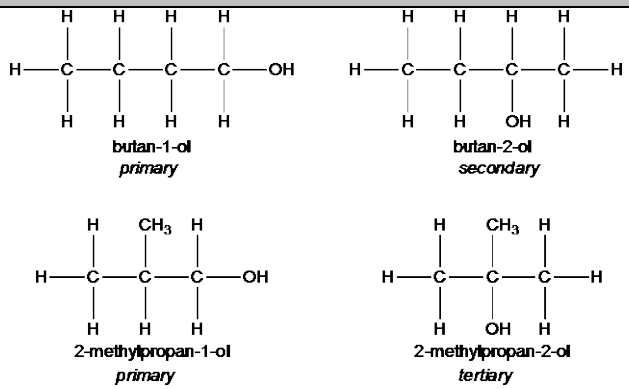
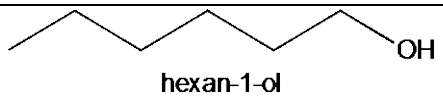
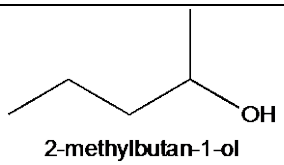
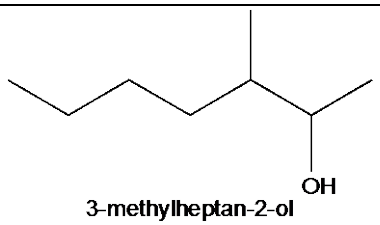
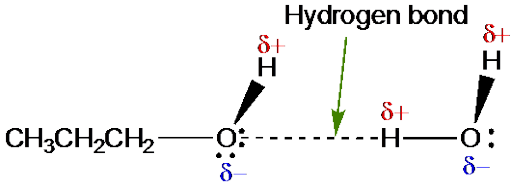
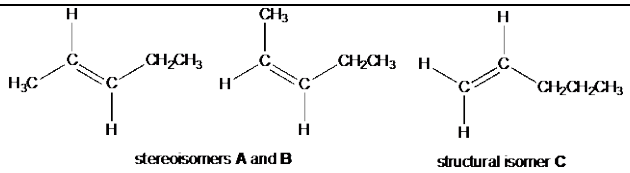
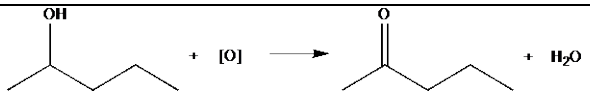
| Question number | Answer | Marks | Guidance |
|---|---|---|---|
| 1 (a) |  <br>1 mark for each alcohol with all details | B1 x 4 | |
| 1 (b) | 2-methylpropan-2-ol does not react | B1 | |
| 2 (a) |  <br>1 mark for name<br>1 mark for formula | B1 x 2 | |
| 2 (b) |  <br>1 mark for name<br>1 mark for formula | B1 x 2 | |
| 2 (c) |  <br>1 mark for name<br>1 mark for formula | B1 x 2 | |
| 3 |  <br>1 mark for dipoles shown on propan-1-ol and water | B1 x 2 | |

| Question number | Answer | Marks | Guidance |
|---|---|---|---|
| | 1 mark for hydrogen bond between H of OH on one molecule and lone pair on O on other molecule | | |
| 4 | Reagents: Acid/$H^+$ and dichromate/$Cr_2O_7^{2-}$<br><br>Observations: Orange to Green/blue<br><br>Distillation produces aldehyde $CH_3CH_2CHO$<br><br>$CH_3CH_2CHO + [O] \rightarrow CH_3CH_2CHO + H_2O$<br><br>Reflux produces carboxylic acid $CH_3CH_2COOH$<br><br>$CH_3CH_2CHO + 2[O] \rightarrow CH_3CH_2COOH + H_2O$ | B1<br><br>B1<br><br>B1<br><br>B1<br><br>B1<br><br>B1 | **ALLOW** $H_2SO_4$ and $K_2Cr_2O_7$<br><br>**ALLOW** correct displayed formula **OR** correct structural formula **OR** skeletal formula **OR** a mixture of the above<br>**DO NOT ALLOW** molecular formulae<br><br>**ALLOW** $C_3H_7OH$ for propan-1-ol in equations<br><br>**DO NOT ALLOW** $CH_3CH_2COH$ for aldehyde<br><br>**IGNORE** further oxidation of aldehyde<br><br>**ALLOW** $CH_3CH_2CO_2H$ for carboxylic acid |
| 5 (a) (i) | **E** and **H** | B1 | |
| 5 (a) (ii) | **H** | B1 | |
| 5 (a) (iii) | **F** | B1 | |
| 5 (b) (i) | $C_4H_8O_2$ | B1 | |
| 5 (b) (ii) | 2-methylpentan-3-ol | B1 | |
| 5 (c) | A homologous series is a family of compounds with the same functional group and similar chemical properties<br><br>whose successive members differ by the addition of a $–CH_2–$ group | B1<br><br>B1 | |
| 6 (a) (i) | Acid catalyst (e.g. conc $H_2SO_4$) | B1 | **ALLOW** named mineral acid or correct formula eg phosphoric acid, $H_3PO_4$, sulfuric acid, $H_2SO_4$ or $H^+$<br>**DO NOT ALLOW** any carboxylic acids |
| 6 (a) (ii) | $C_5H_{12}O \rightarrow C_5H_{10} + H_2O$ | B1 | **DO NOT ALLOW** use of $C_5H_{11}OH$ |
| 6 (a) (iii) | Structural isomers are compounds with the same molecular formula<br><br>but different structural formulae | B1<br><br>B1 | Same formula is **not** sufficient<br><br>**ALLOW** different structure **OR** different displayed formula |

| Question number | Answer | Marks | Guidance |
|---|---|---|---|
| | Stereoisomers have same structural formulae<br><br>but different arrangements in space | B1<br><br>B1 | **OR** different skeletal formula<br>Different formula or different arrangement of atoms is **not** sufficient<br>**ALLOW** different **structural** arrangement (of atoms)<br><br>**ALLOW** have the same structure<br><br>Stereoisomers have the same formula or molecular formula is **not** sufficient<br><br>**ALLOW** different spatial arrangements (of atoms) |
| 6 (a) (iv) |  <br>stereoisomers **A** and **B** structural isomer **C**<br><br>1 mark for each structure | B1 x 3 | **ALLOW** correct structural **OR** displayed **OR** skeletal formula **OR** mixture of the above<br><br>**A** and **B** must clearly show cis and trans configuration<br><br>**eg**<br><br>  <br>**A** **B**<br><br>**Answers to A and B are interchangeable**<br><br>**C**: $CH_2CHCH_2CH_2CH_3$<br><br>**ALLOW** $–C_2H_5$ group in A or B or $–CH_2C_2H_5$ in C<br>**DO NOT ALLOW** $–C_3H_7$ group in C |
| 6 (a) (v) | The molecules have a double C=C bond which does not rotate<br><br>Isomers **A** and **B** needs two different groups attached to each carbon atom of C=C bond | B1<br><br>B1 | **IGNORE** comments about rotation<br>**ALLOW** carbon double bond<br><br>**ALLOW Each** carbon atom of the double bond is attached to a H and an alkyl group<br>**DO NOT ALLOW** functional groups for groups<br>**DO NOT ALLOW** the carbon atoms are attached to different groups<br><br>"**Each** carbon atom in the double bond" implies a |

| Question number | Answer | Marks | Guidance |
|---|---|---|---|
| | | | carbon–carbon double bond for the first marking point |
| 6 (b) |  <br>1 mark for structure of ketone product<br><br>1 mark for rest of equation | B1 x 2 | Balancing mark can only be awarded if the equation has a correct **skeletal** formula for the product |
| 6 (c) | Reagents: Acid/$H^+$ and dichromate/$Cr_2O_7^{2-}$<br><br>Distillation produces $CH_3CH_2CH_2CH_2CHO$<br><br>Reflux produces carboxylic acid $CH_3CH_2CH_2CH_2COOH$ | B1<br><br>B1<br><br>B1 | |