What Is Water?

Water is a very useful substance. Most major towns and cities are built near large bodies of water. We drink water, play with water, put out fires with water, and irrigate crops with water (Figure 1). All living things need water.

Describing Water

Imagine a glass of water at room temperature. You would probably describe it as a liquid that has no colour, taste, or odour.

Many substances dissolve in water, including table salt, sugar, oxygen, and carbon dioxide. This is one reason why water is so important for life. Plants and animals are largely made up of water. Over half of the human body is water.

Water in the body helps to transport substances to all the tissues and organs. Water is an important solvent in which essential chemical reactions can take place. Water also keeps us cool: as sweat evaporates, it transfers thermal energy away from the body. A person can live for over a month without food, but a person can live for only a few days without water. A supply of clean water is essential for our health.

Is Water a Pure Substance or a Mixture?

Pure water is clear, colourless, and has no taste or odour. You might have noticed, however, that natural bodies of water can appear to be blue or green, or even an unpleasant grey colour. Perhaps you have noticed that water from different locations can taste different or have an odour. This is because most of the water in nature is not pure. Rather, it is a mixture of pure water and other substances. Dissolved substances in water can give it colour, taste, and odour. Some of these substances are desirable. Other substances are dangerous. In Section 11.2, we will look at some of the substances that dissolve in water.
The Water Particle

According to the particle theory of matter, pure water is made up of many identical water particles. However, water particles are composed of two even smaller kinds of particles—oxygen and hydrogen. Each particle of water is made up of one oxygen particle and two hydrogen particles joined together (Figure 2).

States of Water

Water can exist as a solid (ice), as a liquid (water), or as a gas (water vapour). The particles of each state of water behave differently.

Solid ice has a definite shape. This is because the water particles of ice cannot move freely around each other; they can only vibrate (Figure 3(a)). In liquid water, particles vibrate faster and are free to move around each other in all directions (Figure 3(b)). In water vapour, the particles are very far apart. They have lots of energy and move very quickly in all directions (Figure 3(c)).

Think about the temperatures at which each state of water exists. Where might you expect to find each state of water on Earth?

CHECK YOUR LEARNING

1. Describe a particle of water. What other particles make up a particle of water?
2. You are given a sample of tap water that is clear, yellowish, and odourless. Is this a sample of pure water? Explain.
3. Choose one of the states of water.
   (a) Draw a labelled diagram to show the arrangement of water particles in this state.
   (b) Describe the arrangement of water particles in this state.