Experiment: A comparison of the rates of Hydrolysis of various halo- Compounds

Introduction

In this experiment, you will compare the rates of hydrolysis of 1-chlorobutane, 1-bromobutane, 1-iodobutane and chlorobenzene.

The carbon – hydrogen bond may undergo either a substitution or an elimination reaction when treated with a base. Concurrent substitution and elimination are common, but in aqueous solution substitution predominates. In alcoholic solution, elimination is generally favoured.

$$R\text{–}CH_2\text{–}CH_2\text{-}X_{(aq)} + H_2O \longrightarrow R\text{–}CH_2\text{–}CH_2\text{-}OH + X^{-1}$$

$$R\text{–}CH_2\text{–}CH_2\text{-}X_{(alcoholic)} + H_2O \longrightarrow R\text{–}CH{=}{=}CH_2 + X^{-1}$$

where R = alkyl or aryl group; X = halogen atom

In either case, halide ions are produced.

Your Task

You are asked to design and carry out an experiment to find out how the rate of hydrolysis of an halogen compound depends on the identity of the halogen atom and on the nature R being either an alkyl or an aryl group.

Make a suitable problem statement, state the control of variables, plan a realistic procedure, (i.e. record exactly how you would do the experiment), data to be collected to contribute towards answering the research question.

Collect all relevant data, carry out data analysis, making inferences and hence drawing suitable conclusions to answer the problem statement.

Evaluate your results and the procedure and suggest possible modifications.

You will be marked on all 8 criteria in this lab:

Pl_a Pl_b DC DPP CE MS Psa P_{SB}