A few equations   A few constants

$PV = nRT$ For H_2O s = 4.184 $J \cdot K^{-1} \cdot g^{-1}$

$\Delta E = q + w$ $R = 0.08206$ $L \cdot atm \cdot mol^{-1} \cdot K^{-1}$

$w = -P\Delta V$ $R = 8.314$ $J \cdot mol^{-1} \cdot K^{-1}$

$\Delta E = q_v$ $N_A = 6.022 \times 10^{23}$ mol^{-1}

$\Delta H = q_p$ (with only constant pressure PV work) 1.000 $L \cdot atm = 101.3$ J

$q = \Delta T \cdot C$ 14.7 psi = 1 atm

                                                        1 torr = 1 mm Hg
$q = \Delta T \cdot n \cdot C_{mol}$
                                                        1 atm = 101,325 Pa

$q = \Delta T \cdot m \cdot s$ 760 torr = 1 atm

                                                        0 °C = 273.15 K

1. 35.0 g of hot water are combined with 60.0 g of cold water. Determine the final temperature of
    the water if the initial temperatures of the hot and cold water samples are 89.5 and 22.3 °C
    respectively.

2. Two identical containers are charged with CH_4 and Cl_2. One container is charged with 1 atm of Cl_2 and the other container is charged with 1 atm of CH_4. The containers are at the same temperature.

a. On average, are the CH_4 molecules moving faster, slower, or the same speed as the Cl_2 molecules?

b. On average, do the CH_4 molecules have more, less, or the same kinetic energy as the Cl_2 molecules?

c. Which gas is more dense, the CH_4, the Cl_2, or neither?

d. Increasing the temperature of the gases in the containers increases their pressures. What effect, if any, does the increase in temperature have on the density of the gases?

3. a. A container was charged with a sample of Argon gas that is initially at 100 °C. The gas was cooled to –78 °C. Does the gas become more or less ideal.

b. At room temperature which gas would behave more ideally He (BP –271 °C) or CO_2 (BP –78 °C).

4. Determine the molar mass of a gas if 20.95 g of the gas occupies a volume of 6.075 L at 23.0 °C and 760.0 torr pressure.

5. Hydrochloric acid reacts with sodium bicarbonate to produce water and carbon dioxide.

$$HCl\ (aq) + NaHCO_3(aq) \longrightarrow H_2O(l) + CO_2(g) + NaCl(aq)$$
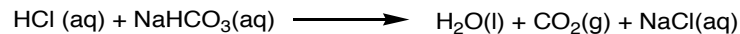
600.0 mL of CO_2 at 23.5 °C was collected by displacing water from an inverted container. The pressure inside the container was 789 torr. How many moles of HCl were neutralized by the sodium bicarbonate?

6. 45.0 g of C_2H_6 were placed into a 1.56-L container. Determine the pressure of the gas inside the container if the temperature of the gas was 35.6 °C.

7. Assuming volume and composition remain constant, does the pressure of a gas double if the temperature of a gas is increased from 50 °C to 100 °C?

Assuming that the temperature and the composition of a gas remains constant, what happens to the pressure of the gas when the volume of the gas is cut in half.