Experiment 1: Mixtures

Notes

Blood is a mixture whose primary function is to transport chemicals such as nutrients and wastes around the body. These chemicals are dissolved in the plasma, which is the liquid part of the mixture in blood. The concentrations of the many solute components in blood can vary.

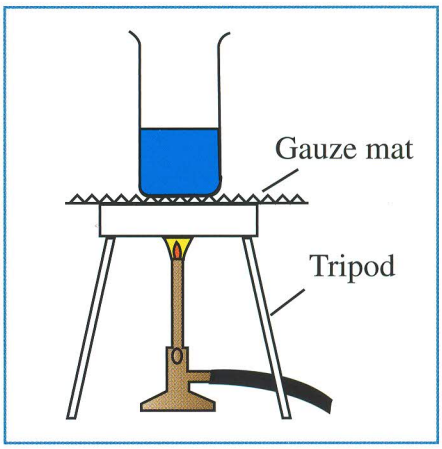
For example, an infusion of blood that is "supersaturated" with oxygen can reduce the amount of damaged heart muscle following a heart attack, according to data presented at Transcatheter Cardiovascular Therapeutics (TCT) 2007, the scientific symposium of the Cardiovascular Research Foundation (CRF). (http://www.medical-newstoday.com/articles/85639.php)

Mixtures can be heterogeneous or homogeneous. A heterogeneous mixture has an irregular composition. Concrete and fruitcakes are examples of heterogeneous mixtures. Homogeneous mixtures on the other hand have the same composition throughout. Solutions are homogeneous mixtures. How would you classify blood?

During this laboratory activity, you will develop an understanding of different types of mixtures including solutions and examine the different solubilities of some solutes in two solvents: water and ethanol.

Equipment

Bunsen burner
tripod and gauze mat
matches
watch glass
glass rod
thermometer
beakers (2 × 100 mL)
measuring cylinder (25 mL)
sodium chloride solid
100% orange juice
100% apple juice
100% prune juice
solder
fruit scone (or fruit cake)
charcoal
sodium chloride
copper(II) chloride
ethanol
distilled water
boiling beads (or boiling chips)
hand lens or magnifying glass



SAFETY NOTE:

- **Do not consume fruit juices or fruit scone/cake.**

Procedure

Part A: homogeneous or heterogeneous?

Notes

1. Examine the 5 mixtures and record your observations in a table similar to the one drawn below.

	Mixture	Observations	Classification
1	100% orange juice		
2	100% apple juice		
3	100% prune juice		
4	solder		
5	fruit scone (or fruit cake)		

2. Classify the mixtures as either homogeneous or heterogeneous.

Procedure

Part B: solutions

1. The salt, sodium chloride, has a solubility of 35.9 g/100 mL at 25 °C. Determine the amount of salt that you would need if only 15 mL of distilled water solvent was used.

2. Using the measuring cylinder measure and pour 15 mL of distilled water into one of the 100 mL beakers. Measure and record the temperature of the water.

Predict *- based on your recorded temperature and value calculated in procedure #1 the type of solution that you would form by dissolving the salt in the 15 mL of water: unsaturated, saturated or supersaturated.*

3. Weigh the calculated amount of sodium chloride in procedure #1 and attempt to dissolve it in 15 mL of distilled water at room temperature.

Observe *- and describe the type of solution that you have created in procedure #2: unsaturated, saturated or supersaturated.*

Explain *- your observations (e.g. explain why your predicted solution type is different to or the same as your observed solution type).*

4. If necessary, gently heat your mixture, with continuous stirring, to dissolve any remaining solid. Stop heating the mixture once you are convinced all solid has dissolved or when boiling is about to occur. Describe and record your observations including the temperature of the water.

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5. Remove any stirring implement but leave the thermometer in the water and allow it to cool. Be very careful not to touch or bump the beaker or thermometer.

6. Record the temperature at which you observe the formation of any solid.

Procedure

Part C: solubility

1. Test the solubility of a small sample (half a teaspoon) of ethanol, charcoal, sodium chloride and copper(II) chloride in separate 15 mL lots of distilled water. Record your observations and classify each sample as soluble or insoluble in the water solvent column of a table similar to that shown.

Solute	Solubility	
	Water (solvent)	Ethanol (solvent)
charcoal		
sodium chloride		
copper(II) chloride		
ethanol		
water		

2. Test the solubility of a small sample (half a teaspoon) of charcoal, water, sodium chloride and copper(II) chloride in 15 mL lots of ethanol. Record your observations and classify each sample as soluble or insoluble in the ethanol solvent column of your table.

Processing of results and questions

1. Describe how you would make 100 mL of the following types of sodium chloride solution given that the solubility of NaCℓ in water is 35.9 g/100 mL at 25 °C.
   a) unsaturated
   b) saturated
   c) supersaturated

2. Compare temperature records in Part B. Did you manage to make a supersaturated solution? Explain.

3. Which is more soluble in human blood oxygen or carbon dioxide? Record the solubility of the two gasses.

4. Ethanol is the alcohol in alcoholic drinks like wine and beer. Ethanol is said to be miscible in water. What does this mean? Is miscibility different to solubility?