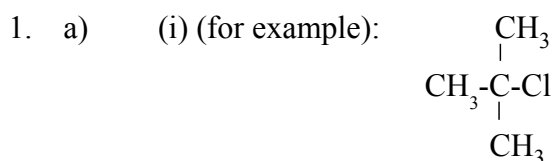


Chemguide – answers

HALOGENOALKANES: MAKING



(or any other structure where the chlorine is attached to a carbon with three alkyl groups attached to it – the same or different)



(Your structure must be consistent with your answer to part (i). The OH group must be in exactly the same position as the chlorine in the compound in part (i).)

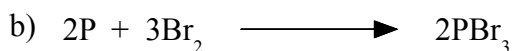
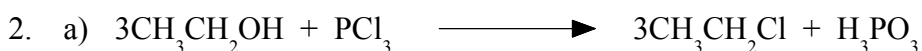
(iii) The reactions are too slow.

b) (i) Ethanol, $\text{CH}_3\text{CH}_2\text{OH}$, sodium or potassium bromide and concentrated sulphuric acid

(ii) Propan-1-ol, $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$, sodium or potassium iodide and concentrated phosphoric(V) acid.

(You can't use concentrated sulphuric acid in this case, because it oxidises the iodide ions to iodine.)

(iii) The sulphuric or phosphoric(V) acids react with bromide or iodide ions to make hydrogen bromide or hydrogen iodide.



(You might have come across the formula P_4 for phosphorus. That is how it exists as simple molecules in white phosphorus. Red phosphorus is polymeric, and is just written as P.)

c) The reaction is violent and lots of poisonous fumes of hydrogen chloride are given off.

3. a) Mixing the two gives out lots of heat, and there is a serious risk of boiling the ethanol which would also splash the concentrated sulphuric acid around.
- b) In a tube surrounded by ice, or under water in a tube surrounded by ice.
- c) (i) These come from a side-reaction between concentrated sulphuric acid and bromide ions in the potassium bromide. Concentrated sulphuric acid is an oxidising agent and oxidises some of the bromide ions to bromine. In the process the sulphuric acid is reduced to sulphur dioxide.
- (ii) This is a side-reaction involving the concentrated sulphuric acid and ethanol.
- d) This will remove most of the hydrogen bromide, together with quite a lot of the bromine, sulphur dioxide and excess ethanol
- e) The lower one. Bromoethane is denser than water.
- f) This removes any remaining acidic impurities by forming soluble salts such as sodium bromide.
- (You might possibly wonder why you bother with shaking the impure product with water in the first place. Why not just shake with sodium carbonate or hydrogencarbonate solution? Shaking a very acidic solution with sodium carbonate or hydrogencarbonate solution will release large amounts of carbon dioxide which can be difficult to manage in a separating funnel. The initial shake with water cuts down the amount of acidic impurities present and helps to avoid this.)
- g) This is to remove any inorganic impurities – excess sodium carbonate solution, sodium bromide from the reaction of the sodium carbonate with HBr or bromine, and so on.
- h) Water and ethanol
- i) Ethoxyethane. (The boiling point is very close to that of bromoethane.)