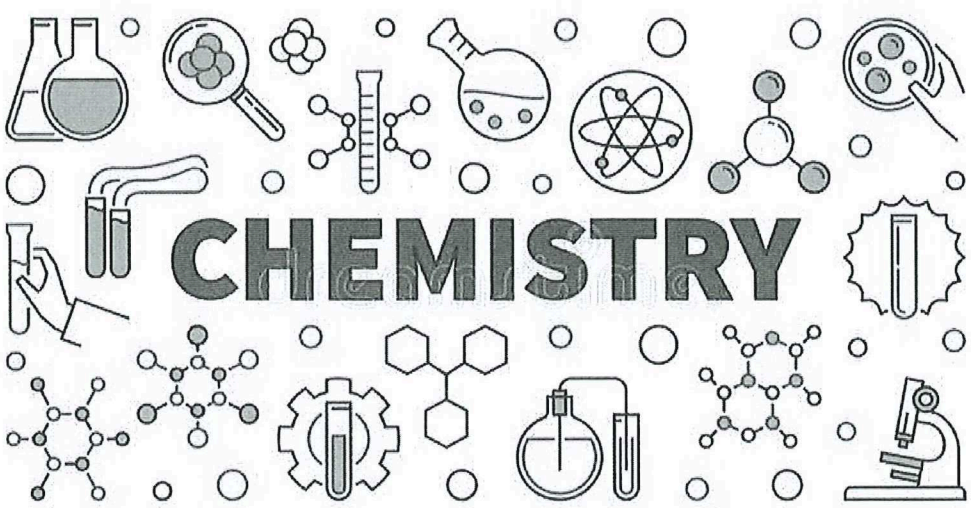


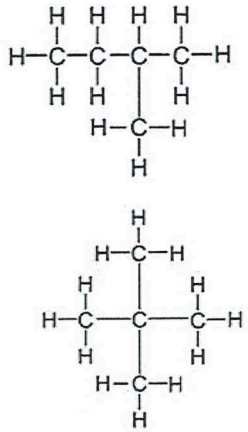

WJEC Chemistry 2

Dual Award – Higher Tier

2.5 Mark Scheme

## Higher Tier only questions

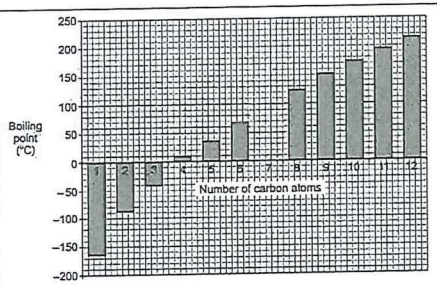
| Question | | | | Marking details | Marks available | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| 3 | (a) | | | award (1) for any of following<br>• the longer the chains, the higher the boiling point<br>• the more carbon atoms, the higher the boiling point<br>• the larger the molecules, the higher the boiling point<br>• the larger $M_r$, the higher the boiling point<br><br>the higher the boiling point, the lower in the column the fraction is collected (1)<br><br>accept converse argument throughout e.g. the shorter the chains, the lower the boiling point etc.<br><br>if **no** reference to boiling point award (1) for 'the bigger the molecule, the lower down the column it collects' | 2 | | | 2 | | |
| | (b) | (i) | | $C_4H_8$ | | 1 | | 1 | 1 | |
| | | (ii) | | any **two** of following<br>• **high** temperature / heat **strongly**<br>• catalyst<br>• absence of air<br><br>ignore any reference to pressure – neutral answer | 1 | | | 1 | | |
| | | (iii) | | any of following<br>• small(er) fractions are more useful / used as fuels<br>• more demand for small(er) fractions<br>• produces alkenes / unsaturated molecules<br>• conserves crude oil supplies<br>• produces **monomers** to make plastics | 1 | | | 1 | | |

| Question | | | | Marking details | Marks available | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| | (c) | (i) | | **same** molecular formula but **different** structural formulas | 1 | | | 1 | | |
| | | (ii) | | award (1) for each correct isomer<br>  | 2 | | | 2 | | |
| | (d) | | | 1.2 g of hydrogen (1)<br>$C = \frac{7.2}{12}/0.6$ and $H = \frac{1.2}{1}/1.2$ (1)<br>1:2 ratio / alkenes have the general formula $C_nH_{2n}$ / alkenes always have double the hydrogen to carbon (1)<br>third mark to be awarded only if the correct ratio is found | | 2 | 1 | 3 | 2 | |
| | | | | **Question 3 total** | **7** | **3** | **1** | **11** | **3** | **0** |

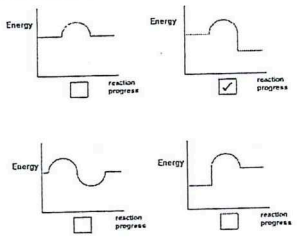
| Question | | | | Marking details | Marks available | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| 6 | (a) | | | The oils contain saturated fats only ☐<br>The oils contain unsaturated fats only ☐<br>The oils contain both saturated and unsaturated fats ✓<br>It is not possible to tell whether the oils contains saturated or unsaturated fats ☐ | | | 1 | 1 | | 1 |
| | (b) | | | it reacts with the unsaturated fats (1)<br><br>bromine atoms attach to the molecule / carbon chain / add across the double bond / an addition reaction takes place (1)<br><br>marking points are not linked | 2 | | | 2 | | 2 |

| Question | | | | Marking details | Marks available | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| | (c) | | | $\frac{9.9}{40} \times 100$ or $\frac{30.1}{40} \times 100$ (1)<br><br>contains 25% saturated fat / 75% unsaturated fat (1)<br><br>therefore the statement is incorrect (1)<br>third marking point is linked – can only be awarded if the correct answer is given<br><br>alternative methods possible e.g.<br>10% unsaturation equivalent to approximately $4cm^3$ of bromine water (1)<br><br>$30cm^3$ of bromine water equivalent to 75% unsaturation (1) | | | 3 | 3 | 2 | 3 |
| | (d) | | | (despite having more than 15% saturated fat) it still contains the lowest percentage of saturated fat / has the highest percentage of unsaturated fat (1)<br><br>award (1) for either of following<br>• less likely to cause heart disease<br>• more likely to lower cholesterol | | | 2 | 2 | | |
| | | | | **Question 6 total** | **2** | **0** | **6** | **8** | **2** | **6** |

## Common questions

| Question | | | | Marking details | Marks available | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| 6/1 | *(a)* | | | the <u>larger the molecules / (as the size/fraction) gets bigger</u><br>• the <u>smokier</u> the <u>flame</u> (1)<br>• the <u>more difficult</u> it becomes to <u>burn</u> (1)<br><br>accept the converse argument<br><br>correct identification of both properties, without reference to increasing size (1) | | | 2 | 2 | | |
| | *(b)* | (i) | |  <br><br>all 5 bars correctly plotted with ±½ small square tolerance (2)<br>3 or 4 correct plots (1)<br><br>accept charts where bars are touching – correct height of each bar to be credited | | 2 | | 2 | 2 | |

| Question | | | | Marking details | Marks available | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| | | (ii) | | appropriate **straight** trend line drawn with ruler, spans across at least 6 bars (1)<br><br>correct boiling point taken from the trend line (1)<br><br>award no credit for a curved trend line (but allow ECF for a correct value read from an incorrect trend line)<br><br>if no trend line drawn, award (1) for a value in the range 85-105 | | | 2 | 2 | 2 | |
| | *(c)* | (i) | | sand / foam / $CO_2$ / fire blanket<br>because it removes oxygen<br>**both** method and explanation needed | | 1 | | 1 | | |
| | | (ii) | | $5CO_2 + 6H_2O$<br><br>correct products (1)<br>correctly balanced (1) – only if correct products given | | 2 | | 2 | 1 | |
| | | (iii) | | does not produce carbon dioxide / sulfur dioxide / **only** produces water (1)<br><br>does not contribute to global warming / climate change / acid rain (1) | 1 | 1 | | 2 | | |

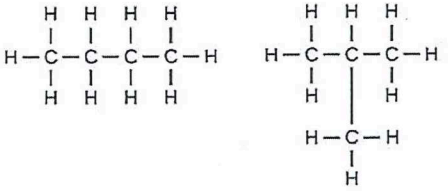
| Question | | | | Marking details | Marks available | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| | *(d)* | (i) | | temperature (of water) **before and after** burning (1)<br>mass of fuel and burner **before and after** burning (1)<br><br>initial ≡ before ≡ at start<br>final ≡ after ≡ at end<br><br>temperature rise and change in mass – neutral answers<br><br>award (1) only for reference to measuring both temperature throughout and mass throughout<br><br>award (1) for answers that refer to measuring **both** the temperature and mass **either** before **or** after burning only | | | 2 | 2 | | 2 |
| | | (ii) | | distance between burner and flame / material or thickness or size of beaker / same size wick / same beaker<br><br>reference to mass of fuel and mass of water – neutral | 1 | | | 1 | | 1 |
| | | (iii) | |  | | 1 | | 1 | 1 | |
| | | | | **Question 6/1 total** | **2** | **7** | **6** | **15** | **6** | **3** |

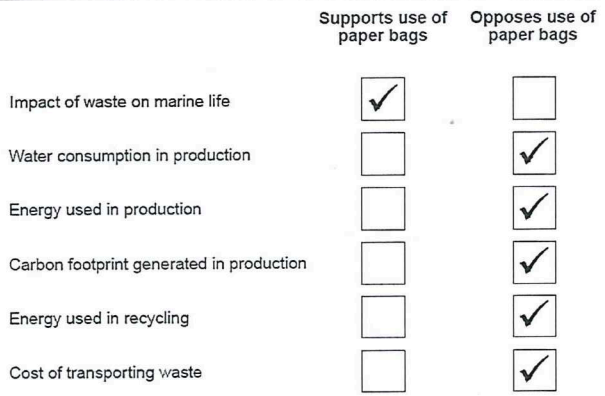
| Question | | | | Marking details | Marks available | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| 6 | | | | **Indicative content:**<br>• definition of isomers – having the same molecular formula but different structural formulae<br>• $C_4H_{10}$ represents isomerism in alkanes – dependent on chain length<br>• $C_4H_8$ represents isomerism in alkenes – dependent on position of double bond<br>• isomers of $C_4H_{10}$<br>• naming butane and methylpropane<br>• isomers of $C_4H_8$<br>• naming but-1-ene and but-2-ene | 6 | | | 6 | | |
| | | | | **5-6 marks**<br>Correct definition of an isomer given; clearly explains isomerism in both alkanes and alkenes using the examples given; some isomers named<br>*There is a sustained line of reasoning which is coherent, relevant, substantiated and logically structured. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.*<br><br>**3-4 marks**<br>Attempt at definition of an isomer given; explains isomerism in either an alkane or alkene using one of the examples given<br>*There is a line of reasoning which is partially coherent, largely relevant, supported by some evidence and with some structure. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.*<br><br>**1-2 marks**<br>Definition of an isomer given or an example of isomerism shown<br>*There is a basic line of reasoning which is not coherent, largely irrelevant, supported by limited evidence and with very little structure. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.*<br><br>**0 marks**<br>*No attempt made or no response worthy of credit.* | | | | | | |
| | | | | **Question 6 total** | **6** | **0** | **0** | **6** | **0** | **0** |

## Common questions

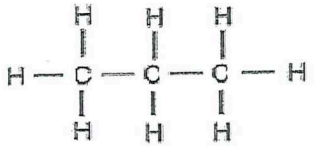
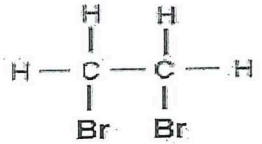
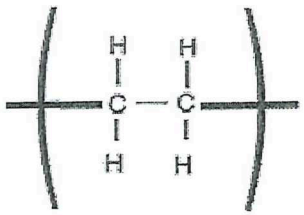
| Question | | | | Marking details | Marks available | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| 6/1 | (a) | (i) | | award (1) for either of following<br>11429<br>11466 | | 1 | | 1 | 1 | 1 |
| | | (ii) | | award (1) for either of following<br><br>able to absorb <u>many times</u> their own mass (of water)<br>able to absorb <u>hundreds of times</u> their own mass (of water)<br><br>accept weight as alternative to mass<br><br>neutral answersable to absorb 11429 times their own mass (of water)<br>able to absorb more than their own mass (of water)<br>able to absorb lots of water | | | 1 | 1 | | |
| | (b) | (i) | | award (2) for all points plotted correctly – tolerance ±½ square<br>award (1) for 4 or 5 points plotted correctly<br><br>award (1) for appropriate curve<br>do not accept point to point line | | 3 | | 3 | 3 | 3 |
| | | (ii) | | award (1) for any of following<br>bead absorbs water at 40°C more quickly / at higher rate<br>bead absorbs more water at 40°C<br>bead absorbs water at 10°C more slowly / at lower rate<br>bead absorbs less water at 10°C<br><br>award (1) for any of following<br>bead becomes saturated (after 10 hours) in water at 40°C<br>bead stops absorbing water at 40°C (after 10 hours)<br>bead not yet saturated (after 10/12 hours) in water at 10°C<br>bead still absorbing water at 10°C (after 10/12 hours) | | | 2 | 2 | | 2 |
| | | | | **Question 6/1 total** | **0** | **4** | **3** | **7** | **4** | **6** |

| Question | | | | Marking details | Marks available | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| 5 | (a) | (i) | | award (1) for each of following<br><br>• up to $C_{16}$ / before $C_{17}$ – demand is greater than the supply (OWTTE)<br>• after $C_{16}$ / from $C_{17}$ onwards – supply is greater than demand (OWTTE)<br><br>accept appropriate alternatives to the number of carbon atoms<br>e.g. chain length of 16<br><br>if no other credit award (1) for any of following<br>(as the size increases) the demand decreases but the supply increases<br>shorter chains have greater demand than supply and longer chains have greater supply than demand<br>short chains have high demand and long chains have low demand<br>short chains have low supply and long chains have high supply | | | 2 | 2 | | |
| | | (ii) | I | breaking of a large hydrocarbon into smaller hydrocarbons (1)<br><br>award (1) for either of following<br>heat **and** pressure<br>heat **and** catalyst | 2 | | | 2 | | |
| | | | II | $C_{14}H_{30}$ | | 1 | | 1 | 1 | |

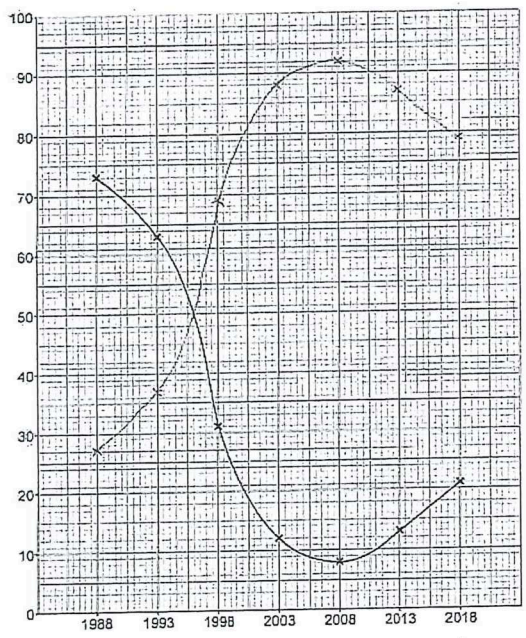
| Question | | | | Marking details | Marks available | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| | (b) | (i) | | (compounds with the) same molecular formula but different structures / different structural formulae / different arrangement of atoms | 1 | | | 1 | | |
| | | (ii) | | award (1) for each correct isomer  | 2 | | | 2 | | |
| | | | | **Question 5 total** | **5** | **1** | **2** | **8** | **1** | **0** |

| Question | | | | Marking details | Marks available | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| 6 | (a) | | | paper bags produce a greater mass of waste than plastic bags / plastic bags produce a lower mass of waste than paper bags (1)<br><br>plastic bags cause more litter than paper bags / paper bags cause less litter than plastic bags (1)<br><br>there must be comparison between the two types of bag in both cases so the following are neutral answers<br><br>plastic bags cause litter problems<br>paper bags produce a large mass of rubbish | | | 2 | 2 | | |
| | (b) | | |  <br><br>award (3) for all correct<br>award (2) for any 4 or 5 correct<br>award (1) for any 2 or 3 correct | | | 3 | 3 | | |
| | (c) | | | paper bag **because** atmospheric acidification leads to acid rain / paper bag production produces acid rain | | 1 | | 1 | | |
| | | | | **Question 6 total** | **0** | **1** | **5** | **6** | **0** | **0** |

## COMMON QUESTIONS

| Question | | | | Marking details | Marks available | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| 7/1 | (a) | (i) | | **D** and **E** **both** needed, either order | | 1 | | 1 | | |
| | | (ii) | | propene | 1 | | | 1 | | |
| | | (iii) | |  | 1 | | | 1 | | |
| | (b) | (i) | |  (1)<br>  (1) | | 2 | | 2 | | |
| | | (ii) | | decolourises / goes colourless<br>neutral answers – goes clear / changes colour | 1 | | | 1 | | 1 |

| Question | | | | Marking details | Marks available | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| | | (iii) | | (addition) polymerisation | 1 | | | 1 | | |
| | (c) | (i) | | 0.15 (2)<br>if answer incorrect award (1) for any of following<br>$\frac{12}{100} \times 1.25$<br>$0.0125 \times 12$<br>15 / 150000 | | 2 | | 2 | 2 | |

| Question | | | | Marking details | Marks available | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| | | (ii) | |  <br>award (2) for **all** points plotted correctly – tolerance ±1 square<br>award (1) for any **four** correct points<br>award (1) for curved line<br>do not accept - point to point line | | 3 | | 3 | 3 | |

| Question | | | | Marking details | Marks available | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| | | (iii) | I | 1996<br><br>accept 1995 / 1997<br>accept range 1995-1996 / 1996-1997 | | 1 | | 1 | | 1 |
| | | | II | 2 : 8 (1 : 4) 4 : 1 8 : 2 20 : 80 | | | 1 | 1 | 1 | |
| | | (iv) | | award (1) for any of following actions<br><br>people **use** bag for life / alternative bags<br>people **reuse** bags<br>supermarkets **charge** for bags / **stop giving** free plastic bags<br>government **introduced** a charge<br>people have **become more aware** of issues to do with plastic waste<br>people **want to reduce** amount of plastic going to landfill / incineration<br>people **want to reduce** the amount of plastic pollution / microsplastics | | | 1 | 1 | | |
| | | | | **Question 7/1 total** | **4** | **9** | **2** | **15** | **6** | **2** |

| Question | | | | Marking details | Marks available | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| 6 | (a) | | | they are macromolecules ☐<br>they are unsaturated ✓<br>they contain hydrophilic groups ☐<br>they are polymers ☐ | | | 1 | 1 | | |
| | (b) | | | ability to swell and shrink, depending on their surroundings | | | 1 | 1 | | |
| | (c) | | | 12440 (2)<br>if answer incorrect award (1) for<br>4.389 – 0.035 = 4.354 | | 2 | | 2 | 2 | |
| | (d) | | | award (1) for **either** of following<br>• the higher the temperature, the more the diameter increases (over time)<br>• the higher the temperature, the higher the rate of increase in diameter / the more quickly the diameter increases<br>at 40°C the size of the bead stops increasing / reaches maximum after 8 hours (1) | | | 2 | 2 | | |
| | | | | **Question 6 total** | **0** | **2** | **4** | **6** | **2** | **0** |