**Quiz 6**

# Directions: Answer each of the following questions. Be sure to use complete sentences where appropriate. For full credit be sure to show all of your work. Where appropriate answers should be boxed for clarity, written to the correct number of significant figures, and, include the proper units.

1. Calculate ∆H°rxn for the reaction (7 points):

2 Ni (s) + $\frac{1}{4}$S8 (s) + 3 O­2 (g) → 2 NiSO3 (s)

From the following information:

NiSO3 (s) → NiO (s) + SO2 (g) ∆H°rxn = 156 kJ

$\frac{1}{8}$S8 (s) + O2 (g) →SO2 (g) ∆H°rxn = -297 kJ

Ni (s) + $\frac{1}{2}$ O2 (g) → NiO (s) ∆H°rxn = -241 kJ

**(**Ni (s) + $\frac{1}{2}$ O2 (g) → NiO (s) ∆H°rxn = -241 kJ**)×2**

**(**$\frac{1}{8}$S8 (s) + O2 (g) →SO2 (g) ∆H°rxn = -297 kJ**)×2**

**(**NiO (s) + SO2 (g) → NiSO3 (s) ∆H°rxn = -156 kJ**)×2**

**2** Ni (s) + **1** O2 (g) → **2** NiO (s) ∆H°rxn = -482 kJ

$\frac{1}{4}$S8 (s) + **2** O2 (g) →**2** SO2 (g) ∆H°rxn = -594 kJ

**+ 2** NiO (s) + **2** SO2 (g) → **2** NiSO3 (s) ∆H°rxn = -312 kJ

2 Ni (s) + $\frac{1}{4}$S8 (s) + 3 O­2 (g) → 2 NiSO3 (s) ∆H°rxn = -1388 kJ

1. Oxygen and ozone are both forms of elemental oxygen. Are the standard enthalpies of formation of oxygen and ozone the same? Explain (3 points).

Ozone and elemental oxygen are different forms of oxygen, their standard enthalpies of formation are different.

1. Automobile air bags produce nitrogen gas from the reaction (10 points):

2 NaN3 (s) → 2 Na (s) + 3 N2 (g)

* 1. If 2.25 g of sodium azide reacts to fill an air bag, how much P-V work, in joules, will the nitrogen gas do against an external pressure of 1.00 atm given that the density of nitrogen is 1.165 g/L at 20°C.

$$2.25 g NaN\_{3}×\frac{1 mol NaN\_{3}}{65.011 g NaN\_{3}}×\frac{3 mol N\_{2}}{2 mol NaN\_{3}}×\frac{28.014 g N\_{2}}{1 mol N\_{2}}=1.45 g N\_{2}$$

$$w=-P∆V$$

$$w=-\left(1.00 atm\right)\left(1.45 g×\frac{1 L}{1.165}\right)×\frac{101.325 J}{1 L atm}=-126 J$$

* 1. If the process releases 2.34 kJ of heat, what is the ∆E for the system?

$$∆E=w+q=-126 J×\frac{1 kJ}{1000 J}+\left(-2.34 kJ\right)=-0.126 kJ+\left(-2.34 kJ\right)=-2.47 kJ$$