Name: _____

Class: _____

ACTIVITY SHEET

Activity 1.3 Investigation: Compressing and expanding gases

Reverse-cycle air conditioners and refrigeration systems work using the following principles.

- The work done on a gas by compressing it increases the temperature of the gas.
- When a gas expands, it does work and its temperature decreases.

In this investigation, you will do work by compressing a gas and observe the effect produced. You will also observe the effect produced when a gas expands.

What you will need

- bicycle pump
- bicycle tyre
- pressure pack can (preferably containing pressurised air, as used in football sirens)
- thermometer

Part A: Compressing gas

Use the bicycle pump to pump up the bicycle tyre vigorously. Feel the temperature of the compressed air leaving the pump.

1 What is the source of the energy that is being transformed into the heat energy contained in the compressed air?

2 If the temperature of the compressed gas is lowered before it is allowed to enter the bicycle tyre, will the compressed air have less, the same, or more energy than before it entered the pump? Explain your answer.

3 Describe how the law of conservation of energy applies in the previous situations.

Part B: Expanding gas

Use the thermometer to measure the temperature of the air in the room you are in. Release the valve on the can of pressurised air and hold the bulb or sensor of the thermometer approximately 20 cm from the valve for as long as possible. Record the temperature of the expanded air.

4 What difference was detected between room temperature and the temperature of the expanded compressed air?

5 How was the expanding compressed air doing work on its surroundings?

6 In terms of the law of conservation of energy, explain why the temperature of the expanding air decreased.

7 Use a flow chart to outline the cycle of events that occurs to the gas in a typical refrigeration system.