

## Chemistry

### Pretest 1.1

1. True? Or False?
  - a) The kinetic molecular theory only applies to gases\_\_\_\_\_
  - b) The three types of motion for a gas are vibrations, rotations and translations\_\_\_\_\_
  - c) Helium gas atoms do not vibrate at room temperature because there are no bonds between them\_\_\_\_\_
  - d) The collisions between air molecules use up energy and eventually make a room cooler.\_\_\_\_\_
  - e) At 35 °C, on average nitrogen molecules will move faster than nitrogen molecules at 12 °C.\_\_\_\_\_
  - f) At the same temperature helium(He) atoms move faster than those of xenon(Xe)\_\_\_\_\_
2. Give an example of an object at a high temperature but which carries very little heat.
3. Is the substance being described showing real gas behaviour? Or ideal gas behaviour?
  - a) There are no attractions between carbon monoxide molecules at 25 °C.\_\_\_\_\_
  - b) Oxygen gas just before it liquefies at -196 °C.\_\_\_\_\_
  - c) Ammonia (NH<sub>3</sub> gas) at a high temperature and low pressure.\_\_\_\_\_
  - d) Ammonia (NH<sub>3</sub> gas) at room temperature\_\_\_\_\_
4. Give a detailed account of what occurs at the molecular level when liquid mercury solidifies.

5. a) Consider the following: Kr: versus O<sub>2</sub> gases, both at 25 °C.

Which gas, if any, moves faster? And if so, how much faster?

b) At 25 °C, which gas, if any, has more kinetic energy? Why?

6. What role does the fan play in making the vacuum cleaner work? Hint: it's related to a pressure gradient.

7. You are lying down, belly up. Does your body experience atmospheric pressure only from above or does the arch of your back experience exactly the same pressure? Explain.

8. Explain why the volume of a gas decreases when its temperature decreases under constant pressure. Make sure that you use relevant parts of the kinetic theory in your explanation.

9. A student would like to compress a sample of hydrogen gas from  $9.0 \times 10^2$  ml to  $6.0 \times 10^2$  ml. By what factor should he change the temperature of the gas while making sure that the pressure remains constant? Respect your grandmother and significant figures.

