



Mark Scheme (Results)

Summer 2019

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

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Summer 2019

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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 |

| Question number | Answer | Mark |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 1(a) | <p>C photosynthesis is the only correct answer</p> <p>A and B are processes that required oxygen</p> <p>D is a process that does not involve oxygen</p> | 1 |

| Question number | Answer | Additional guidance | Mark |
|-----------------|------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|------|
| 1(b)(i) | <p>Vertical bar for oxygen to just over 20% as shown in the bar chart (ignore width):</p> <p>(1)</p> | <p>ignore bars touching each other</p> <p>ignore 21 above bar</p> | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 1(b)(ii) | MP1 : $\frac{21}{100}$ (1) (=0.21) MP2 : 0.21×300 (1) (= 63) (cm ³) | 63 (cm ³) with no working scores 2 marks 300/4.76 = 63 (2) 300/4.8 = 62.5 (2) allow 21 x 300 (1) (= 6300) allow $\frac{300}{100}$ (1) (= 3) | (2) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|------|
| 1(c) | <p>The diagram consists of two boxes on the left: 'atomic number' and 'mass number'. On the right, there are four boxes: 'number of protons', 'number of neutrons', 'total number of protons and electrons', and 'total number of protons, neutrons and electrons'. A line connects 'atomic number' to 'number of protons'. Another line connects 'mass number' to 'total number of protons and neutrons'. Below the diagram, it says '1 mark for each line'.</p> | Each line 1 mark Do not award mark if more than one line joins the left hand boxes with those on the right | (2) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|------|
| 1(d) | B a glowing splint will relight when placed in the gas A describes the test for carbon dioxide C describes the test for hydrogen D describes the test for an alkaline gas such as ammonia | is the only correct answer | (1) |

Total for Question 1 = 7 marks

| Question number | Answer | Additional guidance | Mark |
|-----------------|-----------------------------------|---------------------|------|
| 2(a)(i) | halogens or halogen | reject halide | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|----------------------------------------------------------------------|--------------------------|------|
| 2(a)(ii) | noble gases or inert gases or rare gases | Do not allow gases alone | (1) |

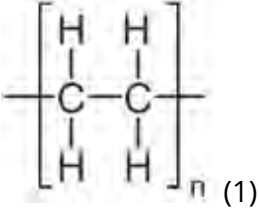
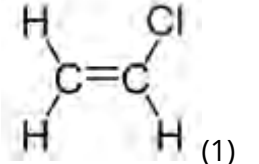
| Question number | Answer | Mark |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 2(b) | C yellow-green red-brown is the only correct answer A gives the colours for iodine vapour and chlorine gas B gives the colours for solid iodine and iodine vapour D gives the colours for bromine liquid and iodine vapour | (1) |

| Question number | Answer | Mark |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 2(c) | <p>D liquid solid is the only correct answer</p> <p>A, B and C are incorrect because bromine is a liquid and iodine is a solid at 50 °C</p> | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 2(d) | <p>accept any number in the range 1.4 – 3.5</p> <p>accept value either on answer or in the space in the table</p> | <p>Allow any number of decimal places</p> <p>Do not allow number below 1.4</p> <p>Do not allow negative numbers</p> <p>Do not allow numbers greater than 3.5</p> | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 2(e) | <p>An explanation linking the points in one of the pairs</p> <p>EITHER</p> <ul style="list-style-type: none"> • argon is {inert / a noble gas} OR argon has /atoms have) {full / 8 electrons in} outer shell (1) • so (it) does not react (with metal filament) OR (argon/atoms) do not {gain / lose / share electrons} <p>OR</p> <ul style="list-style-type: none"> • oxygen is reactive (1) • (air/oxygen) reacts with metal filament / forms metal oxide (1) | <p>so metal does not burn/ combust (in argon) so (argon) does not {burn / combust} with metal (filament)</p> <p>so (argon) {is unreactive / less reactive / not very reactive / inactive } (with metal filament)</p> <p>ignore air for MP1 here</p> <p>allow metal burns</p> | (2) |

Total for Question 2 = 7 marks

| Question number | Answer | Additional guidance | Mark |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 3(a) |   poly(tetrafluoroethene) (1) | note n must be present on the repeating unit allow polytetrafluoroethene ignore ptfе / Teflon | (3) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|------|
| 3(b) | any two from <ul style="list-style-type: none"> • polymers degrade very slowly / last very long time in landfill (1) • not biodegradable (1) • landfill sites fill up quickly (1) • (toxic) gases produced during disposal by combustion (1) • harmful to wildlife / habitats / ecosystems(1) | allow decompose/ breakdown / disintegrates allow named gases allow carbon dioxide | (2) |


| Question number | Answer | Mark |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 3(c) | <p>B</p> $ \begin{array}{cccccc} \text{H} & \text{CH}_3 & \text{H} & \text{CH}_3 & \text{H} & \text{CH}_3 \\ & & & & & \\ -\text{C} & -\text{C} & -\text{C} & -\text{C} & -\text{C} & -\text{C}- \\ & & & & & \\ \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} \end{array} $ <p>is the only correct answer</p> <p>A is not correct because there are insufficient CH₃ groups attached to the carbon chain C is not correct because only one CH₃ group can be attached to a carbon atom D is not correct because there are no H atoms attached to the carbon chain</p> | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|------|
| 3(d) | <p>MP1 : calculation 24 600 x 42 (1) (=1 033 200)</p> <p>MP2 : answer to 3 sig figs = 1 030 000 / 1.03 x 10⁶ (1) (to 3 sig figs)</p> | <p>without working: 1 030 000 – 2 marks 1 033 200 – 1 mark</p> <p>allow 24600/42 = 586 (1)</p> | (2) |

Total for Question 3 = 8 marks

| Question number | Answer | Additional guidance | Mark |
|-----------------|-----------------------|---------------------------|------|
| 4(a) | (top pan) balance (1) | allow (weighing) scale(s) | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 4(b) | <p>An explanation linking</p> <ul style="list-style-type: none"> temperature rises / increases (by 11 °C) (1) exothermic process (1) | <p>allow gets hotter / water heats up {temperature / it} goes up</p> <p>Ignore heat increasing for MP1</p> <p>allow heat / energy {given out / released to surroundings}</p> <p>reject endothermic for MP2</p> | (2) |

| Question number | Answer | Mark |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 4(c)(i) | <p>C  is the only correct answer</p> <p>A is the hazard symbol for corrosive substances B is the hazard symbol for substances that are harmful to the environment D is the hazard symbol for flammable substances</p> | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|-----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|------|
| 4(c)(ii) | wear {goggles / safety glasses} / wear gloves | allow eye protection ignore tie long hair back ignore safety clothing / ppe | (1) |
| Question number | Answer | Additional guidance | Mark |
| 4(d) | put a lid on / put cover on top / lag beaker / use insulation / use polystyrene cup (1) | allow any material around the beaker that prevents heat loss eg cotton wool / (aluminium) foil | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 4(e) | <p>MP1 : using volume = $\frac{\text{mass}}{\text{concentration}}$ (1)</p> <p>MP2: volume = $\frac{9.0}{12}$ (dm³) (1) (= 0.75 dm³)</p> <p>MP3: converting volume to cm³ = 0.75 x 1000 (1) (= 750 (cm³))</p> | <p>without working 750 cm³ (3) 0.75 (dm³) (2)</p> <p>$\frac{12}{9}$ (0) x 1000 (1) = 1333 cm³</p> | (3) |

Total for Question 4 = 9 marks

| Question number | Answer | Mark |
|-----------------|-------------------------|------|
| 5(a)(i) | x = 6 (1) y = 14 (1) | (2) |

| Question number | Answer | Mark |
|-----------------|--------|------|
| 5(a)(ii) | 25 (g) | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|----------------------------------------------|---------------------------------------------------------|------|
| 5(b)(i) | 4 electrons shown between the 2 carbon atoms | electrons may be shown as dots, crosses or as a mixture | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---------------------------------|---------------------------------------|------|
| 5(b)(ii) | carbon monoxide / carbon / soot | allow CO / C ignore carbon dioxide | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------|
| 5(c) | An explanation linking <ul style="list-style-type: none"> (molecules of X) contain double bonds / C=C (1) only contain carbon and hydrogen atoms (1) | allow multiple bond | (2) |

| | | | |
|--|--|--|--|
| | | | |
|--|--|--|--|

| Question number | Answer | Additional guidance | Mark |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 5(d) | An explanation linking any two of the following <ul style="list-style-type: none"> • A reacts with bromine (water) (1) • (therefore) A is unsaturated (1) OR <ul style="list-style-type: none"> • B does not react with bromine (water) (1) • (therefore) B is saturated (1) | allow A is alkene / B is alkane (1) allow alkane does not decolourise / alkene does decolourise (1) allow A is unsaturated and B is saturated (2) allow A reacts and B does not react (2) ignore bromine water turns clear / is discoloured | (2) |

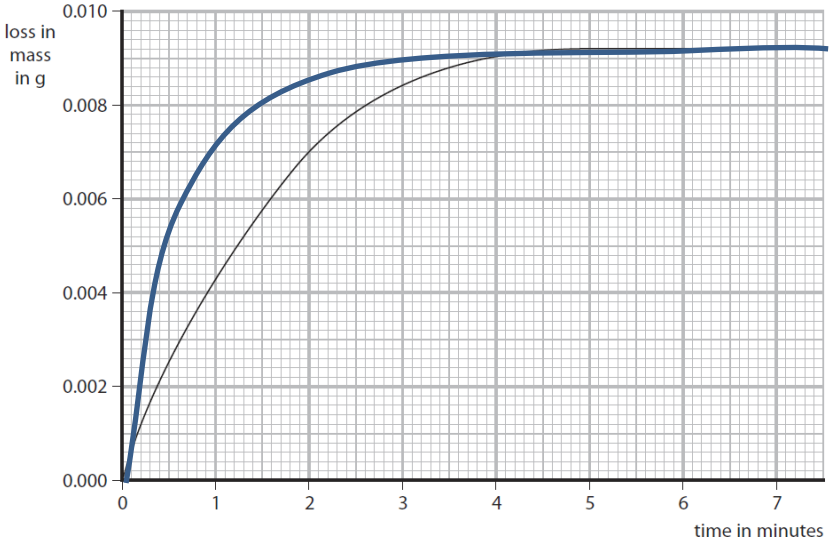
Total for Question 5 = 9 marks

| Question number | Answer | Additional guidance | Mark |
|-----------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------------|------|
| 6(a) | Any suitable container for measuring volume of 100 cm ³ eg measuring cylinder | allow burette / pipette ignore beaker, conical flask, measuring jug | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|------|
| 6(b) | An explanation linking <ul style="list-style-type: none"> {hydrogen / gas} formed / OWTTE (1) escapes (from the flask) (1) | allow released (from the flask) ignore references to magnesium reacting | (2) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 6(c) | An explanation linking <ul style="list-style-type: none"> MP1 : fewer reacting particles left / some particles reacted (1) MP2: fewer collisions (1) MP3: (fewer) frequent (collisions) (1) | for full marks, reference needs to be made to particles in answer allow more particles at the start (than at the end) allow less magnesium / less reactants (1) allow 'less' ignore particle speed allow (fewer collisions) per {second / unit time} (less/fewer) frequent collisions scores MP2 and MP3 | (3) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---------------------------------|----------------------------------------------------------|------|
| 6(d) | (mass loss will be) greater (1) | Allow more gas Ignore references to reaction rate | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|------|
| 6(e) |  <p>(2)</p> | line drawn with steeper gradient to left of line (1) levelling off at the same height as the existing line (1) | (2) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|-------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 6(f)(i) | makes it faster / increases rate / lowers activation energy | accept speeds it up / increases collision rate allow shorter reaction time / alternative reaction pathway / it could be carried out at a lower temperature ignore other aspects of catalysis eg is not used up ignore 'slows down the activation energy' ignore speeds up reaction time | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|------|
| 6(f)(ii) | Any three experimental points to include MP1 : use known mass of catalyst in a reaction / find mass of catalyst before reaction (1) MP2 : after reaction {remove / filter}, wash & dry (1) MP3 : find mass of catalyst afterwards / mass of catalyst unchanged (1) | calculate difference in final and initial masses | (3) |

Total for Question 6 = 13 marks

| Question number | Answer | Mark |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 7(a)(i) | <p>An explanation linking one of the following pairs</p> <ul style="list-style-type: none"> the test only detects that ion (1) so no confusion with other ions (1) <p>OR</p> <ul style="list-style-type: none"> if same result is given by more than one ion (1) do not know which ion is present (1) | (2) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|----------------|-------------------------------------------------------------------------|------|
| 7(a)(ii) | carbon dioxide | allow CO ₂ ignore CO ² / CO2 / Co ₂ | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 7(a)(iii) | <p>(3)</p> | <p>chloride ion – white precipitate (1) iodide ion – yellow precipitate (1) sulfate ion – white precipitate (1) 1 mark for each line</p> <p>If more one line connects a left hand box to those on the right, do not award that mark</p> | (3) |

| Question number | Indicative content | Mark |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| *7(b) | <p>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.</p> <p>AO1 (3 marks) AO3 (3 marks)</p> <ul style="list-style-type: none"> • sodium, potassium and calcium ions detected by flame test • clean flame test wire with hydrochloric acid • dip wire into solid • hold wire in flame • if flame is yellow - sodium • if flame is lilac - potassium • if flame is orange-red – calcium • if no flame colour – could be aluminium • calcium and aluminium ions detected using sodium hydroxide solution • dissolve white solid in water • add drops of sodium hydroxide solution • white ppt shows calcium or aluminium ions • no ppt shows sodium or potassium ions • add more drops sodium hydroxide solution • if white ppt dissolves to form colourless solution • is aluminium ions • if white ppt does not dissolve • is calcium ions | (6) |

| Level | Mark | Descriptor |
|---------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | 0 | <ul style="list-style-type: none"> No awardable content |
| Level 1 | 1-2 | <ul style="list-style-type: none"> Interpretation and evaluation of the information attempted but will be limited with a focus on mainly just one variable. Demonstrates limited synthesis of understanding. (AO3) Presents an explanation with some structure and coherence. (AO1) |
| Level 2 | 3-4 | <ul style="list-style-type: none"> Interpretation and evaluation of the information on both variables, synthesising mostly relevant understanding. (AO3) Presents an explanation that has a structure which is mostly clear, coherent and logical. (AO1) |
| Level 3 | 5-6 | <ul style="list-style-type: none"> Interpretation and evaluation of the information, demonstrating throughout the skills of synthesising relevant understanding. (AO3) Presents an explanation that has a well-developed structure which is clear, coherent and logical. (AO1) |

| 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 | <p><u>Additional guidance</u> State test OR State the result of a test OR knows that sodium hydroxide solution can be used to test for some metal Gives correct flame colour for more than one metal One test stated and one correct result One test poorly described</p> | <p><u>Possible candidate responses</u></p> <ul style="list-style-type: none"> • use a flame test OR sodium gives a yellow flame OR carry out precipitate test OR use sodium hydroxide • sodium gives a yellow flame and potassium gives a lilac flame • use a flame test, and sodium gives a yellow flame • use sodium hydroxide for a ppt test OR sodium above blue flame |
| Level 2 | 3–4 | <p><u>Additional guidance</u></p> <p>One test poorly described and one correct result for either test OR One test well described</p> <p>States both tests, including sodium hydroxide OR One test well described and at least one correct result</p> <p>Both tests poorly described OR One test poorly described, two correct results from either test</p> | <p><u>Possible candidate responses</u></p> <ul style="list-style-type: none"> • sodium (compound) above blue flame gives yellow flame OR add sodium hydroxide and aluminium gives white ppt • sodium (compound) on wire/splint and in blue flame OR dissolve solid in water and add sodium hydroxide • do flame test; use sodium hydroxide for a ppt test OR dissolve solid in water and add sodium hydroxide and aluminium gives white ppt OR sodium (compound) on wire/splint and in blue flame gives yellow flame • sodium (compound) above the blue flame; use sodium hydroxide for a ppt test OR sodium (compound) above the blue flame gives a yellow flame, carry out precipitate test, white ppt formed |
| Level 3 | 5–6 | <p><u>Additional guidance</u></p> <p>Both tests poorly described, a correct result for both tests Both tests well described</p> <p>One test well described, one test poorly described, and a correct result for either test Both tests well described, and a correct result for both tests</p> | <p><u>Possible candidate responses</u></p> <ul style="list-style-type: none"> • sodium (compound) on wire/splint gives yellow flame AND Add sodium hydroxide and aluminium gives white ppt • dissolve solid in water and add sodium hydroxide AND Sodium (compound) on wire/splint and in blue flame. • sodium(compound) on wire/splint and in blue flame gives yellow flame AND add sodium hydroxide to metal. • Dissolve solid in water and add sodium hydroxide and sodium on wire/splint and in blue flame AND sodium gives yellow flam AND aluminium gives white ppt. |

Total for Question 7 = 12 marks

| Question number | Answer | Mark |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 8(a) | B Crude oil is a mixture of hydrocarbons is the only correct answer Answer A , C and D are factually incorrect | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|------|
| 8(b)(i) | kerosene: (fuel for) aircraft / jets / lamps / cooking / heaters / fire lighters / rocket fuel (1) diesel oil: (fuel for) cars / trains / trucks / lorries / vehicles / tractors / generators / boats (1) | Ignore generic uses such as factories / machines / engines / fuel reject trains, boats allow ships | (2) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 8(b)(ii) | any one of <ul style="list-style-type: none"> boiling point: low(er) melting point: low(er) ignition: easy / easier viscosity: low(er) / {runny / runnier} / thin(ner) flammability: high(er) volatility: high(er) density: low(er) | Note : unless otherwise stated, comparison is kerosene with diesel oil ignore lower number of carbons and hydrogens: lower length of chain: lower /shorter molecule / colour sootiness: diesel has sootier flame accept reverse argument for diesel oil note: property may be implicit in comparison | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 8(c)(i) | <p>An explanation linking</p> <ul style="list-style-type: none"> they differ by CH₂ / differ by one carbon atom / pentane has one more carbon (1) they have the same general formula / C_nH_{2n+2} / both alkanes (1) | <p>ignore: similar chemical properties, quoting the two molecular formulae, they are both saturated, both have single bonds (only)</p> <p>reject carbon or hydrogen molecules for MP1</p> <p>ignore same pattern of formula / similar general formula</p> <p>reject same {chemical / molecular} formula</p> | (2) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 8(c)(ii) | <p>82.8 with or without working scores 3 correct answer but incorrectly rounded or not to 3sf scores 2</p> <p>4 x 12 (1) (= 48) OR <u>100</u> (= 1.724...) (1) 58</p> <p><u>48</u> x 100 (1) (= 82.759) 58</p> <p>= 82.8 (g) (1)</p> | <p>allow ecf but calculation must use 12, 58, 100</p> <p>if working rounded to 1dp and carried forward, allow full marks eg 1.72 x 48 = 82.56 (2) or 82.6 (3)</p> <p>allow <u>100</u> (1) (= 1.72414) 58 = 1.72 (1) (to 3 sf)</p> <p>OR <u>100</u> (1) x 12 (= 20.68966) 58 = 20.7 (1) (to 3 sf)</p> <p>OR 4 x 12 (1) x 100 (= 4800) = 4.80 x 10³ (1) (to 3 sf)</p> | (3) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|--------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 8(c)(iii) | butane + oxygen → carbon dioxide + water (2) butane + oxygen → (1) → carbon dioxide + water (1) | allow $C_4H_{10} + 6.5 O_2 \rightarrow 4CO_2 + 5H_2O$ (2) allow multiples correct formulae no balancing (1) allow hydrogen oxide for water allow reactants and products in either order ignore state symbols allow = for → | (2) |

Total for Question 8 = 11 marks

| Question number | Answer | Mark |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 9(a) | <p>B 13 14 10 is the only correct answer</p> <p>A is incorrect because it is the numbers of subatomic particles in the atom not the ion C is incorrect because it would be an isotope of silicon with a +4 charge to it D is incorrect because it would be another isotope of silicon but with a 3- charge to it.</p> | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 9(b) | <p>2.25/ 2.3 with or without working scores 3</p> <p>MgO = 24 + 16 = 40 (1)</p> <p>THEN 1 g Mg forms $\frac{40}{24}$ (1) = 1.67 (g) MgO</p> <p>1.35 g Mg forms $\frac{40 \times 1.35}{24}$ (1) MgO = 2.25 (g)</p> <p>OR</p> <p>Mg $\frac{1.35}{24}$ (1) = 0.05625 MgO 0.05625 x 40 (1) = 2.25 (g)</p> | <p>allow ecf for incorrect formula mass</p> <p>allow 48 g Mg forms 80 g MgO (1) (could be under the equation)</p> <p>THEN 1 g Mg forms $\frac{80}{48}$ (1) = 1.67 g MgO</p> <p>1.35 g Mg forms $\frac{80 \times 1.35}{48}$ (1) MgO = 2.25 (g)</p> <p>OR</p> <p>Mg $\frac{1.35}{48}$ (1) = 0.028125 MgO 0.028125 x 80 (1) = 2.25 (g)</p> <p>Note 40 x 1.35 = 54 (2) or 80 x 1.35 = 108 (2)</p> | (3) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 9(c) | <p>$\text{Cl}_2 + \text{H}_2 \rightarrow 2\text{HCl}$ (3)</p> <p>$\text{Cl}_2 + \text{H}_2 \rightarrow$ (1)</p> <p>$\rightarrow \text{HCl}$ (1)</p> <p>balancing of correct formulae (1)</p> | <p>do not penalise incorrect small/ capital letters</p> <p>for left hand side formulae, do not allow Cl^2 or Cl_2, but allow MP3 if correctly balanced</p> <p>allow reactants in either order</p> <p>allow ClH for HCl</p> <p>allow = for \rightarrow</p> <p>allow multiples</p> <p>ignore state symbols</p> <p>if molecules have a + or - charge do not allow mark for formulae but allow MP3 for correct balancing</p> | (3) |

| Question number | Indicative content | Mark |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| *9(d) | <p>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.</p> <p>AO1 (3 marks) AO3 (3 marks)</p> <ul style="list-style-type: none">• sodium atoms lose electrons• each sodium atom loses one electron• to obtain electronic configuration 2.8• which is that of sodium ions, Na⁺• electrons transfer to chlorine atoms• chlorine atoms gain electrons• each chlorine atom gains one electron• to obtain electronic configuration 2.8.8• which is that of chloride ions, Cl⁻• sodium ions attract chloride ions• because of opposite charges• ions pack close together• ratio of ions 1:1• ions arranged in lattice• giant (ionic) (structure) | (6) |

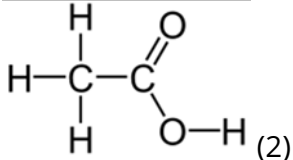
| Level | Mark | Descriptor |
|---------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | 0 | <ul style="list-style-type: none"> No awardable content |
| Level 1 | 1-2 | <ul style="list-style-type: none"> Interpretation and evaluation of the information attempted but will be limited with a focus on mainly just one variable. Demonstrates limited synthesis of understanding. (AO3) Presents an explanation with some structure and coherence. (AO1) |
| Level 2 | 3-4 | <ul style="list-style-type: none"> Interpretation and evaluation of the information on both variables, synthesising mostly relevant understanding. (AO3) Presents an explanation that has a structure which is mostly clear, coherent and logical. (AO1) |
| Level 3 | 5-6 | <ul style="list-style-type: none"> Interpretation and evaluation of the information, demonstrating throughout the skills of synthesising relevant understanding. (AO3) Presents an explanation that has a well-developed structure which is clear, coherent and logical. (AO1) |

| 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 use of the information will help place the answer at the top, or the bottom, of that level. |
|---------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | 0 | No rewardable material. | |
| Level 1 | 1–2 | <u>Additional guidance</u> Describes how ions are formed by loss or gain of electrons OR identifies structure type of sodium chloride | <u>Possible candidate responses</u> <ul style="list-style-type: none"> atoms {lose / gain} electrons sodium chloride has a giant structure loose description of a solid ionic structure |
| Level 2 | 3–4 | <u>Additional guidance</u> Describes formation of sodium ions by loss of electrons or describes formation of chloride ions by gain of electrons OR Describes formation of one ion using electron configurations OR Describes structure type of sodium chloride OR Basic description of ion formation and identifies sodium chloride structure | <u>Possible candidate responses</u> <ul style="list-style-type: none"> sodium loses electrons and chlorine gains electrons to form ions sodium loses {electrons / 1 electron} to form sodium ions [incorrect number of electrons lost puts this at the bottom of the level] chlorine gains {electrons / 1 electron} to form chloride ions [incorrect number of electrons gained or 'chlorine ions' puts this at the bottom of the level] electron shell diagram showing atoms forming ions for either sodium or for chlorine |
| Level 3 | 5–6 | <u>Additional guidance</u> Describes formation of sodium and chloride ions by loss or gain of electrons AND describes formation of ions using electron configurations. or Describes structure of sodium chloride | <u>Possible candidate responses</u> <ul style="list-style-type: none"> {sodium / Na} atoms lose 1 electron to form {sodium ions / Na⁺ (ions)} and {chlorine / Cl} atoms gain 1 electron to form {chloride ions / Cl⁻ (ions)} AND <ul style="list-style-type: none"> Na : 2.8.1 becomes Na⁺ : 2.8 and Cl : 2.8.7 becomes Cl⁻ : 2.8.8 OR as electron shell diagrams showing electron transfer or <ul style="list-style-type: none"> sodium and chloride ions have opposite charges and attract each other (to make a giant structure) (could be shown in a diagram) |

Total for Question 9 = 13 marks

| Question number | Answer | Additional guidance | Mark |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 10 (a) | <p>An explanation linking</p> <ul style="list-style-type: none"> • yeast provides enzymes (1) • (at 80°C) the enzymes {not effective / denatured} (1) | <p>allow yeast provides a biological catalyst allow yeast provides zymase</p> <p>allow yeast {contains/is} an enzyme</p> <p>allow yeast is denatured ignore enzyme is killed</p> <p>allow yeast grows well at 30°C but yeast cells are killed at 80°C .</p> | (2) |

| Question number | Answer | Mark |
|-----------------|-------------------------------------------------------------------------------------------------------------|------|
| 10 (b)(i) | <p>B oxidised is the only correct answer</p> <p>A, C and D are factually incorrect</p> | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 10 (b)(ii) |  <p>or correct carboxylic acid group (1)</p> <p>correct methyl group (1)</p> | <p>allow correct dot and cross diagram ignore incorrect bond angles</p> <p>allow OH for O-H</p> <p>reject methyl group with additional carbons</p> <p>max 1 mark if double bond present 2 carbons</p> | (2) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 10 (c)(i) | <p>A description to include</p> <ul style="list-style-type: none"> heat water to increase temperature by 30°C (1) <p>AND any two from</p> <ul style="list-style-type: none"> extinguish flame (1) (re-)determine mass of burner containing ethanol (1) subtract final from initial mass / calculate the change in mass (1) | <p>ignore references to timing</p> <p>allow watch thermometer until the temperature increases 30°C / wait for temperature to rise 30°C</p> <p>allow put a cap on the burner (to extinguish flame)</p> <p>allow '(re-)weigh the burner'</p> | (3) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 10 (c)(ii) | vertical axis with linear scale that uses more than half of the edge of the grid (1) all points correctly plotted to +/- ½ small square (1) single line of best fit drawn (1) | allow axis not starting at 0 allow points joined by straight lines / dot to dot ignore the line after points reject tramlines correct bar chart can gain MP1 and MP2 | (3) |

Total for Question 10 = 11 marks

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