

3. Disposal of chemical waste is one of the chemical industry's biggest concerns. Leaking, corroded barrels at long-abandoned waste-disposal sites raise the spectre of potential environmental disaster wherever they are found.

Summoned to such a site, a chemist dons her respirator and takes a sample from a barrel that reeks of an overpowering fish smell. After purification, the sample's mass spectrum indicates a molecular ion at m/z of 101, while the IR spectrum shows no peaks past 3000 cm^{-1} , several absorptions between 2860 and 2980 cm^{-1} , and no absorptions between 1500 and 2860 cm^{-1} . The proton NMR shows only a triplet at 1.0 ppm and a quartet at 2.4 ppm , with integrals of 17 and 11 units, respectively.

a) Show what structural information each type of spectroscopy supplies. (5 marks)

MASS SPEC: 101 gives molecular weight
 odd man = odd # of N atoms $101 = \text{C}_6\text{H}_{15}\text{N}$

IR: not 1° or 2° amine, not aromatic
 sp^3 C-H
 no C=O or C=C double bonds

^1H NMR: supports an ethyl group - CH_2CH_3
 triplet (17 units = 3)
 quartet (11 units = 2)

b) Propose a structure for the pollutant based on your analysis above. (2 marks)

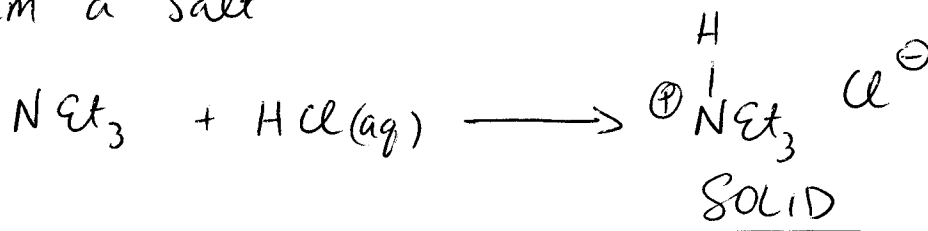
triethylamine



c) In the United States, the EPA forbids disposal of liquid wastes based on numerous experiences such as the one above where they eventually leak out of their containers and contaminate the surrounding land and water table. By contrast, solid wastes are acceptable in landfill.

Show a simple reaction to convert the liquid waste to a solid material for reburial. Make sure to also give the structure of the solid formed. (3 marks)

Form a salt



(one of many possible answers)