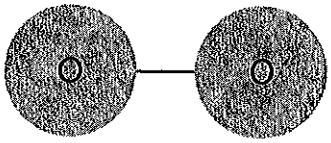
c) O_2 is non-polar because both oxygen atoms have equal electronegativity.



Non-polar

9. **a)** Condensation

b) Redox

c) Redox

d) Neutralization

e) Redox

f) Condensation

g) Hydrolysis

h) Hydrolysis

i) Condensation

10. **a)** Iron (Fe)

b) Chlorine gas (Cl_2)

c) Chlorine gas (Cl_2)

d) Iron (Fe)

Lesson 2

11.
- All living things are made of cells.
- The cell is the basic unit of living things.
- All cells come from the division of pre-existing cells. They cannot spontaneously come into being.

12. Prokaryotes do not have membranes around their cell organelles, while eukaryotes do.

13. **a)** Plasma membrane: The cell membrane separates the cell's contents from its surrounding environment. It controls the movement of materials in and out of the cell, and allows the exchange of food and gases.

b) Ribosomes: Ribosomes manufacture proteins in the cell. They are attached to the endoplasmic reticulum or float freely in the cytoplasm.

c) Lysosomes: Lysosomes contain digestive enzymes that help to break down food molecules.

d) Microtubules: Microtubules are protein-rich rods that provide pathways for organelle movement.

e) Nucleus: The nucleus is the control centre of the cell because it directs all cell activities. It is involved in cell division and is the storage area for all information and instructions for the organelles. The nucleus contains the cell's genetic material (DNA).

f) Cytoplasm: The cytoplasm is a form of protoplasm found outside the nucleus. It is the fluid that surrounds all of the organelles.

14. Since a mammal is warm-blooded (endothermic), it requires more energy in order to maintain its internal temperature. For example, if a mammal is cold, it contracts its muscles (shivers) to release heat. This requires energy. Cellular energy or ATP is produced by the mitochondria in cells. A lizard is cold-blooded (ectothermic), which means that it does not expend cellular energy to maintain its body temperature.

15. There are several reasons why it is important that the cell membrane be fluid. For example:

- So that it can allow molecules to pass through it, when desired
- So that it can quickly seal over rips and tears, to seal the cytoplasm

16. Passive transport does not require cellular energy, whereas active transport does. Also, passive transport moves with the concentration gradient (higher concentration to lower concentration), whereas active transport moves against the concentration gradient (lower concentration to higher concentration).

17. **a)** The solution in the osmometer is hypertonic, in relation to the distilled water. The distilled water will move across the cellular membrane into the osmometer.

b) The solution in the osmometer is hypotonic, in relation to the 10% sugar solution. Water molecules from the osmometer move across the selectively permeable membrane into the hypertonic 10% sugar solution.

18. Place a wilted flower in a glass of pure water. The flower cells would be hypertonic, in relation to pure water, so water would move by osmosis into the wilted flower to "pump it up." Water always moves to the area that is hypertonic.

19. Red blood cells must be in an isotonic solution. Too much or too little solute would cause the cells to shrink or swell and burst. This is why intravenous fluids in hospitals have a similar concentration to the internal environment of a blood cell.

20.
- Phagocytosis brings large solid particles into the cell inside a vesicle. Pinocytosis brings water and small dissolved particles into the cell inside a vesicle.
- Phagocytosis occurs only in certain kinds of cells, such as white blood cells. Pinocytosis occurs in almost all cell types.

Activity: Osmosis Experiment

Sample data

Treatment	Initial size of potato strip (cm)				Size of potato strip after 24 hours (cm)			
	L	W	T	V	L	W	T	V
Glass A—just water	4.0	1.0	0.5	2.0	4.1	1.3	0.6	3.2
Glass B—water and salt	4.0	1.0	0.5	2.0	3.4	0.6	0.3	0.6

21. **a)** Your answer may be different, depending on the texture and size of the potato you used. In the sample data, the potato in glass A increased in volume by about 1.2 cm^3.

b) Your answer may be different, depending on the texture and size of the potato you used. In the sample data, the potato in glass B decreased in volume by about 1.4 cm^3.

c) Your answer may be different, depending on the texture of the potato you used, but your results should generally be similar to those in the sample data. In the sample data, both glasses showed changes in the potato volumes. In glass A, the potato grew by about 1.2 cm^3, and in glass B, the potato shrank by about 1.4 cm^3. The shrinkage in glass B was greater than the growth in glass A, indicating that the salt solution in glass B was much saltier than the inside of the potato. In other words, there was greater osmotic potential in glass B than in glass A.

22. In glass A, the potato's internal environment was hypertonic, in relation to the tap water. Therefore, water moved by osmosis from the glass into the potato's cell, causing it to swell up. This was seen as an increase in size and volume.

In glass B, the potato's internal environment was hypotonic, in relation to the salty water. Thus, water moved out of the potato and into the glass. This caused the potato to shrivel up and become smaller in volume.

23. The solution in glass A was hypotonic, in relation to the potato, while the solution in glass B was hypertonic, in relation to the potato.

24. The rate of water leaving the potato would increase. Increasing the temperature increases the motion of the water molecules, thus increasing the rate of diffusion of water.