JABchem

Past Papers Nat 5 Chemistry

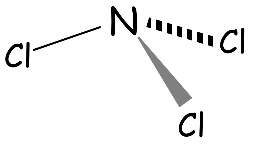
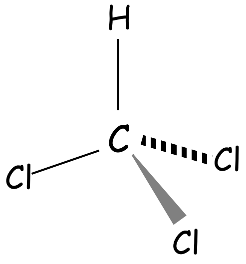
2020

Marking Scheme

Grade Obtained	A	B	C	D	N/A
2020	43.2%	23.1%	21.9%	8.8%	3.0%
2021	45.0%	21.3%	19.5%	8.6%	5.1%

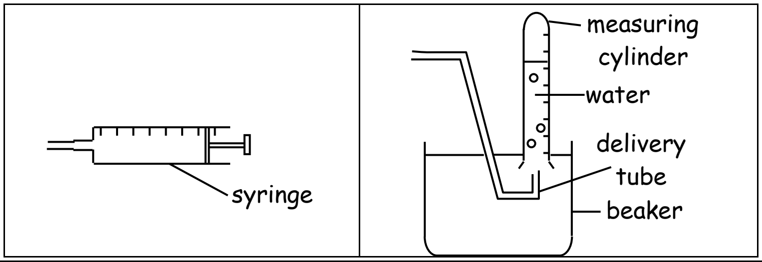
This marking scheme is for the intended National 5 Chemistry Exam in 2020 which was cancelled due to the Covid-19 pandemic. This paper was widely used in schools in 2021 to predict grades for students when the 2021 exams were cancelled. Some refer to this paper as the 2021 paper for this reason.
Whether this paper would have been the exact same paper presented to students had the exams gone ahead in 2020 is unknown but it fair to conclude that it would have been very close if not the same.
The grades awarded by SQA in 2020 and 2021 are in the table above.

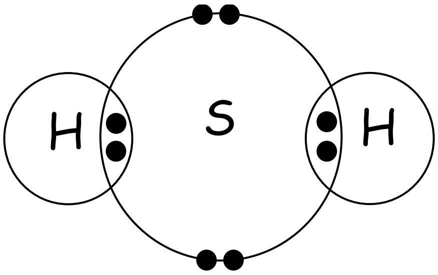
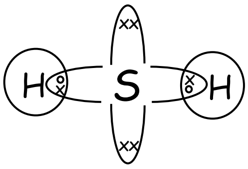
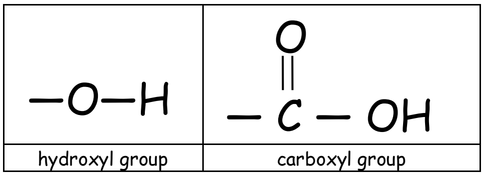
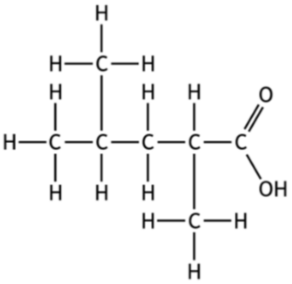
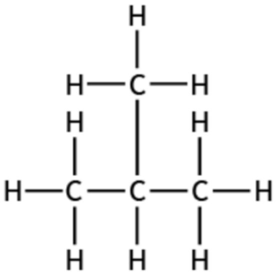
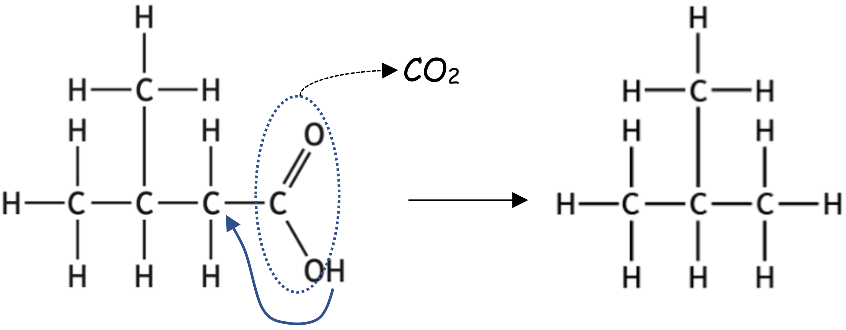
2020 National 5 Chemistry Marking Scheme

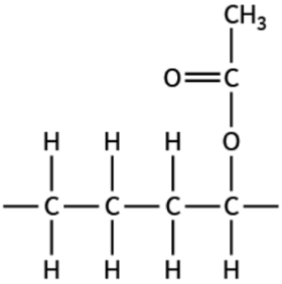
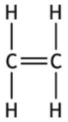
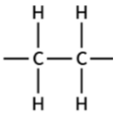
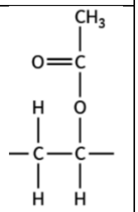
<table>
<tr><th>MC Qu</th><th>Answer</th><th>Reasoning</th></tr>
<tr><td>1</td><td>B</td><td>☒A Neon is in group 0 and has different chemical properties to Fluorine in group 7
☑B Both Fluorine and chlorine are in group 7 and have similar chemical properties.
☒C Nitrogen is in group 5 and has different chemical properties to Fluorine in group 7
☒D Hydrogen is in group 1 and has different chemical properties to Fluorine in group 7</td></tr>
<tr><td>2</td><td>A</td><td>☑A Atom has atomic number = 15 so has 15 protons and 15 electrons as it is neutral.
☒B atoms are neutral so atom will have equal number of protons and electrons
☒C Atom has atomic number of 15 ∴ atom has 15 protons
☒D Atom has atomic number of 15 ∴ atom has 15 protons</td></tr>
<tr><td>3</td><td>C</td><td><table>
<tr><th>HCl</th><th>CO_2</th><th>NCl_3</th><th>$CHCl_3$</th></tr>
<tr><td>H—Cl</td><td>O=C=O</td><td></td><td></td></tr>
<tr><td>Linear</td><td>Linear</td><td>Trigonal pyramidal</td><td>tetrahedral</td></tr>
</table></td></tr>
<tr><td>4</td><td>B</td><td>☒A Correct state symbols are $H^{+}(aq)$ and $SO_4^{2-}(aq)$ as they are dissolved in water
☑B $SO_2(g) + H_2O(l) \rightarrow 2H^{+}(aq) + SO_3^{2-}(aq)$ has the correct state symbols for each species
☒C water is a liquid (and the solvent) and should be written as $H_2O(l)$ and not $H_2O(aq)$
☒D SO_2 is a gas in question so should be written as $SO_2(g)$ not $SO_2(l)$</td></tr>
<tr><td>5</td><td>C</td><td>$\text{concentration} = \frac{\text{no. of mol}}{\text{volume}} = \frac{0.2\text{ mol}}{0.25\text{ litres}} = 0.8\text{ mol l}^{-1}$</td></tr>
<tr><td>6</td><td>A</td><td>☑A nitrogen monoxide NO is a diatomic molecule containing 2 atoms
☒B nitrogen dioxide NO_2 is a diatomic molecule containing 3 atoms
☒C dinitrogen monoxide N_2O is a diatomic molecule containing 3 atoms
☒D dinitrogen tetraoxide N_2O_4 is a diatomic molecule containing 4 atoms</td></tr>
<tr><td>7</td><td>D</td><td><table>
<tr><td>Type of base</td><td>metal oxide</td><td>metal hydroxide</td><td>metal carbonate</td></tr>
<tr><td>Example</td><td>magnesium oxide</td><td>magnesium hydroxide</td><td>magnesium carbonate</td></tr>
</table></td></tr>
<tr><td>8</td><td>C</td><td>☒A Dilution of acid will increase the pH until the pH reaches pH=7
☒B Dilution of acid will increase the pH until the pH reaches pH=7
☑C pH of solution increases with dilution and concentration of $H^{+}(aq)$ decreases with dilution
☒D Concentration of $H^{+}(aq)$ decreases as acid is diluted.</td></tr>
<tr><td>9</td><td>D</td><td>☒A All solutions, whether acidic, alkaline or neutral, contain both H^{+} ions and OH^{-} ions
☒B All solutions, whether acidic, alkaline or neutral, contain both H^{+} ions and OH^{-} ions
☒C acids with pH<7 contain more hydrogen ions than hydroxide ions
☑D alkalis with pH>7 contain more hydroxide ions than hydrogen ions</td></tr>
<tr><td>10</td><td>B</td><td>☒A Material being dyed must be the same for a fair comparison
☑B Same material (nylon), same temp (20°C)
☒C Temperature must be the same for a fair comparison
☒D Temperature and material being dyed must be the same for a fair comparison</td></tr>
<tr><td>11</td><td>C</td><td><table>
<tr><td>Number of C=C bonds</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr>
<tr><td>Formula</td><td>$C_{16}H_{34}$</td><td>$C_{16}H_{32}$</td><td>$C_{16}H_{30}$</td><td>$C_{16}H_{28}$</td><td>$C_{16}H_{26}$</td></tr>
</table></td></tr>
<tr><td>12</td><td>A</td><td>☑A C_3H_6O fits the general formula $C_nH_{2n}O$
☒B Propan-1-ol C_3H_8O fits the general formula $C_nH_{2n+2}O$
☒C Propan-2-ol C_3H_8O fits the general formula $C_nH_{2n+2}O$
☒D C_3H_8O fits the general formula $C_nH_{2n+2}O$</td></tr>
</table>

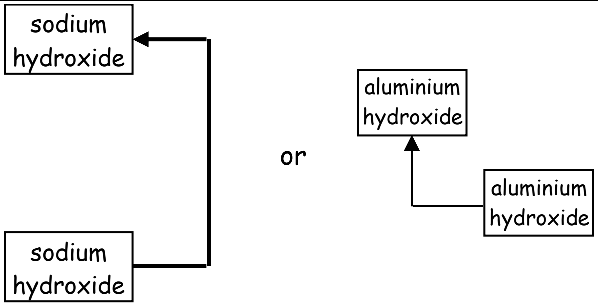
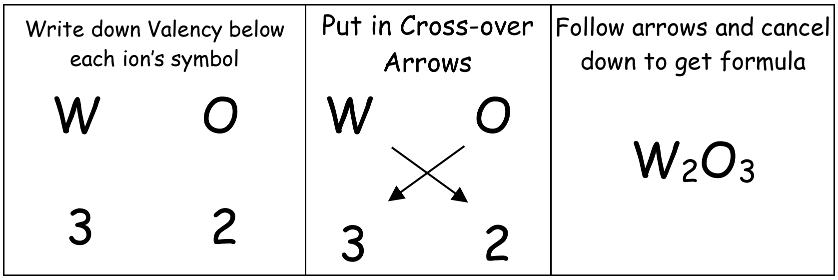
<table>
<tr><td>13</td><td>C</td><td>Structure drawn is 3,3-dimethylpentane
☒A $CH_3CH_2CH_2CH_2CH_2CH_3$ is the shortened structural formula of hexane
☒B $CH_3CH_2CH(CH_3)CH_2CH_2CH_3$ is the shortened structural formula of 3-methylhexane
☑C $CH_3CH_2C(CH_3)_2CH_2CH_3$ is the shortened structural formula of 3,3-dimethylpentane
☒D $CH_3C(CH_3)_2CH_2CH_2CH_3$ is the shortened structural formula of 2,2-dimethylpentane</td></tr>
<tr><td>14</td><td>A</td><td>☑A Cl groups are on same side of the C=C bond ∴ cis structure of 1,2-dichloroethene
☒B This molecule is 1-chloroethene and not 1,2-dichloroethene
☒C Cl groups are on opposite sides of the C=C bond ∴ trans structure of 1,2-dichloroethene
☒D This molecule is 1,1-dichloroethene and not 1,2-dichloroethene</td></tr>
<tr><td>15</td><td>C</td><td>☒A C=O group not directly attached to -O- on either side ∴ not an ester
☒B C=O group not directly attached to -O- on either side ∴ not an ester
☑C C=O group attached to -O- on left side ∴ structure is an ester
☒D C=O group not directly attached to -O- on either side ∴ not an ester</td></tr>
<tr><td>16</td><td>D</td><td>☒A Structure shown is 4,5-dimethylhex-2-ene
☒B Structure shown is 2,4-dimethylhex-1-ene
☒C Structure shown is 2,4-dimethylpent-2-ene
☑D Structure shown is 2,4-dimethylhex-2-ene</td></tr>
<tr><td>17</td><td>D</td><td>☒A Covalent bonds are equally strong in methanoic acid and ethanoic acid
☒B If methanoic acid had stronger intermolecular forces then it would have higher b.pt.
☒C Covalent bonds are equally strong in methanoic acid and ethanoic acid
☑D Ethanoic acid has higher b.pt. due to stronger intermolecular forces due to longer chain</td></tr>
<tr><td>18</td><td>B</td><td>☒A $Pb^{2+}_{(aq)}$ ion changes as it forms the precipitate so Pb^{2+} ion is not a spectator ion
☑B Both $K^{+}_{(aq)}$ and $NO_3^{-}{}_{(aq)}$ ions are unchanged in the reaction so they are spectator ions
☒C $I^{-}_{(aq)}$ ion changes as it forms the precipitate so I^- ion is not a spectator ion
☒D Pb^{2+} and I^- ions change as they form the precipitate so neither ion is a spectator ion</td></tr>
<tr><td>19</td><td>D</td><td>☒A oxidation is a reaction where electrons are lost by a reactant
☒B reduction is a reaction where electrons are gained by a reactant
☒C neutralisation is a reaction where acid reacts with a base to form water and a salt
☑D precipitation is a reaction where soluble ion join together to form an insoluble salt</td></tr>
<tr><td>20</td><td>A</td><td>☑A potassium sulfate is colourless as both potassium and sulfate ions are colourless
☒B potassium chromate is yellow because chromate ions are yellow
☒C Copper sulfate is blue because copper ions are blue
☒D copper chromate is brown as it is a mixture of blue copper ions and yellow chromate ions</td></tr>
<tr><td>21</td><td>B</td><td>☒A Iodide ions are negative not positive: $2I^- \rightarrow I_2 + 2e^-$
☑B Nickel(II) ions are oxidised into nickel(III) ions: $Ni^{2+} \rightarrow Ni^{3+} + e^-$
☒C Cobalt (III) ions are reduced into cobalt (II) ions: $Co^{3+} + e^- \rightarrow Co^{2+}$
☒D Sulfate ions are negative not positive : $SO_4^{2-} + 2H^+ + 2e^- \rightarrow SO_3^{2-} + H_2O$</td></tr>
<tr><td>22</td><td>B</td><td>☒A Electrons flow from the higher up metal (zinc) to lower down metal (tin)
☑B Zinc electrode decreases in mass as electrons flow from zinc to tin through wires
☒C Electrons flow from the higher up metal (zinc) to lower down metal (tin)
☒D Zinc electrode decreases in mass as the reaction proceeds: $Zn_{(s)} \rightarrow Zn^{2+}_{(aq)} + 2e^-$</td></tr>
<tr><td>23</td><td>C</td><td><table>
<tr><td>Radiation</td><td>Alpha</td><td>Beta</td><td>Gamma</td></tr>
<tr><td>Mass</td><td>4</td><td>0</td><td>No mass</td></tr>
<tr><td>Charge</td><td>2</td><td>-1</td><td>No charge</td></tr>
<tr><td>Stopped by</td><td>sheet of paper</td><td>thin aluminium</td><td>thick lead/concrete</td></tr>
<tr><td>Deflection</td><td>Towards negative</td><td>Towards positive</td><td>No defection</td></tr>
</table></td></tr>
<tr><td>24</td><td>D</td><td><table>
<tr><td>Process</td><td>Catalyst</td><td>Equation</td></tr>
<tr><td>Haber</td><td>Iron</td><td>$N_2 + 3H_2 \rightleftharpoons 2NH_3$</td></tr>
<tr><td>Ostwald</td><td>Platinum</td><td>$2NH_3 + 2\frac{1}{2}O_2 \longrightarrow 2NO + 3H_2O$</td></tr>
</table></td></tr>
<tr><td>25</td><td>D</td><td>☒A temperature must be 80°C for all 50g of potassium chloride to have dissolved
☒B all potassium nitrate would have dissolved at 40°C.
☒C potassium chloride is less soluble than potassium nitrate
☑D all 50g of potassium nitrate has dissolved at 40°C but not all potassium chloride has.</td></tr>
</table>

2020 National 5 Chemistry Marking Scheme

Long Qu	Answer	Reasoning
1a(i)	isotope	Same Atomic number Number of protons Different Mass number Number of neutrons
1a(ii)	120	The average atomic mass (ram) =119.4 This means the most common isotope in the sample must be 120 for the average to be so close.
1b	$^{124}_{50}Sn$	All atoms of tin (Sn) have the same atomic number of 50. The mass number is the number of protons + number of neutrons = 50 = 74 = 124
1c	Covalent	Substances which do not conduct in the solid or liquid state contain **covalent** bonds. (Due to the low melting and boiling points, the substance must be covalent molecular)
2a	Diagram showing:	
2b(i)	Curve showing:	curve steeper at start Curve should plateau at same volume/height
2b(ii)	Reactants being used up	As the reaction proceeds, the reactants get used up as they turn into products. With less reactants available, there are less collisions leading to decrease in the reaction rate.
2c(i)	0.22	$\text{Rate} = \frac{\Delta \text{Quantity}}{\Delta \text{Time}} = \frac{50cm^3}{230\ s} = 0.22\ cm^3\ s^{-1}$
2c(ii)	As temperature increases the time taken decreases	As the temperature increases, the reaction rate increase and the time taken for $50cm^3$ of gas to form will decrease. This is due to an increase in collisions between the reactants as the particles have more energy at a higher temperature.
2c(iii)	Sulfuric acid contains more H^+ ions	Sulfuric acid has the formula H_2SO_4 and has two H^+ ions in every formula unit of H_2SO_4. Hydrochloric acid HCl has one H^+ ions per formula unit. Sulfuric acid has a higher concentration of H^+ than hydrochloric acid when they two acids have the same concentration.
3a	Speed up chemical reactions	Catalysts speed up chemical reactions but can be recovered chemically unchanged at the end of the reaction.
3b(i)	phosphorus or potassium	The three elements essential for heathy plant growth are: Nitrogen Phosphorus Potassium
3b(ii)	soluble	All fertilisers must contain at least one element from N, P or K <u>and</u> be soluble in water. If the chemical is not soluble then it will not be able to get in plants through their roots.
3c(i)	46.7	gfm $(NH_2)_2CO$: (2x14)+(4x1)+(1x12)+(1x16) = 28+4+12+16 = 60 (1 mark) $\% \text{Fe} = \frac{28}{60} \text{ x } 100 = 46.7\%$ (1 mark)
3c(ii)	Thermometer	Thermometer is the apparatus to measure changes in temperature.
4a	triethylene glycol	Problem Solving: Selecting information from a passage

<table>
<tr><td>4b</td><td>Diagram showing:</td><td> or  </td></tr>
<tr><td>4c</td><td>131</td><td>1mol skatole C_9H_9N = (9x12) + (9x1) + (1x14) = 108+9+14 = 131</td></tr>
<tr><td>4d</td><td>Hydroxyl</td><td><table><tr><td>$-O-H$</td><td>$-\overset{\overset{O}{||}}{C}-OH$</td></tr><tr><td>hydroxyl group</td><td>carboxyl group</td></tr></table></td></tr>
<tr><td>4e(i)</td><td></td><td>$\underbrace{\text{2,4}}_{\text{side groups on } C_2 \text{ and } C_4}\text{-}\underbrace{\text{dimethyl}}_{\text{2x methyl } -CH_3 \text{ side groups}}\underbrace{\text{pentan}}_{\text{Five carbons in main chain}}\underbrace{\text{oic acid}}_{\text{Carboxyl -COOH Group on } C_1}$</td></tr>
<tr><td>4e(ii)</td><td></td><td> </td></tr>
<tr><td>4f</td><td>unsaturated</td><td>Compounds with C=C double bonds are unsaturated and will decolourise bromine solution quickly and take part in addition reactions.</td></tr>
<tr><td>5</td><td>Open Question:</td><td><table><tr><th>3 mark answer</th><th>2 mark answer</th><th>1 mark answer</th></tr><tr><td>Demonstrates a <u>good</u> understanding of the chemistry involved. A good comprehension of the chemistry has provided in a logically correct, including a statement of the principles involved and the application of these to respond to the problem.</td><td>Demonstrates a <u>reasonable</u> understanding of the chemistry involved, making some statement(s) which are relevant to the situation, showing that the problem is understood.</td><td>Demonstrates a <u>limited</u> understanding of the chemistry involved. The candidate has made some statement(s) which are relevant to the situation, showing that at least a little of the chemistry within the problem is understood.</td></tr></table></td></tr>
<tr><td>6a(i)</td><td>Propene</td><td><table><tr><td>Monomer</td><td>ethene</td><td>propene</td><td>chloroethene</td><td>tetrafluorothene</td></tr><tr><td>Polymer</td><td>poly(ethene)</td><td>poly(propene)</td><td>poly(chloroethene)</td><td>poly(tetrafluorothene)</td></tr></table></td></tr>
<tr><td>6a(ii)</td><td>Bar chart showing:</td><td><table><tr><th>1 mark</th><th>1mark</th><th>1 mark</th><th>1 mark</th></tr><tr><td>For appropriate format: bars (not 4 points)</td><td>The 'percentage' axis of the graph has a suitable scale. For the graph paper provided within the question paper, the selection of a suitable scale will result in a graph (plotted bars) that occupies greater than half of the width and half of the height of the graph paper.</td><td>The axes of the graph have suitable labels and units.</td><td>All bars are plotted accurately (within a half box tolerance).</td></tr></table></td></tr>
<tr><td>6b(i)</td><td>Contains C=C double bonds or they are unsaturated</td><td>C=C double bonds are needed within any monomer for addition polymerisation. The C=C double bonds opens up and the monomers join together to make a polymer.</td></tr>
</table>

<table>
<tr><td>6b(ii)</td><td></td><td><table>
<tr><td>Monomer</td><td></td><td></td></tr>
<tr><td>Portion of Repeating Unit</td><td></td><td></td></tr>
</table></td></tr>
<tr><td>7a(i)</td><td>sodium methanoate</td><td>methanoic acid + sodium hydroxide → sodium methanoate + water
ACID + METAL HYDROXIDE → SALT + WATER</td></tr>
<tr><td>7a(ii)</td><td>Any pH value less the 7</td><td>Hydrochloric acid is a STRONG acid and ammonium hydroxide is a WEAK base.
strong acid + weak base → acidic salt + water<table>
<tr><th>Acidic solution</th><th>Neutral Solution</th><th>Alkaline Solution</th></tr>
<tr><td>pH<7</td><td>pH=7</td><td>pH>7</td></tr>
</table></td></tr>
<tr><td>7b(i)</td><td>Titration</td><td>Titration is the technique in chemistry where accurate volumes of solutions are measured using pipettes and burettes. Indicators are used to show the end of the reaction by a colour change.</td></tr>
<tr><td>7b(ii)</td><td>Within 0.2cm^3 of each other</td><td>In a titration, a rough titration is initially carried out to work out the approximate volume where the colour change takes place but is not used when the final volumes are averaged. The experiment is repeated with the majority of the rough volume added in one big addition from the burette and then added drop by drop until the colour changes in the conical flask. The experiment is repeated until at least two volumes within 0.2cm^3 of each other are achieved.</td></tr>
<tr><td>7c(i)</td><td>Red</td><td><table>
<tr><th>Element</th><th>Ion</th><th>Flame Colour</th></tr>
<tr><td>Barium</td><td>Ba^{2+}</td><td>Green</td></tr>
<tr><td>Potassium</td><td>K^+</td><td>Lilac</td></tr>
<tr><td>Calcium</td><td>Ca^{2+}</td><td>Orange-red</td></tr>
<tr><td>Sodium</td><td>Na^+</td><td>Yellow</td></tr>
</table><table>
<tr><th>Element</th><th>Ion</th><th>Flame Colour</th></tr>
<tr><td>Copper</td><td>Cu^{2+}</td><td>Blue-green</td></tr>
<tr><td>Strontium</td><td>Sr^{2+}</td><td>Red</td></tr>
<tr><td>Lithium</td><td>Li^+</td><td>Red</td></tr>
<tr><td></td><td></td><td></td></tr>
</table></td></tr>
<tr><td>7c(ii)</td><td>$Ba^{2+}SO_4^{2-}$</td><td><table>
<tr><th>Write down Symbols and valency below</th><th>Cross-Over arrows to work out formula</th><th>Work out chemical formula (Cancel down if necessary)</th><th>Insert charges to each ion and multiple ions required brackets</th></tr>
<tr><td>Ba SO_4^{2-}
2 2</td><td>Ba SO_4^{2-}
2 2</td><td>$BaSO_4$</td><td>$Ba^{2+}SO_4^{2-}$</td></tr>
</table></td></tr>
<tr><td>8a(i)</td><td>Lime water</td><td><table>
<tr><td>Gas</td><td>Carbon Dioxide</td><td>Oxygen</td><td>Hydrogen</td></tr>
<tr><td>Test</td><td>turns lime water milky</td><td>relights a glowing splint</td><td>burns with a pop</td></tr>
</table></td></tr>
<tr><td>8a(ii)</td><td>Answer to include:</td><td>similar chemical properties <u>and</u> a general formula</td></tr>
<tr><td>8a(iii)</td><td>$C_4H_{10} + 6\frac{1}{2}O_2$
↓
$4CO_2 + 5H_2O$</td><td>$C_4H_{10} + 6\frac{1}{2}O_2 \longrightarrow 4CO_2 + 5H_2O$</td></tr>
<tr><td>8b</td><td>70</td><td>$E_h = cm\Delta T \therefore \Delta T = \dfrac{E_h}{c \times m} = \dfrac{76.32}{(3.6\times0.4)} = 53^\circ C$
Final Temperature = Initial Temp + Change in Temp = 17°C + 53°C = 70°C</td></tr>
</table>

9a(i)	ore/bauxite filtration aluminium hydroxide aluminium oxide	Problem Solving: Processing written passage in flow chart
9a(ii)	One arrow drawn from:	
9b(i)	Breaking down ionic compound using electricity	Electrolysis is the breaking up (decomposition) of an ionic compound back to its elements using electricity. The ionic compound is chemically changed as electricity passes through the substance.
9b(ii)	One from:	Allows the product(s) to be identified To make sure only one product is produced at each electrode To separate aluminium from oxygen
9b(iii)	Ions are free to move	In solid ionic compounds, the ions are locked in an ionic lattice and cannot move. When the ionic substance melts, the lattice is broken up and the ions are now free to move to their oppositely charged electrode.
9b(iv)	$6O_2 + 4Al^{3+}$ ↓ $4Al + 3O_2$	❶ $Al^{3+} + 3e^- \rightarrow Al$ ❷ $2O^{2-} \rightarrow O_2 + 4e^-$ ❶x4 $4Al^{3+} + 12e^- \rightarrow 4Al$ ❷x3 $6O^{2-} \rightarrow 3O_2 + 12e^-$ Add ❶'+❷' $6O^{2-} + 4Al^{3+} + \cancel{12e^-} \rightarrow 4Al + 3O_2 + \cancel{12e^-}$ cancel e⁻ $6O^{2-} + 4Al^{3+} \rightarrow 4Al + 3O_2$
10a	Wolframite	Problem Solving: Selecting Information from a passsage
10b	W_2O_3	
10c	Any temperature greater than 2870°C and lower than 6000°C	Reaction took place at temperature where tungsten carbide is a liquid. Substances are liquids at temperatures between melting and boiling points. Temperature must be above 2870°C but below 6000°C
10d	15.8	From data booklet page 7: Density of titanium = 4.51 g cm^{-3} Density of tungsten carbide = 3.5 x density of titanium = 3.5 x 4.51 – 15.8
11a	One answer from:	proton $^{1}_{1}p$ $^{1}_{1}H$ H hydrogen
11b(i)	5500-6000 years	Time taken on the x-axis for the y-axis figure to half. Any halving e.g. 100%→50% or 80%→40% on y-axis will give the same value for time taken on the x-axis

<table>
<tr><td>11b(ii)</td><td>Answer is four times answer from Q11b(i)</td><td><table><tr><td>No of half-lives</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>Fraction remaining</td><td>1</td><td>$^1/_2$</td><td>$^1/_4$</td><td>$^1/_8$</td><td>$^1/_{16}$</td></tr></table>If 1 half-life = 5500 years then 4 four half-lives = 22000years</td></tr>
<tr><td>11b(iii)</td><td>No ^{14}C left in bones</td><td>Too many half-lives have passed for an accurate number of half-lives to be calculated and therefore the date of the bone cannot be made.</td></tr>
<tr><td>12a</td><td>Compounds containing carbon and hydrogen only</td><td>There are many types of hydrocarbons but they are all compounds</td></tr>
<tr><td>12b(i)</td><td>Hydrogenation</td><td>The addition of hydrogen across a C=C double bond is also called hydrogenation.</td></tr>
<tr><td>12b(ii)</td><td>Diagram of six carbon alkene</td><td>Diagram of one of the following alkenes:<table><tr><td>hex-1-ene</td><td>hex-2-ene</td><td>hex-3-ene</td></tr><tr><td>2-methylpent-1-ene</td><td>3-methylpent-1-ene</td><td>4-methylpent-1-ene</td></tr><tr><td>2-methylpent-2-ene</td><td>3-methylpent-2-ene</td><td>4-methylpent-2-ene</td></tr><tr><td>2,3-dimethylbut-1-ene</td><td>3,3-dimethylbut-1-ene</td><td>2,3-dimethylbut-2-ene</td></tr></table></td></tr>
<tr><td>12c</td><td>115</td><td>1mol C_5H_{10} = (5x12) + (10x1) = 60 + 10 = 70g
$\textbf{no}\text{. of mol} = \frac{\textbf{mass}}{\textbf{gfm}} = \frac{175g}{70g\ mol^{-1}} = 2.5mol$
$C_5H_{10}Br_2 + 2Na \longrightarrow C_5H_{10} + 2NaBr$
2mol 1mol
5mol 2.5mol
1mol Na = (1x23) = 23g
mass = **no**. of mol x **gfm** = 5 mol x 23g mol^{-1} = 115g</td></tr>
<tr><td>12d</td><td>4</td><td>$\text{Ring strain per carbon} = \frac{\text{total ring strain}}{\text{no. of carbons in cycloalkane}} = \frac{28}{7} = 4$</td></tr>
<tr><td>13</td><td>Open Question:</td><td><table><tr><td>**3 mark answer**</td><td>**2 mark answer**</td><td>**1 mark answer**</td></tr><tr><td>Demonstrates a **good** **understanding** of the chemistry involved. A good comprehension of the chemistry has provided in a logically correct, including a statement of the principles involved and the application of these to respond to the problem.</td><td>Demonstrates a **reasonable** **understanding** of the chemistry involved, making some statement(s) which are relevant to the situation, showing that the problem is understood.</td><td>Demonstrates a **limited** **understanding** of the chemistry involved. The candidate has made some statement(s) which are relevant to the situation, showing that at least a little of the chemistry within the problem is understood.</td></tr></table></td></tr>
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