Disposal of waste

If students use only a few drops of each hydrocarbon, set up in a fume cupboard a 400 mL beaker containing 100 g perlite or cat litter. Students should empty their test-tubes into the beaker. Leave the perlite with waste to evaporate overnight in the fume cupboard, then wrap it up in plastic or paper and dispose of it in the garbage bin.

How are risks controlled?

- wear safety glasses
- use gloves
- fume cupboard
- wash hands after use
- use small quantities (specify): Use only 10 drops or less of each hydrocarbon

Assessment of risk:

Risk for this investigation is **not significant**, provided appropriate control measures are in place as indicated above.

Approved by: _____ Date: _____

Investigation 22

Ethanol as a solvent

Rationale

Students design an investigation to gather meaningful information about the class of substances that dissolve readily in ethanol. They select their own substances, elements and compounds, fill in a pre-lab safety form and complete a risk assessment record.

Syllabus

Plan, choose equipment for and perform a first-hand investigation to gather information about the range of substances that can be dissolved by ethanol.

Background knowledge

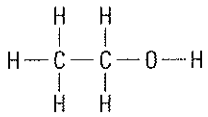
Students have learned about the bonding and structure of ethanol, and know that it has polar molecules with hydrogen bonding as the intermolecular forces.

Hints

- Students should test at least the following substances: salt, sugar, iodine, water, acetone, variety of alkanols, esters, acids, bases, sulfur, oil.
- Encourage students to use very small quantities of solid (the size of a rice grain) or just a few drops of liquid solute.

Discussion

1



All C–C bonds are non-polar, while C–H bonds are slightly polar but cancel each other out due to their orientation. C–O and O–H bonds are very polar due to the high electronegativity of oxygen. Because of the bend in the molecule at the oxygen atom (due to its lone pairs of electrons), the polar bonds do not cancel each other out; therefore, the molecule is polar.

2 **a** water, alkanols, short-chain alkanoic acids, acetone, esters
b These are all polar compounds.
c All can form hydrogen bonds with ethanol.

3 **a** sugar, some salts, iodine
b Except for iodine, they are either polar or ionic.

4 Iodine is non-polar, so cannot dissolve in highly polar water. Ethanol is less polar than water. It contains a non-polar part, CH_3–CH_2–, which more easily dissolves non-polar molecules.

5 **a** sulfur, some salts such as lead iodide
b They contain either non-polar molecules, or have very strong ionic bonds, or are covalent network solids (which are also non-polar).

6 Water, acetone and sugar are dissolved by ethanol, breaking their intermolecular forces, some of which formed new hydrogen bonding with ethanol. Iodine dissolved in ethanol to produce a brownish solution. This is due to the solvent effect—that is, the reflection of light from iodine molecules in ethanol, rather then the formation of new products. Some solvents, such as hexane and TTE, dissolve iodine into a crimson-coloured solution.