

Solutions

Original marking guidance: M1 method, A1 accuracy, B1 explanation.

2.1 Propanal; propanoic acid; propanone. Acidified potassium dichromate(VI) is the stated oxidant.

2.2 $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3 + [\text{O}] \rightarrow \text{CH}_3\text{COCH}_3 + \text{H}_2\text{O}$. Orange to green.

2.3 Concentrated phosphoric acid with heat, ethene, elimination.

3.1 Ethanoic acid has Mr 60, contains both carbonyl and acid OH, and reacts with carbonate. Propan-1-ol also has Mr 60 but lacks carbonyl and does not give the acid carbonate test. A carbonyl alone also fits aldehydes/ketones, so combine independent evidence.

3.2 Reflux returns vapour and allows further oxidation to acid; distillation removes aldehyde before further oxidation. Any two explained actions: solvent extraction/separation, drying removes residual water, final distillation separates volatile product from less volatile impurities.

3.3 PCl_5 gives a chloroalkane; KBr with 50% concentrated sulfuric acid supplies HBr for a bromoalkane; red phosphorus and iodine provide reagent for an iodoalkane. The tertiary alcohol gives 2-chloro-2-methylpropane. Layer identification separates bulk aqueous/organic phases; drying removes water remaining in the organic layer.