JABchem

Past Papers Higher Chemistry

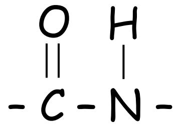
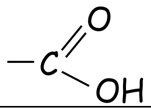
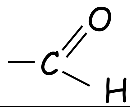
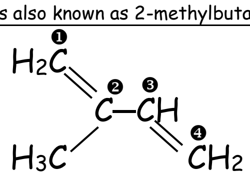
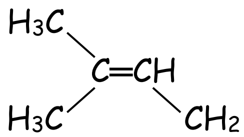
REVISED 2012 Marking Scheme

Grade Awarded	Mark Required (/100)	% candidates achieving grade
A	73+	34.6%
B	61+	28.9%
C	50+	17.7%
D	44+	7.1%
No award	<44	11.7%

Section:	Multiple Choice	Extended Answer
Average Mark:	20.6 /40	44.0 /60

2012 Revised Higher Chemistry Marking Scheme

MC Qu	Answer	% Pupils Correct	Reasoning
1	C	90	☒A Cl has a larger electronegativity value than Br so Cl atom carries the $\delta-$ charge ☒B There is no polarity in Cl-Cl bond as both atoms have the same electronegativity ☑C Cl has a smaller electronegativity value than F so Cl atom carries the $\delta+$ charge ☒D Cl has a larger electronegativity value than I so Cl atom carries the $\delta-$ charge
2	B	78 OldH=68	☒A Hydrogen gas H_2 has a single covalent bond inside the H_2 molecule ☑B Helium is a monatomic gas as it is a Noble Gas ☒C Nitrogen gas N_2 has a N≡N triple covalent bond inside the N_2 molecule ☒D Solid sulphur S_8 has covalent bonds inside the S_8 molecule
3	B	90 OldH=88	☒A Ionic substances are compounds between metals and non-metals ☑B Compounds contain bonds between atoms ∴ monoatomic are not compounds ☒C Silicon Dioxide is an example of a compound with a covalent network structure ☒D H_2O, NH_3 and CH_4 are examples of compounds with a molecular structure
4	C	76 OldH=62	☒A Electronegativity of carbon =2.5 ∴electronegativity difference = 3.0–2.5 = 0.5 ☒B Electronegativity of oxygen =3.5 ∴electronegativity difference = 3.5-3.0 = 0.5 ☑C Electronegativity of chlorine =3.0 ∴electronegativity difference = 3.0-3.0 = 0 ☒D Electronegativity of phosphorus=2.2∴electronegativity difference=3.0-2.2 =0.8
5	D	36 OldH=33	☒A Neon atoms have no charge as they are atoms ☒B Fluoride F^- ions have an electron arrangement of 2,8 but are negatively charged ☒C Sodium atoms have no charge as they are atoms ☑D Aluminium atoms=2,8,3∴Aluminium Al^{3+} ions have electron arrangement of 2,8
6	D	83 OldH=78	☒A Melting point too high to be only London dispersion forces being overcome ☒B Conductor when solid ∴substance contains metallic bonding ☒C Conductor when solid ∴substance contains metallic bonding ☑D Low melting point and non-conductor as solid consistent with LDforces only
7	C	60	☒A Propanoic acid contains polar bonds and would not dissolve non-polar coniceine ☒B Propan-1-ol contains polar bonds and would not dissolve non-polar coniceine ☑C Heptane is non-polar and would dissolve non-polar coniceine ☒D Water contains polar bonds and would not dissolve non-polar coniceine
8	C	57	☒A Reduction is the gain of electrons (electrons on LEFT of arrow) ☒B Redox reaction do not contain electrons (they have been cancelled out) ☑C Oxidation is the loss of electrons (electrons on RIGHT of arrow) ☒D Hydration occurs when H_2O is added across a C=C double bond
9	D	43 OldH=43	Write down main species involved: $IO_3^- \rightarrow I_2$ Balance all atoms other than O and H: $2IO_3^- \rightarrow I_2$ Add H_2O to other side to balance O atoms: $2IO_3^- \rightarrow I_2 + 6H_2O$ Add H^+ to other side to balance H atoms: $2IO_3^- + 12H^+ \rightarrow I_2 + 6H_2O$ Add electrons to most positive side to balance charge: $2IO_3^- + 12H^+ + 10e^- \rightarrow I_2 + 6H_2O$
10	A	79	☑A Hydration: Addition of H_2O across a C=C double bond ☒B Hydrogenation: Addition of H_2 across a C=C double bond ☒C Condensation: Joining of two molecules with the removal of water at the join ☒D Hydrolysis: Splitting of a large molecule into two with water added at the break
11	B	78 OldH=74	☒A ethylethanoate hydrolyses to ethanol (gfm=46g) and ethanoic acid (gfm=60g) ☑B propylethanoate hydrolyses to propanol (gfm=60g) and ethanoic acid (gfm=60g) ☒C methylpropanoate hydrolyses to methanol (gfm=28g) and propanoic acid (gfm=74g) ☒D ethylpropanoate hydrolyses to ethanol (gfm=46g) and propanoic acid (gfm=74g)

<table>
<tr><td>12</td><td>D</td><td>84</td><td><table><tr><th>Amides</th><th>Salts</th><th>Esters</th></tr><tr><td>Amide links formed between $-NH_2$ groups and $-COOH$ groups of amino acids in formation of protein</td><td>Salts formed by neutralisation of fatty acids by alkalis forms soaps</td><td>Fats and oils have ester links between glycerol and 3 fatty acids</td></tr></table></td></tr>
<tr><td>13</td><td>B</td><td>83</td><td>☒A fats and oils have the same degree of hydrogen bonding (i.e. none)
☑B fats are solid because the saturated molecules fit more closely together
☒C fats are more closely packed than oils making them solid
☒D fats and oil do not have cross-links between molecules</td></tr>
<tr><td>14</td><td>C</td><td>96</td><td>The structure of the amide link is </td></tr>
<tr><td>15</td><td>B</td><td>78
OldH=74</td><td>☒A mixture of peptides is missing a W-V fragment
☑B all possible fragments from peptide are in this answer
☒C mixture of peptides is missing a X-W fragment
☒D mixture of peptides is missing a Z-X fragment</td></tr>
<tr><td>16</td><td>A</td><td>55</td><td><table><tr><th>Chemical</th><th>Solublility in Water</th><th>Volatility</th></tr><tr><td>Vanillin</td><td>More soluble as aldehydes are more soluble than ketones</td><td>More volatile as smaller molecules have lower b.pt.</td></tr><tr><td>Zingerone</td><td>Less soluble as ketones are less soluble than aldehydes</td><td>Less volatile as larger molecules have higher b.pt.</td></tr></table></td></tr>
<tr><td>17</td><td>B</td><td>98
OldH=61</td><td><table><tr><th>carboxylic acids</th><th>alcohols</th><th>aldehydes</th></tr><tr><td></td><td>—OH</td><td></td></tr></table></td></tr>
<tr><td>18</td><td>D</td><td>92
OldH=87</td><td>☒A pentan-2-ol: secondary alcohols oxidise to ketones
☒B pentan-3-ol: secondary alcohols oxidise to ketones
☒C 2-methylbutan-2-ol: tertiary alcohols do not undergo mild oxidation
☑D 2,2-dimethylpropan-1-ol: primary alcohol oxidises to aldehydes then carboxylic acids</td></tr>
<tr><td>19</td><td>A</td><td>75</td><td><table><tr><th>Terpenes are based on multiples of 5 carbon units of isoprene (isoprene is also known as 2-methylbuta-1,3-diene)</th><th>The only highlighted 5 carbon unit in the question is:</th></tr><tr><td>
2-methylbuta-1,3-diene</td><td></td></tr></table></td></tr>
<tr><td>20</td><td>A</td><td>58
OldH=61</td><td><table><tr><th>$2NO_{(g)}$</th><th>+ $O_{2(g)}$ →</th><th>$2NO_{2(g)}$</th></tr><tr><td>2mol</td><td>1mol</td><td>2mol</td></tr><tr><td>1mol</td><td>½mol</td><td>1mol</td></tr><tr><td>1vol</td><td>½vol</td><td>1vol</td></tr><tr><td>1litre</td><td>½litre</td><td>1litre</td></tr></table></td></tr>
<tr><td>21</td><td>B</td><td>69
OldH=71</td><td>☒A temperature affects the rate of reaction but not the position of equilibrium
☑B at equilibrium, the concentration of reactant and products are constant
☒C in an equilibrium, 100% of the reactants are never used up
☒D in an equilibrium, 100% of the reactants are never used up</td></tr>
<tr><td>22</td><td>D</td><td>82
OldH=83</td><td>☒A Catalysts do not affect the position of equilibrium
☒B Catalysts do not change the enthalpy change
☒C Catalysts do not affect the position of equilibrium
☑D Catalysts do not change the enthalpy change or the position of equilibrium</td></tr>
<tr><td>23</td><td>C</td><td>58
OldH=65</td><td><table><tr><th>$CaCO_3$</th><th>+ $2HNO_3$ →</th><th>$Ca(NO_3)_2$</th><th>+ H_2O</th><th>+ CO_2</th></tr><tr><td>1mol</td><td>2mol</td><td>1mol</td><td>1mol</td><td>1mol</td></tr><tr><td>0.05mol</td><td>0.1mol (0.1mol HNO_3 required but only 0.08mol HNO_3 available)</td><td></td><td></td><td></td></tr><tr><td>0.04mol
(required)</td><td>0.08mol
(available)</td><td>0.04mol</td><td>0.04mol</td><td>0.04mol</td></tr></table></td></tr>
</table>

<table>
<tr><td>24</td><td>B</td><td>78
OldH=79</td><td>☒A distance x represents the activation energy for the forward reaction
☑B distance y represents the enthalpy change R→P for the forward reaction
☒C distance x+y represents the activation energy for the reverse reaction
☒D distance x-y does not represent anything on this graph</td></tr>
<tr><td>25</td><td>D</td><td>78
OldH=79</td><td>☒A Activation Energy E_a is not altered by changes in temperature
☒B The Enthalpy Change ΔH is independent of the temperature it takes place at
☒C Activation Energy E_a is not altered by changes in temperature
☑D Increasing temperature means more collision with energy greater than E_a</td></tr>
<tr><td>26</td><td>A</td><td>36
OldH=44</td><td>$5N_2O_4 + 4CH_3NHNH_2 \longrightarrow 4CO_2 + 12H_2O + 9N_2$ ΔH=-5116kJ
5mol 4mol
2mol 4mol x $^2/_5$ ΔH=-5116kJ x $^2/_5$
= 1.6mol (2mol available) = -2046.4kJ</td></tr>
<tr><td>27</td><td>A</td><td>49
OldH=56</td><td><table>
<tr><th>Enthalpy</th><th>Definition</th><th>Equation</th><th>ΔH</th></tr>
<tr><td>Formation</td><td>The formation of one mole of a substance from its elements in their natural state</td><td>$2Al + 1\frac{1}{2}O_2 \rightarrow Al_2O_3$</td><td>-1670 kJ mol^{-1}</td></tr>
<tr><td>Combustion</td><td>Energy change for the complete combustion of one mole of a substance</td><td>$Al + \frac{3}{4}O_2 \rightarrow \frac{1}{2}Al_2O_3$</td><td>-835 kJ mol^{-1}</td></tr>
</table></td></tr>
<tr><td>28</td><td>D</td><td>54</td><td>Bond Breaking: $H_{2(g)} \rightarrow 2H_{(g)}$ ∴ H-H bond enthalpy
Bond Forming: $H_{(g)} + Cl_{(g)}$ $HCl_{(g)}$ ∴ H-Cl bond enthalpy
Enthalpy Change = Bond Breaking Steps. – Bond Forming Steps
= (H-H bond enthalpy) – (H-Cl Bond Enthalpy)</td></tr>
<tr><td>29</td><td>A</td><td>23</td><td>If a pure sample of the new compound has been produced, there would only be one spot on the chromatograph which would be neither X or Y.</td></tr>
<tr><td>30</td><td>C</td><td>88</td><td><table>
<tr><th>Student</th><th>1st</th><th>2nd</th><th>3rd</th><th></th></tr>
<tr><td>Student A</td><td>10.0</td><td>9.0</td><td>8.0</td><td></td></tr>
<tr><td>Student B</td><td>6.4</td><td>6.6</td><td>6.8</td><td></td></tr>
<tr><td>Student C</td><td>6.5</td><td>6.6</td><td>6.6</td><td>Only student with 3 volumes within ±$0.2cm^3$ of each other</td></tr>
<tr><td>Student D</td><td>9.0</td><td>8.5</td><td>9.6</td><td></td></tr>
</table></td></tr>
</table>

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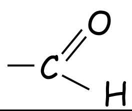
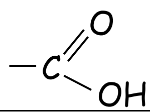
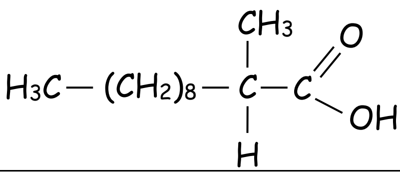
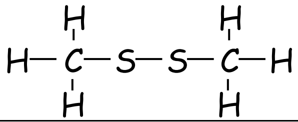
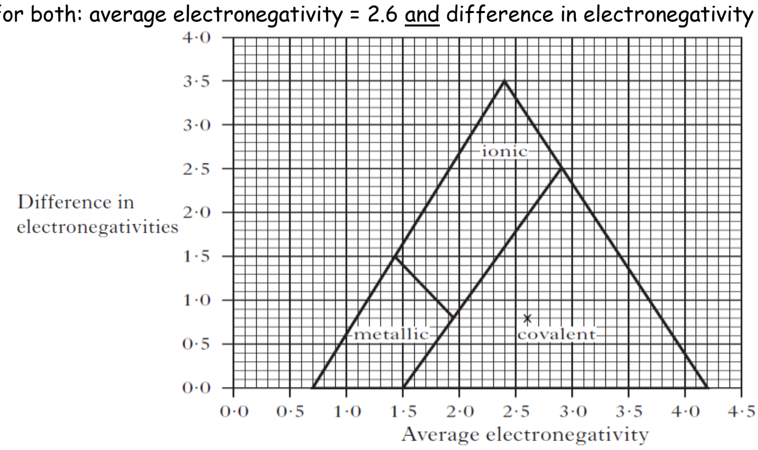
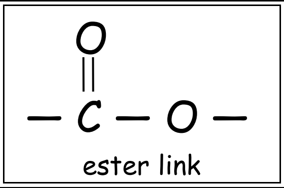
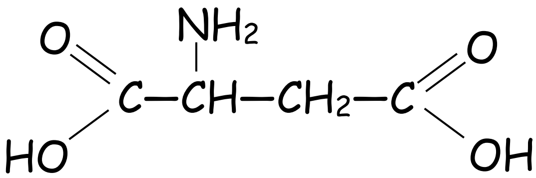
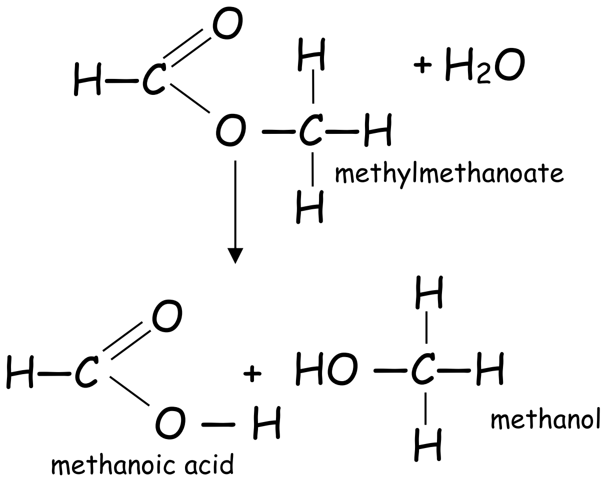
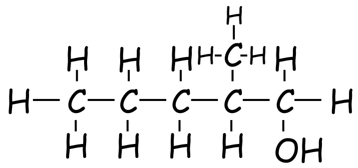
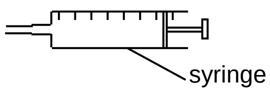
<table>
<tr><th>Long Qu</th><th>Answer</th><th>Reasoning</th></tr>
<tr><td>1a(i)</td><td>Boron or carbon</td><td>Covalent Networks are found in non-metal elements with high melting points:
<table>
<tr><td>Type</td><td colspan="2">metal</td><td colspan="6">non-metal</td></tr>
<tr><td>Element</td><td>Li</td><td>Be</td><td>B</td><td>C</td><td>N</td><td>O</td><td>F</td><td>Ne</td></tr>
<tr><td>m.pt. (°C)</td><td>181</td><td>1287</td><td>2075</td><td>3825</td><td>-210</td><td>-219</td><td>-220</td><td>-249</td></tr>
</table></td></tr>
<tr><td>1a(ii)</td><td>Number of protons increases</td><td>Other acceptable answers: increased atomic number or
greater/positive charge (pull) or
greater pull on (outer) electrons</td></tr>
<tr><td>1a(iii)</td><td>Lithium</td><td>The strongest reducing agents are found at the top of the electrochemical series
The strongest oxidising agents are found at the bottom of the electrochemical series.</td></tr>
<tr><td>1b</td><td>Answer to include:</td><td>
<table>
<tr><td>1st mark:</td><td>Electrons are further away from the nucleus
or Atomic size increasing
or Extra energy level/electron shell</td></tr>
<tr><td>2nd mark:</td><td>Screening/shielding effect in complete inner shells</td></tr>
</table></td></tr>
<tr><td>2a</td><td>4.0</td><td>Ignore rogue result (21.7)
$\text{Average} = \frac{4.0+3.9+4.1}{3} = \frac{12.0}{4} = 4.0$</td></tr>
<tr><td>2b</td><td>288g</td><td>3.3mg zinc = 100g peanuts
9.5mg zinc = 100g peanuts $\times \frac{9.5}{3.3}$
= 288g peanuts</td></tr>
<tr><td>3a(i)</td><td>0.125</td><td>$\Delta H = cm\Delta T = 4.18 \times 0.5 \times 82 = -171.38kJ$
-1367kJ is released by burning 1 mol ethanol
-171.38kJ released by 1 mol $\times$ $^{-171.38}/_{-1367}$
= 0.125mol</td></tr>
<tr><td>3a(ii)</td><td>2 from:</td><td>
<table>
<tr><td>heat lost to surroundings</td><td>incomplete combustion</td><td>loss (of ethanol) through evaporation</td><td>ethanol impure</td></tr>
</table></td></tr>
<tr><td>3b</td><td>1.66×10^6
or 1660000</td><td>$1.45cm^3$ petrol = 0.00145 litres petrol
1g petrol = 0.00145litres petrol = 48.0 kJ
50litres petrol = 48.0kJ $\times \frac{50}{0.00145}$
= 1.66×10^6 kJ</td></tr>
<tr><td>4a</td><td>Hydrogen bonding in geraniol</td><td>Geraniol contains hydrogen bonding as it contains a hydroxyl –OH group.
• all substances with N, O or F attached to hydrogen results in hydrogen bonding.
Hydrogen bonding brings molecules closer together, raising the boiling point and reducing the ease of evaporation of the molecule.</td></tr>
<tr><td>4b(i)</td><td>Aldehyde or alkanal</td><td>
<table>
<tr><th>Alcohols</th><th>Aldehydes</th><th>Carboxylic Acids</th></tr>
<tr><td>—OH</td><td></td><td></td></tr>
</table></td></tr>
<tr><td>4b(ii)</td><td>Diagram showing:</td><td></td></tr>
<tr><td>4c</td><td>Open question answer to include:</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>
</table>

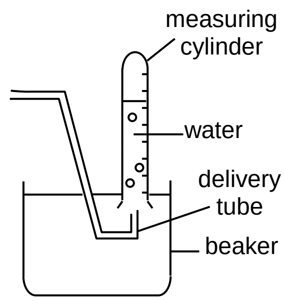
5a	2.76×10^{21}	From graph: At voltage=20mV, volume = $110 cm^3$ 1 mol ethanol = 46g = 24 litres = 6.02×10^{23} molecules 0.110litres = 6.02×10^{23}molecules x $^{0.110}/_{24}$ = 2.76×10^{21}molecules
5b	$CH_3CH_2OH + O_2$ ↓ $CH_3COOH + H_2O$	❶ $O_2 + 4H^+ + 4e^- \rightarrow 2H_2O$ ❷ $CH_3CH_2OH + H_2O \rightarrow CH_3COOH + 4H^+ + 4e^-$ ❶+❷ O_2 + ~~$4H^+$~~ + ~~$4e^-$~~ + CH_3CH_2OH + ~~H_2O~~ → ~~2~~ 1 H_2O + CH_3COOH + ~~$4H^+$~~ + ~~$4e^-$~~ overall $CH_3CH_2OH + O_2 \rightarrow CH_3COOH + H_2O$
6a		Methyl $-CH_3$ groups must each be attached to a sulphur and this leaves a bond left for the sulphur to be attached to each other.
6b	2 marks for:	First Mark: • Permanent dipole-permanent dipole attractions or polar-polar attractions/forces (½mark) • weak intermolecular bonds/forces (½mark) Second Mark: If permanent dipole-permanent dipole attractions mentioned for 1st Mark: • Mention of difference in electronegativities or indication of polar bonds or indication of permanent dipole (1mark) If London dispersion forces mentioned for 1st Mark: • instantaneous dipoles or temporary dipoles or uneven distribution of electrons or electron wobbles (1mark)
6c(i)	Pipette or burette	Pipettes and burettes have the level of accuracy required to perform the titration. Measuring cylinders and syringes lack the accuracy required.
6c(ii)	A solution of precisely known concentration	A standard solution is a solution where the concentration is known.
6c(iii)	1.47×10^{-3}	no. of mol Cl_2 = volume x concentration = 0.0294litres x 0.01mol l^{-1} = 2.94×10^{-4} mol $4Cl_2 + H_2S + 4H_2O \longrightarrow SO_4^{2-} + 10H^+ + 8Cl^-$ 4mol 1mol 2.94×10^{-4}mol 7.35×10^{-5}mol $50 cm^3$ water sample contains 7.35×10^{-5}mol of Cl_2 $1000 cm^3$ water sample 7.35×10^{-5} mol x $^{1000}/_{50}$ = 1.47×10^{-3} mol l^{-1}
7a	2.9	Problem Solving: reading from a graph
7b	Covalent	Problem Solving: interpreting information from a graph
7c	Cross at (2.6,0.8)	1 mark for both: average electronegativity = 2.6 and difference in electronegativity = 0.8 

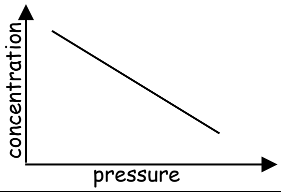
8a	Diagram of hexan-1-ol	$CH_3—CH_2—CH_2—CH_2—CH_2—CH_2—OH$ (hexan-2-ol and hexan-3-ol structures accepted)
8b	Answer to include:	Further the O atom is from end of chain, the lower the flash point
9a(i)	ester link	
9a(ii)	Diagram showing:	
9a(iii)	Essential	Amino acids which cannot be made by the body are described as essential amino acids and must be consumed through our diet.
9b(i)	69-70mg	Soft Drink X: Peak Area = 68000 at retention time 96s From graph: Peak Area = 68000 gives caffeine concentration = 70mg
9b(ii)	Dilute soft drink Y	I the peak area goes off the scale, the sample should be diluted before chromatography. The concentration of caffeine in the chromatogram must then be multiplied to calculate the original concentration of caffeine.
10a	It is polar or contains hydrogen bonding	Methanamide contains polar bonds (C=O) and bonds with have hydrogen bonding (N-H)
10b(i)	methylmethanoate	
10b(ii)	58%	Atom economy = $\frac{\text{mass of product}}{\text{total mass of products}}$ x100 = $\frac{45.0}{77.0}$ x100 = 58.4%
10c	70%	1mol HCOOH = (2x1)+(1x12)+(2x16) = 2+12+32 = 46g 1mol $HCONH_2$ = (3x1)+(1x12)+(1x16)+(1x14) = 3+12+16+14 = 45g $HCOOH + NH_3 \rightleftharpoons HCONH_2 + H_2O$ 1mol → 1mol 46g → 45g 1.38g → 45g x $^{1.38}/_{46}$ = 1.35g (Theoretical) % Yield = $\frac{\text{Actual}}{\text{Theoretical}}$ x 100 = $\frac{0.935}{1.35}$ x100 = 70%
11a(i)	3-methylbutan-2-ol	**3-methylbutan-2-ol** 3-methyl: Methyl $-CH_3$ side groups on C_3; but: Four carbons on main chain; an: Single bonds on main chain; 2-ol: -OH hydroxyl group on C_2

<table>
<tr><td>11a(ii)</td><td>Diagram of 2-methylpentan-1-ol</td><td></td></tr>
<tr><td>11b(i)</td><td>$4BF_3 + 3NaBH_4$
↓
$2B_2H_6 + 3NaBF_4$</td><td>$4BF_3 + 3NaBH_4 \longrightarrow 2B_2H_6 + 3NaBF_4$</td></tr>
<tr><td>11b(ii)</td><td>-2168</td><td>❶ $2B + 3H_2 \rightarrow B_2H_6$ $\Delta H = +36\ kJ\ mol^{-1}$
❷ $H_2 + \frac{1}{2}O_2 \rightarrow H_2O$ $\Delta H = -236\ kJ\ mol^{-1}$
❸ $2B + 1\frac{1}{2}O_2 \rightarrow B_2O_3$ $\Delta H = -1274\ kJ\ mol^{-1}$

❶x-1 $B_2H_6 \rightarrow 2B + 3H_2$ $\Delta H = -36\ kJ\ mol^{-1}$
❷x3 $3H_2 + 1\frac{1}{2}O_2 \rightarrow 3H_2O$ $\Delta H = -858\ kJ\ mol^{-1}$
❸ $2B + 1\frac{1}{2}O_2 \rightarrow B_2O_3$ $\Delta H = -1274\ kJ\ mol^{-1}$

Add ❶'+❷'+❸ $B_2H_6 + 3O_2 \rightarrow B_2O_3 + 3H_2O$ $\Delta H = -2168\ kJ\ mol^{-1}$</td></tr>
<tr><td>12a</td><td>Diagram showing:</td><td>

or

</td></tr>
<tr><td>12b(i)</td><td>Water bath or heating mantle</td><td>A water bath or heating mantle are appropriate apparatus as temperature is controllable with a thermostat.</td></tr>
<tr><td>12b(ii)</td><td>Protein denatures or changes shape</td><td>Proteins are held together by a variety of intermolecular bonds and heating a protein breaks these intermolecular bonds between the protein chains and permanently changes the shape of the protein.</td></tr>
<tr><td>13a</td><td>F_2 is below MnO_4^- in electrochemical series</td><td>Acidified permanganate solution is above F_2 in the electrochemical series. Oxidising agents are listed in the electrochemical series with the most powerful ones at the bottom. Oxidising agents will cause any of the reactions above it in the electrochemical series to react in the reverse direction to the direction written in the electrochemical series.</td></tr>
<tr><td>13b(i)</td><td>Initiation</td><td><table>
<tr><td>Step</td><td>Reactants (before Arrow)</td><td>⟶</td><td>Products (after Arrow)</td></tr>
<tr><td>Initiation</td><td>No free radicals on Left Hand Side</td><td>⟶</td><td>Free radicals on Right Hand Side</td></tr>
<tr><td>Propagation</td><td colspan="3">Free Radicals found on both sides of arrow</td></tr>
<tr><td>Termination</td><td>Free radicals on Left Hand Side</td><td>⟶</td><td>No free radicals on Right Hand Side</td></tr>
</table></td></tr>
<tr><td>13b(ii)</td><td>$2F^{\bullet} \longrightarrow F_2$
$CH_3^{\bullet} + CH_3^{\bullet} \longrightarrow C_2H_6$</td><td>Termination steps are when two free radical species join together to form a molecule with no unpaired electrons.</td></tr>
<tr><td>13c(i)</td><td>exothermic or heat given out</td><td>From Graph: Decrease in Temperature gives higher concentration of C_2F_4
∴Decrease in temperature favours forward reaction which forms C_2F_4
A decrease in temperature always favours the exothermic reaction
∴ Forward Reaction (Formation of C_2F_4) is exothermic</td></tr>
</table>

<table>
<tr><td>13c(ii)</td><td>
</td><td>Increasing pressure favours the pressure-reducing reaction
Reverse reaction reduces pressure (2mol of gas $\rightarrow$ 1mol of gas)
∴ Increase in pressure favours reverse reaction
∴ Increase in pressure decreases concentration of C_2F_4</td></tr>
<tr><td>14a</td><td>Octadec-9,12,15-trienoic acid</td><td>Octadec-9,12,15-trienoic acid
Octadec – 18 Carbon Main Chain
9,12,15 – Position of C=C double bonds
trien – Three C=C double boinds
oic acid – Carboxyl -COOH group on C_1</td></tr>
<tr><td>14b(i)</td><td>Neutralisation</td><td>Fatty acids are neutralised by alkali to form a salt/soap and water</td></tr>
<tr><td>14b(ii)</td><td>Answer to include:</td><td><table><tr><td>1st mark</td><td>Soaps have hydrophobic/oil-soluble tail and hydrophilic/water-soluble head</td></tr><tr><td>2nd mark</td><td>$-COO^{-}Na^{+}$ is water-soluble part and hydrocarbon chain is oil-soluble part</td></tr><tr><td>3rd mark</td><td>Emulsion is formed when oil-grease is held inside a ball of water-soluble heads</td></tr></table></td></tr>
<tr><td>15</td><td>Open Question answer to include:</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>
</table>