5. Review Question (page 370)
Is iodine, $I_2(s)$, more likely to dissolve in water or in carbon tetrachloride, $CCl_4(\ell)$? Explain.

Iodine is more likely to dissolve in $CCl_4(\ell)$. $I_2(s)$ and $CCl_4(\ell)$ are both non-polar molecular compounds, whereas water is a polar molecular compound. There are no significant attractions between the non-polar I_2 molecules and polar water molecules that would cause molecules of $I_2(s)$ to separate.

6. Review Question (page 370)
Explain why the solubility of a gas in olive oil is similar to the solubility of the same gas in animal fat. How could this information be useful to a researcher who is evaluating the safety of a new anesthetic gas? Anesthetics are medicines that are given to patients before surgery to keep them from feeling pain during the procedure.

Fats and oils are chemically similar. Physically, the oils have weaker intermolecular forces between molecules and have a lower melting point than fats. The solubility of a gas in an oil would be similar to the solubility in fat if it is soft (i.e., has a lower melting point). This information is valuable to a researcher, because the solubility of a new anesthetic can be tested in the laboratory using oil rather than on a patient.

7. Review Question (page 370)
Food colouring is often added to ice cream, candies, and icing for birthday cakes. Are the molecules in food colouring more likely to be polar or non-polar? Explain your answer.

Food colouring must dissolve completely because there is a homogeneous appearance to the foods. Since the food colouring mixes completely, and since each food contains polar water molecules, the food colouring would be expected to be made up of polar molecules. The polar water molecules would hydrate the molecules in the food colouring.

8. Review Question (page 370)
A scuba diver who is experiencing the "bends" as a result of nitrogen bubbles in the blood may be treated in a recompression chamber. The air pressure in this sealed chamber can be increased to many times the atmospheric pressure. Explain how a recompression chamber can be used to remove the nitrogen bubbles safely.

There is a problem with ascending from an underwater dive too quickly. A scuba diver breathes air at a greater pressure under water than at the surface of the water. More nitrogen is dissolved in the diver's blood. Slow surfacing

allows the dissolved nitrogen to come out of the blood solution gradually, preventing the sudden formation of bubbles of gas in the blood that is potentially fatal.

A recompression chamber can be used to simulate the underwater pressure conditions and cause the nitrogen gas to dissolve in the blood. The pressure can then be decreased slowly, similar to ascending from the dive gradually. The nitrogen gas can be safely exhaled in small amounts.

9. Review Question (page 370)

Use the solubility curves in **Figure 8.11** (below) to predict whether each solution of potassium chlorate, $KClO_3(aq)$, is saturated, unsaturated, or supersaturated.

a. 15 g of $KClO_3(aq)$ in 100 g of water at 40°C
b. 10 g of $KClO_3(aq)$ in 50 g of water at 65°C
c. 8 g of $KClO_3(aq)$ in 50 g of water at 50°C

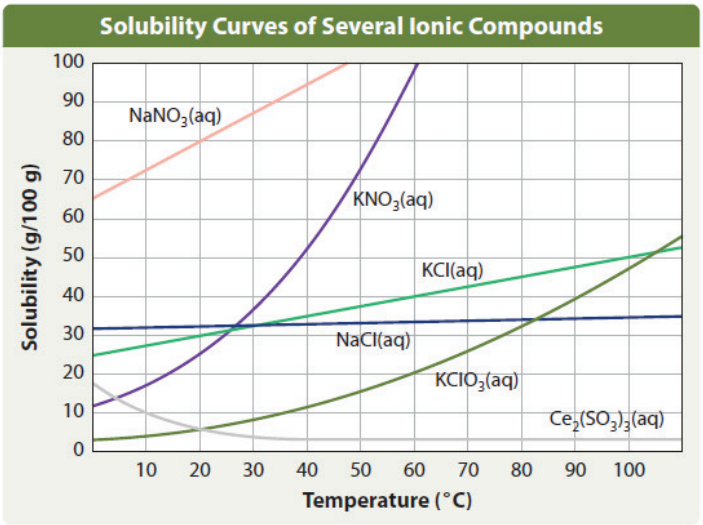


Figure 8.11 The solubility of most ionic substances in water increases with temperature. In this graph, the solubility is given in grams of solute per 100 g of *solvent*. This is different from other expressions of solubility, which are given in grams of solute per 100 mL of *solution*.

a. At 40°C, the solubility of $KClO_3(aq)$ in 100 g of water is 12 g. A solution containing 15 g of $KClO_3(aq)$ in 100 g of water is supersaturated.
b. At 65°C, the solubility of $KClO_3(aq)$ in 100 g of water is 24 g. At 65°C, the solubility of $KClO_3(aq)$ in 50 g of water is 12 g. A solution containing 10 g of $KClO_3(aq)$ in 50 g of water is unsaturated.
c. At 50°C, the solubility of $KClO_3(aq)$ in 100 g of water is 16 g. At 50°C the solubility of $KClO_3(aq)$ in 50 g of water is 8 g. A solution containing 8 g of $KClO_3(aq)$ in 50 g of water is saturated.

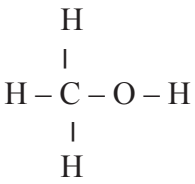
11. Review Question (page 370)

Explain why sodium chloride, NaCl(s), is insoluble in benzene, $C_6H_6(\ell)$. In your explanation, refer to the forces of attraction between the various particles.

NaCl(s) is an ionic solid held together by strong electrical attraction between oppositely charged Na^+ ions and Cl^- ions. $C_6H_6(\ell)$ is a non-polar molecular compound in which molecules are weakly attracted to one another. There are no centres of charge in the $C_6H_6(\ell)$ that can attract ions and cause separation of the ions in NaCl(s). Therefore, NaCl(s) does not dissolve in $C_6H_6(\ell)$.

15. Review Question (page 370)

The molecular structure of methanol is shown below. Use this structure to explain why methanol is soluble in both water and gasoline.



CH_3OH has a polar –OH group on one side of the molecule that can lead to hydrogen bonding. The CH_3– is non-polar. Methanol is soluble in water because the hydrogen bonding in both water and methanol results in attractions between the polar water molecules and the polar methanol molecules. The non-polar part of methanol will be attracted to, and mix with, non-polar octane, $C_8H_{18}(\ell)$, the main component of gasoline.

16. Review Question (page 370)

Boiling is an effective method for sterilizing water. The water will remain sterile if it is covered while it cools to room temperature. Water that is sterilized in this way is not suitable for filling a fish tank, however. Explain why.

Fish survive by extracting dissolved oxygen from water. The solubility of a gas in a liquid decreases with increasing temperature. Boiling the water will decrease the dissolved oxygen content to zero, and because the water is left covered while it cools, oxygen in the air cannot dissolve in the water. Fish would have no oxygen to breathe in the cooled water and would die.