional guidance	Mark
5(d)(ii)	(lamp) lights up / glows / works	ignore becomes brighter / dimmer	**(1)**

Question number	Answer	Additional guidance	Mark
5(e)	A description including • conductivity increases **and** then decreases (1) **AND** any one *quantitative description* from • conductivity increases (from 0) to 150 (g dm^{-3}) (1) • conductivity reaches maximum at 150 (g dm^{-3}) (1) • conductivity then decreases from 150 (to 500) (g dm^{-3}) (1)	allow positive correlation for increases and negative correlation for decreases	**(2)**

(Total for Question 5 = 10 marks)

Question number	Answer	Additional guidance	Mark
6(a)(i)	methane + oxygen (1) → water + carbon dioxide (1)	ignore symbols reject other substances on either side for that mark	**(2)**

Question number	Answer	Additional guidance	Mark
6(a)(ii)	limited supply of oxygen	ignore air	**(1)**

Question number	Answer	Additional guidance	Mark
6(b)(i)	bitumen	reject other fractions	**(1)**

Question number	Answer	Additional guidance	Mark
6(b)(ii)	gases	reject other fractions	**(1)**

Question number	Answer	Mark
6(c)	**B** gases, petrol, diesel oil This is the only correct answer. **A** is incorrect because only diesel oil has a relative demand greater than the relative amount obtained **C** is incorrect only gases and petrol have a relative demand greater than the relative amount obtained **D** is incorrect only petrol and diesel oil have a relative demand greater than the relative amount obtained	**(1)**

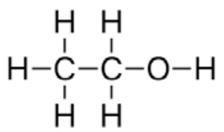
Question number	Answer	Mark
6(d)(i)	x = 6	**(1)**

Question number	Answer	Additional guidance	Mark
6(d)(ii)	allow 2 for correct answer with or without working 170 (g) dodecane forms 114 (g) octane 1 (g) dodecane forms $\frac{114}{170}$ (g) octane (1) 340 (g) dodecane forms $\frac{114}{170}$ x 340 (1) (= 228(g))	OR $\frac{340}{170}$ (1) (= 2) 2 x 114 (1) (= 228 (g))	**(2)**

(Total for Question 6 = 9 marks)

Question number	Answer	Mark
7(a)	**B** glucose → ethanol + carbon dioxide **B** is the only correct answer. **A** is incorrect because water is not produced **C** is incorrect because hydrogen is not produced **D** is incorrect because water is not produced	**(1)**

Question number	Answer	Additional guidance	Mark
7(b)(i)	$C_5H_{11}OH$	allow $C_5H_{12}O$	**(1)**

Question number	Answer	Additional guidance	Mark
7(b)(ii)	 (2)	allow 1 for any molecule containing 2 carbon atoms and one single C-C bond OR any molecule containing one C–O-H allow the OH without bond between allow dot-and-cross diagrams	**(2)**

Question number	Answer	Additional guidance	Mark
7(c)(i)	$C_2H_5OH + O_2 \rightarrow CH_3COOH + H_2O$ (2) left hand side (1) right hand side (1)	correct formulae with incorrect balancing (1)	**(2)**

Question number	Answer	Mark
7(c)(ii)	**C** 4/60 x 100 **C** is the only correct answer. **A** is incorrect because there are four atoms of hydrogen in ethanoic acid **B** is incorrect because there are four atoms of hydrogen in ethanoic acid **D** is incorrect because the fraction is inverted and there are four atoms of hydrogen in ethanoic acid	**(1)**

Question number	Indicative content	Mark
*7(c)	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material that is indicated as relevant. Additional content included in the response must be scientific and relevant. A description to include some of the following points **(reasons for the uses)** **poly(ethene) :** • **plastic bags / plastic bottles** – flexible/bendable, inert/unreactive, waterproof/weatherproof, light **poly(chloroethene) :** • **window frames / gutters / waterpipes -** tough/hard, long-lasting, durable/good insulator, waterproof/weatherproof, inert/unreactive • **insulation for electrical wires –** flexible /bendable, good insulator,waterproof/weather proof, inert/unreactive **poly(tetrafluoroethene):** • **coating for frying pans -** slippery, non-stick, tough, high melting point/heat resistant, inert/unreactive • **stain-proofing clothing and carpets –** slippery **(problems of disposal)** **landfill** • non-biodegradable • persist in landfill/very long time to degrade • fill up land/new landfill sites needed • harmful to animal habitats **recycling** • plastics need to be sorted/time consuming • transport to collection area/recycling point uses fuel • collection point may cause litter problem/eyesore *etc* **burning** • toxic substances released • hydrogen chloride/acid gas produced from burning PVC • carbon dioxide released contributing to global warming • carbon monoxide released • toxic ash/solids formed	**(6)**

Level	Mark	Additional Guidance	General additional guidance – the decision within levels Eg - At each level, as well as content, the scientific coherency of what is stated backed up by planning detail will help place the answer at the top, or the bottom, of that level.
	0	No rewardable material.	
Level 1	1–2	Additional guidance • gives simple statements about problems in disposal of polymers OR • link a use of one polymer to its properties	Possible candidate responses • polymers are not biodegradable • not all polymers can be recycled • polythene is used in plastic bags because it is flexible • PTFE is used in frying pans because it is non-stick • Statement with detail scores upper mark of level
Level 2	3–4	Additional guidance • links uses of at least two polymers to their properties OR • describes at least two problems associated with disposing of polymers OR • links a use of at least one polymer to its properties AND describes at least one problem associated with disposing of polymers	Possible candidate responses • PVC is used as insulation in electrical wires because it does not conduct electricity. PTFE is used in frying pans because it is non-stick. • Polymers will be present in landfill for a long time. Incineration of polymers releases toxic gases. • Poly(ethene) is used in plastic bags because it is flexible, but it is not biodegradable. • All statements with detail scores upper mark of level
Level 3	5–6	Additional guidance • links uses of at least two polymers to their properties AND explains at least one problem associated with disposing of polymers OR • links uses of at least one polymer to its properties AND explains at least two problems associated with disposing of polymers	Possible candidate responses • PTFE is used in stainproof clothing and carpets because it is non-stick so stains are easily removed. PVC is used in window frames because it is waterproof. Polymers last for a long time in landfill sites. • Poly(ethene) is used in plastic bottles because it is inert so will not react with food. However, it is not biodegradable and releases carbon dioxide when burnt, which contributes to global warming • All statements with detail scores upper mark of level

Total for Question 7 = 13 marks

Question number	Answer	Additional guidance	Mark
8(a)(i)	2.8.8.1	allow any separator including gaps *e.g.* 2 8 8 1 send to review any diagrams	**(1)**

Question number	Answer	Mark
8(a)(ii)	**B** 19 (protons) 20 (neutrons) This is the only correct answer. **A** is incorrect because there are 20 neutrons in the ion **C** is incorrect because there are 19 protons and 20 neutrons **D** is incorrect because there are 19 protons in the ion	**(1)**

Question number	Answer	Additional guidance	Mark
8(b)	An explanation linking • outer (electron) shell (1) • (both have) {same number / 1} electron(s) (1)	allow both lose 1 electron (to form ion / to form noble gas configuration) reject same number of outer shells / same number of electrons MP2 depends on MP1	**(2)**

Question number	Answer	Additional guidance	Mark
8(c)	An explanation linking • (intermolecular) forces are weak (1) • little **energy** needed (to overcome forces) (1)	allow intermolecular bonds / weak bonds between molecules ignore needs a low temperature to break	**(2)**

Question number	Answer	Additional guidance	Mark
8(d)	**2**K (**s**) + F_2 (g) → **2**KF (**s**) **2** K **(1)** **2** KF **(1)** **s**, **s** **(1)**	 ignore words	**(3)**

Question number	Answer	Mark
8(e)	**A** alkali metals **A** is the only correct answer. **B** is incorrect because fullerenes are not a group in the periodic table **C** is incorrect because halogens are group 7 **D** is incorrect because noble gases are group 0	**(1)**

Question number	Answer	Mark
8(f)(i)	any value between 51 (°C) and 70 (°C)	**(1)**

Question number	Answer	Mark
8(f)(ii)	iodine **and** astatine	**(1)**

(Total for Question 8 = 12 marks)

Question number	Answer	Additional guidance	Mark
9(a)(i)	larger **surface area** {higher /faster} rate /ORA	answer must be comparative	**(1)**

Question number	Answer	Additional guidance	Mark
9(a)(ii)	final answer of 0.3 with or without working scores 3 MP1 : conversion of time from minutes into seconds 5 x 60 = 300 (seconds) (1) MP2 : rate = volume / time rate = $\frac{90}{300}$ (1) MP3 : evaluation of the fraction = 0.3 ($cm^3 s^{-1}$) (1)	allow 90/5 (1) 90/5 = 18 (2) 300/90 = 3.33 (2) 5/90 = 0.0556 (1)	**(3)**

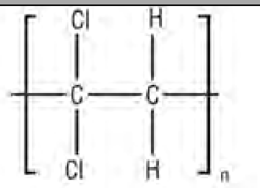
Question number	Answer	Additional guidance	Mark
9(a)(iii)	An explanation linking three of the following • particles have more energy (1) • so (particles) move faster (1) • (so) there are more frequent collisions between particles (1) • higher proportion of collisions have at least the activation energy to react when particles collide (1)	Allow more kinetic energy for MP1 and MP2 needs to be comparative allow greater chance of collision allow higher {proportion / chance} of collisions are successful / productive allow more particles have activation energy	**(3)**

Question number	Indicative content	Mark
*9(b)	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material that is indicated as relevant. Additional content included in the response must be scientific and relevant. A plan to include some of the following points • measure equal masses of zinc using balance • measure equal volumes of acid using measuring cylinder/pipette/suitable named piece of apparatus • pour acid in suitable container • record initial temperature • use of thermometer • add zinc to acid • place bung with delivery tube in container / reaction vessel immediately after the zinc is added • use of timer • start timer on addition of zinc • measure volume of gas evolved using a delivery tube and inverted measuring cylinder/burette over water OR delivery tube and (gas) syringe • record time to collect fixed volume of gas • record final/highest temperature • calculate the temperature increase • repeat for procedure • same initial temperature • same size pieces of zinc • same volume of acid credit use a suitable labelled diagram of apparatus for rate measurement/ temperature of acid	(6)

Level	Mark	Additional Guidance	General additional guidance – the decision within levels Eg - At each level, as well as content, the scientific coherency of what is stated backed up by planning detail will help place the answer at the top, or the bottom, of that level.
	0	No rewardable material.	
Level 1	1–2	Additional guidance Identifies relevant practical operations such as • carries out basic reaction – add zinc to acid • measures at least one of mass, time, volume, temperature	Possible candidate responses • put zinc in test tube and add some acid • find the mass of zinc • measure volume of the acid • carries out basic reaction or measures at least one factor with details scores upper part of level
Level 2	3–4	Additional guidance Some correct sequencing of correct operations • carries out basic reaction with dilute acid and repeat with the more concentrated acid and • carries out reaction makes some relevant observation or obtains a result or • measures at least two of mass, time, volume, temperature	Possible candidate responses • put zinc in test tube, add acid and time the reaction • put zinc in test tube, add dilute acid, then repeat experiment and add more concentrated acid • measures mass of zinc and measures volume of acid before adding together • measures temperature of acid before adding to zinc and measures temperature at end of reaction • a similar description, but with detail of apparatus scores the upper part of the level
Level 3	5–6	Additional guidance Sequence of operations of an experiment to include two from • measures temperature and volume of acid, and mass of zinc • repeats expt but with more concentrated acid • measure temperature of reaction mixture at end and finds temperature rise	Possible candidate responses • record temperature of 25 cm^3 dilute acid, add to known mass of zinc, record temperature after reaction • using suitable apparatus measure volume of gas every minute • repeat experiment using same conditions but using the more concentrated acid • work out temperature rises for both reactions • descriptions with detail or workable method scores upper part of level

Total for Question 9 = 13 marks

Question number	Answer	Additional Guidance	Mark
10(a)(i)	A description to include any two from • double bond (in monomer) breaks (1) • {monomers/ molecules} link together (1) • to form a (long) chain (1)	diagrams can score MP1, 2 or 3 ignore mention of addition or condensation	**(2)**

Question number	Answer	Mark
10(a)(ii)	 **B** **B** is the only correct answer. **A** is not correct as it is poly(1,2-dichloroethene) **C** is not correct as it has a double bond **D** is not correct as it is poly(1,1,2-trichloroethene)	**(1)**

Question number	Answer	Mark
10(a)(iii)	**B** only the dichloroethene and bromine water goes colourless **A** is incorrect because the alkene decolourises bromine water **C** is incorrect because the polymer does not decolourise bromine water but the alkene does **D** is not correct because the polymer does not decolourise bromine water	**(1)**

Question number	Answer	Mark
10(b)	$C_2H_4 + 2Cl_2 \rightarrow C_2H_2Cl_2 + 2HCl$ • HCl (1) • 2 (1)	**(2)**

Question number	Answer	Additional Guidance	Mark
10(c)	An explanation to a property with a linked reason non-toxic **(1)** so stops food being poisonous **(1)** OR unreactive **(1)** so it does not react with the food **(1)** OR flexible **(1)** so it can wrap all around the food **(1)**	<u>MP2 depends on MP1</u> allow impermeable to air **(1)** stops food {**oxidation** / reaction with air} **(1)** ignore 'stops food going off' impermeable to water **(1)** stops dampening of food **(1)** high melting point (1) so can wrap hot food (without melting) (1) ignore: strong/ tough/ transparent/ cheap/ can seal	**(2)**

Question number	Answer	Additional guidance	Mark
10(d)	18 as final answer with or without working scores 3 100 – 96.5 = 3.5 **(1)** 500 x 3.5/100 (=17.5) **(1)** **=** 18 (tonnes to 2 s.f.) **(1)**	480 as final answer scores 2 482.5 / 483 as final answer scores 1 answer with working using 96.5 and 500 and rounded correctly to 2 s.f. scores 1	**(3)**

(Total for Question 10 = 11 marks)