ALCOHOLS: REPLACING THE -OH GROUP BY A HALOGEN

1. a) Describe what you would see if you added a small amount of phosphorus(V) chloride to an alcohol.

   b) This can only be used as a test for an alcohol if you first eliminate other compounds which also contain an -OH group. Give two completely different examples of something which would react with PCl_5 in a similar way.

2. Suggest two different ways you could convert ethanol into bromoethane. For each method you suggest, give the reagent(s) and any essential conditions.

3. To convert propan-1-ol into 1-iodopropane, you can heat it with a mixture of concentrated phosphoric(V) acid and potassium iodide. You can think of this mixture producing hydrogen iodide which then reacts with the alcohol.

   a) Write the equation for the reaction of propan-1-ol with hydrogen iodide.

   b) Explain why phosphoric(V) acid is used rather than concentrated sulphuric acid.

   c) You can also convert propan-1-ol into 1-iodopropane using a mixture of red phosphorus and iodine. Write the equations for the reactions which occur.

4. a) Write the equation for the reaction between butan-1-ol and thionyl chloride (sulphur dichloride oxide – $SOCl_2$).

   b) What advantage does this method have over other methods of replacing -OH groups by -Cl?

   c) The tertiary alcohol, 2-methylpropan-2-ol, can be converted into 2-chloro-2-methylpropane, by treating it with concentrated hydrochloric acid at room temperature. Explain why you wouldn't choose to use this method for a primary or secondary alcohol.

   d) Apart from the reactions with PCl_5 or $SOCl_2$, what other single reagent could you use to convert propan-1-ol into 1-chloropropane? Write the equation for the reaction.