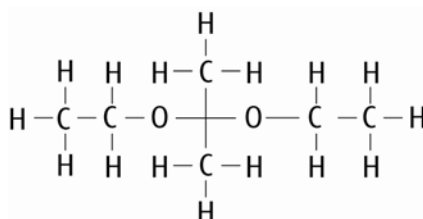


Marking scheme for AHL Worksheet – Option A

- 1**
- a** $\text{C}_5\text{H}_{10}\text{O}$ [1]
- b** A $\text{CH}_3\text{CH}_2\text{CO}^+$ [1]
 B CH_3CH_2^+ [1]
- c** aldehyde and ketone [1]
- d** ratio of steps in the integration trace is 2 : 3 [1]
 number of hydrogens in each environment is 4H : 6H [1]
- e** the number of hydrogen atoms/protons on the adjacent (carbon) atom [1]
- f** the quartet, integral 2, and triplet, integral 3, indicate an ethyl group [1]
 with 4H and 6H in these environments there must be 2 ethyl groups [1]
 peak at 57 in mass spectrum and $\text{C}=\text{O}$ from IR indicate the presence of $\text{CH}_3\text{CH}_2\text{C}=\text{O}$ group [1]
 structure is $\text{CH}_3\text{CH}_2\text{COCH}_2\text{CH}_3$ [1]
- 2**
- a** 102 [1]
- b** $\text{C}_5\text{H}_{10}\text{O}_2$ [1]
- c** A CH_3CH_2^+ [1]
 B $\text{CH}_3\text{CH}_2\text{O}^+$ [1]
 C $\text{CH}_3\text{CH}_2\text{CO}^+$ [1]
- d** the quartets, integral 2, and triplets, integral 3, indicate two ethyl groups in different environments [1]
 no O–H peak in the spectrum and peaks B and C in the mass spectrum suggest an ester group [1]
 structure is $\text{CH}_3\text{CH}_2\text{COOCH}_2\text{CH}_3$ [1]
- 3**
- triplet, integral 6, at 1.2 ppm indicates two methyl groups next to a CH_2 group [1]
 quartet, integral 4, at 3.5 ppm indicates two CH_2 groups next to a CH_3 group [1]
 triplet and quartet together indicate an ethyl group [1]
 singlet, integral 6, at 1.4 ppm indicates two methyl groups with no Hs on the adjacent carbon atom [1]
 the molecular formula and IR data indicate no double bonds in the molecule [1]
 structure is [1]



- 4**
- a** A is coloured and B is colourless. [1]
- b** A absorbs certain frequencies of light in the visible region of the spectrum. [1]
- B only absorbs light in the UV region of the spectrum. [1]
- A has a longer conjugated/delocalised system. [1]
- A has a smaller energy gap between molecular orbitals, therefore absorbs light of longer wavelength. [1]
- c** C absorbs a shorter wavelength than B. [1]
- The C=C are not conjugated in C as there are two single bonds between them/there is no delocalisation in C as the double bonds are separated by two single bonds. [1]