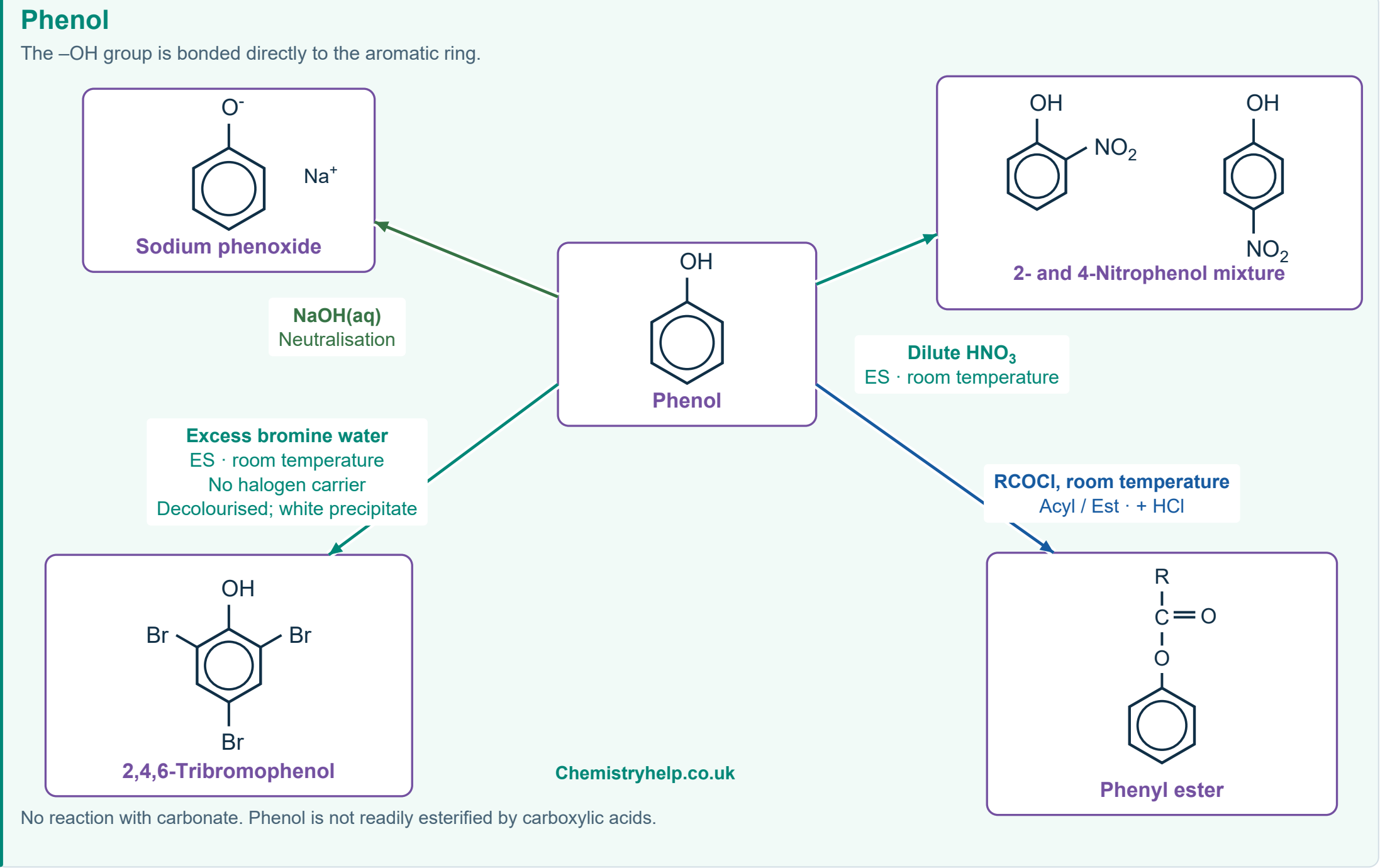
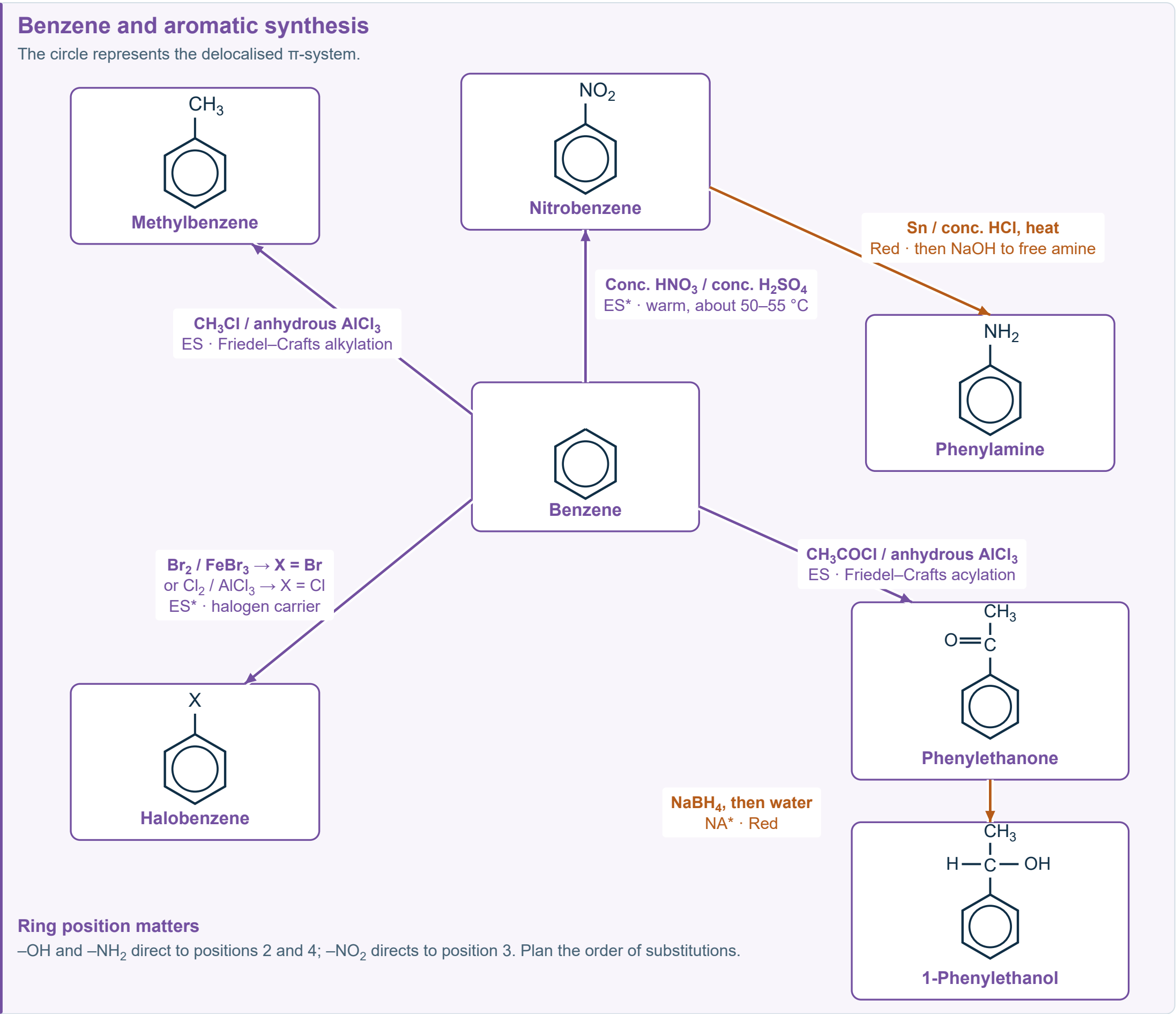
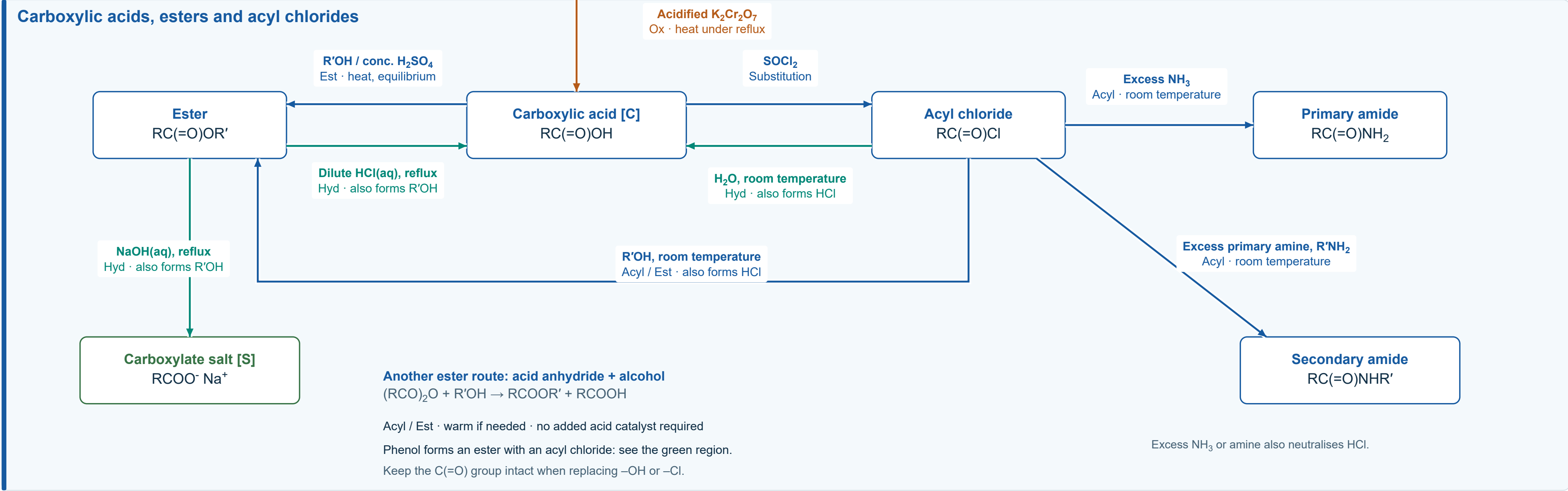
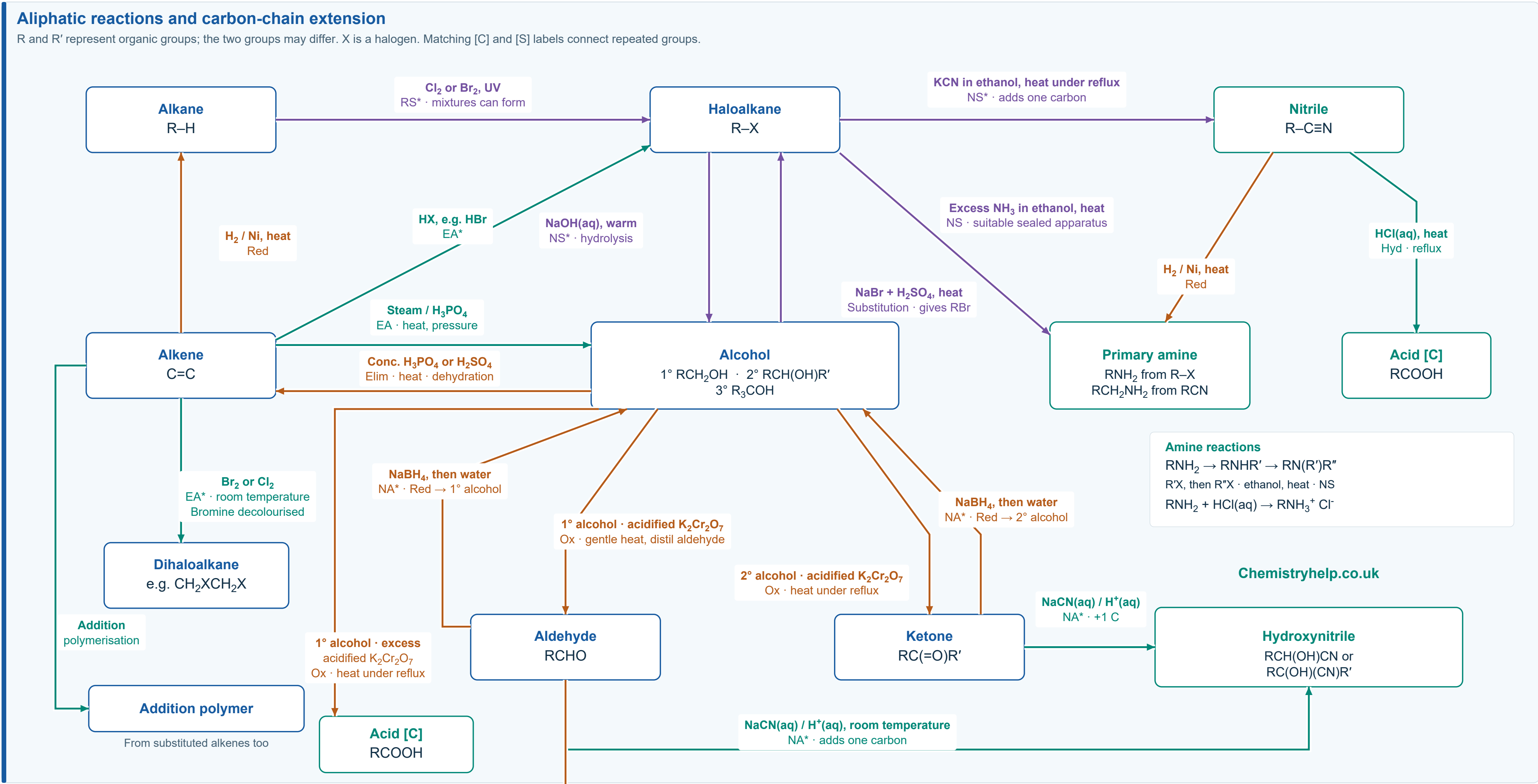


Follow the arrows to plan a route. Check the functional group, reagents and conditions at every step.

RS Radical substitution **EA** Electrophilic addition **NS** Nucleophilic substitution **NA** Nucleophilic addition **ES** Electrophilic substitution

Ox Oxidation Red Reduction Hyd Hydrolysis Est Esterification Elim Elimination Acyl Acylation

* Practise the OCR mechanism for this route. RS uses initiation, propagation and termination equations. Other labels name the reaction type.



Keep the whole molecule

CN becomes COOH on acid hydrolysis, or CH₂NH₂ on reduction. For a hydroxynitrile, the existing –OH stays: hydrolysis gives a hydroxy acid; reduction gives an amino alcohol.

Salts and amino acids

$\text{RCOOH} + \text{NaOH} \rightarrow \text{RCOO}^- \text{Na}^+ + \text{H}_2\text{O}$ [S]. For amino acids, –COOH reacts with alkalis and with alcohol/H⁺ to form esters; –NH₂ reacts with dilute acid. Keep both groups when drawing the product.

Polyesters and polyamides

Diol + dicarboxylic acid → polyester. Diamine + dicarboxylic acid → polyamide. Respective diacyl chlorides also work. Acid or base hydrolysis breaks ester/amide links; acidic products include ammonium groups, alkaline products include carboxylates.

Check before you choose a route

Count every carbon. Show an intermediate for each step. For an unsymmetrical alkene + HX, the major product forms via the more stable carbocation. 3° alcohols resist dichromate oxidation. NaBH₄ reduces aldehydes/ketones, not ordinary carboxylic acids.