HALOGENOALKANES: REACTIONS WITH AMMONIA

1. Halogenoalkanes react with ammonia to form amines, which come in three kinds – primary, secondary and tertiary. Draw the structures of

   a) a primary amine based on the methyl group, CH_3

   b) a secondary amine based on a methyl group and an ethyl group, CH_3CH_2

   c) a tertiary amine based only on methyl groups

2. Give the conditions for the reaction of bromoethane with ammonia.

3. When bromoethane reacts with ammonia, the equations for the initial reaction (taken from the Chemguide page) are

   Equation 1: $CH_3CH_2Br + NH_3 \longrightarrow CH_3CH_2NH_3^+ Br^-$

   Equation 2: $CH_3CH_2NH_3^+ Br^- + NH_3 \rightleftharpoons CH_3CH_2NH_2 + NH_4^+ Br^-$

   a) What type of compound is the product in the first equation? Name it.

   b) Explain what is happening in the second equation.

   c) Like ammonia, the organic product of the second reaction can also react with bromoethane in a similar pair of equations. Write those equations, making sure that you show the structure of the products clearly.

   d) More reactions can occur, leading to various other products, getting increasingly complicated. Draw the structure of the *final* organic product in the sequence.

   e) Suppose you wanted to maximise your chances of forming mainly ethylamine (the organic product in equation 2 above). How would you achieve that? Explain your answer.