## Assessment Schedule – 2007

## Chemistry: Describe the structural formulae and reactions of compounds containing selected organic functional groups (90309)

### Judgement Statement

| Q | Evidence | Achievement | Achievement with Merit | Achievement with Excellence |
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| **One** | A 1,2–dibromobutane<br>B pent–2–yne<br>C propanoic acid<br>D propyl methanoate | THREE correct. | All FOUR correct showing understanding of numbering of substituents. | |
| **Two**<br>(a)<br>(b) | E, G and H<br>Structural isomers have the same number of atoms of each element / E, G and H all contain 4 C's, 10 H's and 1 O atom / same molecular formula and they have a different structure / atoms are joined differently / bonded together in a different order . | TWO of the structural isomers identified<br>**AND**<br>limited attempt to justify choice | All THREE structural isomers identified<br>**AND**<br>requirements for structural isomers clearly explained. | |
| **Three**<br>(a)(i)<br><br>(ii) | $\longrightarrow CH_3-\underset{\displaystyle Cl}{\underset{\vert}{CH}}-CH_2-CH_3$<br>Addition involves a small molecule (HCl) joining onto adjacent carbon atoms of an unsaturated molecule. The double bond breaks / molecule becomes less unsaturated / becomes saturated. | Addition and elimination products correct (either 1-chloro- or 2-chlorobutane)<br>**OR**<br>addition and elimination reactions partially explained<br>**OR**<br>One correct product and partial explanation. | **EITHER**<br>Addition and elimination products correct (either 1-chloro- or 2-chlorobutane)<br>**AND**<br>addition and elimination reactions partially explained<br>**OR**<br>One correct product AND clear corresponding explanation. | Addition and elimination products correct with 2-chlorobutane for addition product.<br>**AND**<br>addition and elimination reactions clearly explained. |
| (b)(i)<br><br>(ii) | $\longrightarrow CH_2=CH_2$<br>Elimination involves the removal of two substituents / groups / H & OH / water / on neighbouring C atoms in a molecule. A double bond forms / forms an alkene / the molecule becomes less saturated. | | | |
| **Four** | $\underset{\displaystyle Cl}{\underset{\vert}{CH}}=CH_2$ | Structure correct. | | |

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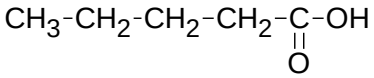
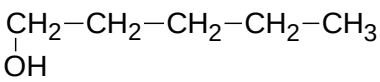
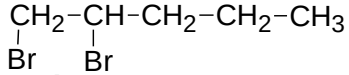
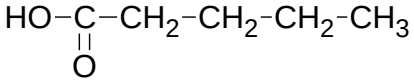
| **Five**<br>(a) | pentanoic acid<br>  **OR** $CH_3CH_2CH_2CH_2COOH$<br>pentan–1–ol<br>  **OR** $CH_2OHCH_2CH_2CH_2CH_3$<br>pent–1–ene <br>Full structures showing all C–H bonds may be used. | TWO structures correct<br>**OR**<br>Consistently incorrect number of C atoms used but all functional groups correct. | | |
| (b) | **BROMINE FIRST**<br>**1. Add bromine solution** to a sample of each of the 3 liquids:<br>orange colour goes colourless → pent–1–ene<br>as  (OR 1,2–dibromopentane)<br>is formed.<br>Orange colour remains → pentan–1–ol or pentanoic acid.<br>**2. Then add permanganate solution** to separate samples of the remaining 2 liquids (pentan-1-ol, and pentanoic acid):<br>purple colour changes to a brown precipitate, indicating pentan–1–ol<br>as  (OR pentanoic acid)<br>is formed from the alcohol.<br>If purple colour remains, then the liquid is pentanoic acid.<br>**OR** | TWO liquids clearly distinguished with tests and observations.<br>**OR**<br>Correct formula or names for two products. Allow carry on error from part (a)<br>**OR**<br>The alkene identified by correct steps, observations, conclusion, name or formula. | Two liquids identified by correct steps, full observations for two positive reactions, conclusions, and one correct name or formula of a product.<br>**OR**<br>Missing excellence by one aspect not correct. | All three liquids identified by a workable process including correct steps, full observations, conclusions, specific names or formulae for all products. |

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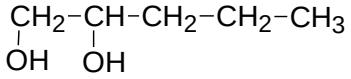
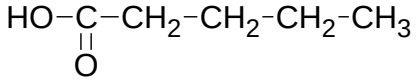
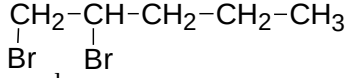
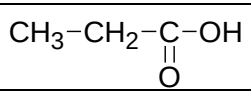
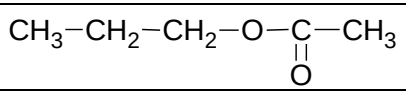
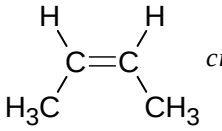
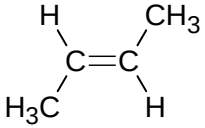
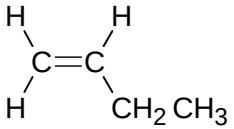
| | **PERMANGANATE FIRST**<br>**1. Add potassium permanganate solution.** If the purple colour remains, (no reaction) the liquid is pentanoic acid.<br>Permanganate reacts with both pent–1–ene and pentan–1–ol:<br>purple solution changes to a brown precipitate.<br>The product from the pent–1–ene is pentan 1,2 diol<br>  <br>while the product from the alcohol is pentanoic acid<br>  <br>**2.** Test these two remaining liquids with bromine. Bromine reacts with pent–1–ene but not with the alcohol.<br>orange colour goes colourless with pent–1–ene<br>as  (OR 1,2–dibromopentane)<br>is formed. | | | |
| **Six** | **A** secondary **B** primary | BOTH correct. | | |
| **Seven** (a,b) |   | ONE product correct. | BOTH products correct. | |
| **Eight** |  *cis*  *trans*<br>Geometric (*cis–trans)* isomers exist where there is a **C = C** that **cannot freely rotate**.<br>If there are **two different groups** bonded to the **C's of the double bond**, two arrangements are possible.<br>But–2–ene meets these requirements since each C of the double bond has –H and $–CH_3$, i.e. two different groups.<br>But–1–ene does not meet these requirements as it has 2 H atoms on one C of the double bond.  | *Cis–trans* isomers drawn and labelled correctly<br>**OR**<br>ONE general requirement for *cis–trans* isomers is described. | *Cis–trans* isomers drawn and labelled correctly<br>**AND**<br>ONE general requirement for *cis–trans* isomers is described. | *Cis–trans* isomers drawn and labelled correctly<br>**AND**<br>clear explanation of requirements for *cis–trans* isomers with reference to but–2–ene, and compares with but–1–ene. |

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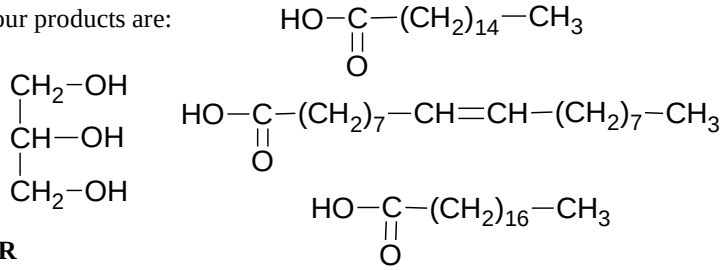
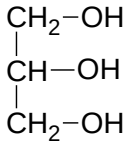
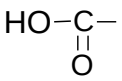
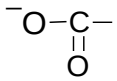
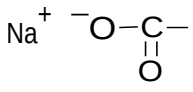
| **Nine**<br>(a) | Four products are:<br>  <br>**OR**<br>  <br>for acid groups | Recognises ester group is broken. | Glycerol is drawn<br>  <br>**OR**<br>Fatty acids drawn correctly. | All FOUR products correctly drawn. |
| (b) | In basic conditions the acid groups, of the 3 acids, would be present as the anion of the acid.<br>Ie   **OR**  <br>**OR**<br>  <br>in acid conditions<br>**OR**<br>  <br>in basic conditions | Recognises the acid group will not exist<br>**OR**<br>states sodium salt / soap is formed.<br>**OR**<br>States glycerol / alcohol still formed.<br>**OR**<br>Recognises carboxylate ions form. | Recognises glycerol is still formed<br>**AND**<br>sodium salt / soap / carboxylate ion forms instead of the acid | |

**Judgement Statement**

| Achievement | Achievement with Merit | Achievement with Excellence |
|---|---|---|
| SIX opportunities answered at Achievement level (or higher).<br><br>Minimum of 6 × A | SEVEN opportunities answered including at least FIVE at Merit level (or higher) and TWO at Achievement level (or higher).<br><br>Minimum 5 × M + 2 × A | NINE opportunities answered including at least TWO at Excellence level plus FOUR at Merit level (or higher) and THREE at Achievement level (or higher).<br><br>Minimum 2 × E + 4 × M + 3 × A |