SUMMARY OF CHAPTER 2

THE HUMAN ORGANISM AND THE POWER OF ENERGY

1. WHAT IS ENERGY?

- Energy is the capacity to do work or effect a change (p. 34).
- In the International System of Units, energy is expressed in joules (J) (p. 34).

2. FORMS OF ENERGY

- Thermal energy is the energy that comes from the random motion of particles that make up a substance. The higher the temperature of a substance, the more thermal energy it contains because there is greater movement of its particles (p. 36).
- Radiant energy is the kind of energy contained in and transported by electromagnetic waves. The quantity of energy depends on the wavelength: the shorter the wavelength, the more energy the wave can transport. The quantity of energy also depends on the quantity of radiation emitted by the source: the more radiation emitted, the greater the energy emitted as well (p. 37).
- Chemical energy is contained in the bonds of a molecule. It is energy in reserve, since the bonds need to be broken to free the energy they contain. The amount of energy depends on the strength of the bonds between the atoms. The stronger the bond, the more energy it contains (p. 38).
- Mechanical energy is the energy that results from the forces acting on an object. It depends on the object's speed, its mass and its relationship to its surroundings (p. 39).

3. ENERGY TRANSFORMATION AND TRANSFER

- The transformation of energy is the changing of energy from one form to another; for example, from chemical energy to mechanical energy (p. 41).
- Energy transfer is the movement of energy from one place to another; for example, from the Sun to the leaves on a tree (p. 41).
- Most of the time, energy transformation and transfer occur at the same time (p. 41).
- Energy transformation and transfer help to carry out different kinds of change; for example, physical changes and chemical changes (p. 42).

4. PHYSICAL CHANGES

- Physical change does not affect the nature or the characteristic properties of matter; for example, change of phase, dissolution and deformation (p. 43).
- A state (or phase) change is the transformation from one state (or phase) to another; for example, from a solid to a liquid (p. 43).
- A change of state calls for a transfer of thermal energy and a change in the forces of attraction among the particles of a substance. In the transfer of thermal energy, the substance with the higher temperature gives off energy and the other substance(s) absorbs this energy. The bonds between the particles change when a substance reaches its melting point or boiling point (p. 44).
- Dissolution is the creation of a solution by dissolving a solute in a solvent (p. 46).
- Dissolution is a change that involves a transfer of energy; that is, absorption or release of energy (p. 48).
- Deformation is the changing of the shape of a material (p. 49).
- A deformation always involves an energy transfer and often more than one energy transformation (p. 49).

5. CHEMICAL CHANGES

- A chemical change changes the nature and the characteristic properties of matter; for example, synthesis, decomposition, oxidation and precipitation (p. 50).
- During a chemical change, the bonds between atoms are broken and reorganized for new substances to be formed. Even if new substances are formed, however, the number of atoms remains constant. The law of conservation of mass continues to apply (p. 51).
- Synthesis is the formation of a complex molecule from two or more atoms or simpler molecules (p. 53).
- Synthesis is a chemical reaction that either absorbs energy or releases energy (p. 53).
- Synthesis in living organisms always involves absorption of energy. This energy is transformed into chemical energy and stored in the bonds of the molecules that are produced (p. 55).
- Decomposition is the transformation of complex molecules into simpler molecules or atoms (p. 55).
- Decomposition is a chemical reaction that absorbs energy or releases energy (p. 55).
- In living organisms, decomposition always involves release of energy (p. 55).
- Oxidation is a chemical reaction involving oxygen or a substance that has similar properties to oxygen (p. 57).
- Oxidation generally involves release of energy (p. 57).
- Precipitation is the formation of a solid that is less soluble or not soluble following the mixture of two solutions (p. 58).
- Precipitation is a process that requires very little energy (p. 58).