**Unit 5 – Thermochemistry and Gas Laws Test Review**

1. Terms – know the definitions of these terms
   1. Heat
   2. Temperature
   3. Exothermic
   4. Endothermic
   5. Enthalpy
   6. Boyle’s Law
   7. Charles’s Law
   8. Avogadro’s Law
   9. Combined Gas Law
   10. Ideal Gas Law
2. Hess’s Law
   1. Calculate ΔH for the reaction: **P4O6 (s) + 2O2 (g) 🡪** **P4O10 (s)** given the information below.
      1. P4 (s) + 3O2 (g) 🡪 P4O6 (s) ΔH = -1640.1 kJ
      2. P4 (s) + 5O2 (g) 🡪 P4O10 (s) ΔH = -2940.1 kJ
   2. Calculate ΔH for the reaction: **CO (g) + 2H2 (g) 🡪 CH3OH (g)** given the information below.
      1. 2C (s) + O2 (g) 🡪 2CO (g) ΔH = -537 kJ
      2. 2C (s) + O2 (g) + 4H2 (g) 🡪 2CH3OH (g) ΔH = -402.4 kJ
   3. Calculate ΔH for the reaction: **C2H4 (g) + 6F2 (g) 🡪 2CF4 (g) + 4HF (g)** given the information below.
      1. H2 (g) + F2 (g) 🡪 2HF (g) ΔH = -537 kJ
      2. C (s) + 2F2 (g) 🡪 CF4 (g) ΔH = -680 kJ
      3. 2C (s) + 2H2 (g) 🡪 C2H4 (g) ΔH = +52.3 kJ
   4. Calculate ΔH for the reaction: **N2O (g) + NO2 (g) 🡪 3NO (g)** given the information below.
      1. N2 (g) + O2 (g) 🡪 2NO (g) ΔH = +180.7 kJ
      2. 2NO (g) + O2 (g) 🡪 2NO2 (g) ΔH = -113.1 kJ
      3. 2N2O (g) 🡪 2N2 (g) + O2 (g) ΔH = =163.2 kJ
3. Heat – use the equation **q = mCΔT (**ΔT = Tfinal – Tinitial) to solve the following problems.
   1. The specific heat capacity of octane is 2.22 J/gK. How much heat energy is required to raise the temperature of 80.0g of octane from 10.0°C to 25.0°C? Is this process endothermic or exothermic?
   2. A 45.0g block of copper is cooled down from 30.0°C to 15.0°C. The specific heat capacity of copper is .385 J/g°C. How much heat energy is released? Is this process endothermic or exothermic?
   3. 1500.J of heat is released when 99.88g of magnesium is cooled. The specific heat capacity of magnesium is 1.020 J/g°C. What is the change in temperature of the magnesium?
4. Gas Laws

**Boyle’s Law Charles’s Law Avogadro’s Law Ideal Gas Law**

**P1V1 = P2V2 V1T2 = V2T1 n1V2 = n2V1 PV = nRT**

**R = .08206 L·atm/mol·K**

**Combined Gas Law**

**P1V1 = P2V2**

**T1 T2**

Units of Pressure 1 atm = 760 torr = 760 mmHg = 101.325 kPa

Units of volume 1 L = 1000 mL = 1000 cm3

Units of temperature TKelvin = TCelsius + 273

1. For each problem, determine which law you would use to solve the problem and then solve it!
   1. If 5.00L of neon gas is cooled from 24.0°C to -272°C, what is the new volume of the gas?
   2. If .214 mol of argon gas occupies a volume of 652 mL, what would the volume of .375 mol of argon gas occupy?
   3. If the pressure exerted on the gas in a weather balloon with a volume of 33.0 L decreases from 1.00 atm to .562 atm, what is the new volume of the weather balloon?
   4. 1900. mL of carbon dioxide gas contains .777 moles of gas. If some gas leaks out of the container so that its volume is now 1.200L, how many moles of gas are still in the container?
   5. A flexible container has a volume of 1.23L at 42.0°C and a pressure of 190.0 kPa. The pressure inside the container suddenly drops to 1100. Torr and the temperature is 24.0°C. What is the volume of the container now?
   6. A balloon was filled with 1234mL of helium gas to a pressure of .3456atm. What is the pressure in the balloon is the volume is increased to 2345mL?
   7. A 3.00 L container is filled with dinitrogen monoxide gas at 25.00°C. The container doubles in size. What is the new temperature inside the container?
   8. At what temperature does 16.3 g of nitrogen gas have a pressure of 126.7 kPa in a 25.00L tank?
   9. What will the volume of a balloon filled with a sample of krypton gas be if 100.0 g of krypton is at -99.66°C at a pressure of 726 torr?