

NAME _____
CHEM1450/Practice Test 4

(3 Points Each) Place the letter corresponding to the correct answer in the blank to the left of the question number.

- _____ 1. Which of the following processes is endothermic?
- the freezing of water
 - the combustion of propane
 - a hot cup of coffee (system) cools on a countertop
 - the chemical reaction in a "hot pack" often used to treat sore muscles
 - the boiling of water

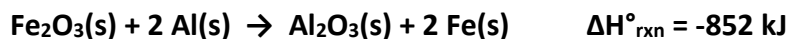
- _____ 2. Which of the following signs of heat (q) and work (w) represent a system that has released heat to the surroundings and has had work done to it by the surroundings?

	q	w
a.	-	-
b)	-	+
c)	+	-
d)	+	+
e)	-	can't be determined

- _____ 3. Which of the following are TRUE statements about a reaction if $\Delta H_{\text{rxn}} = +350 \text{ kJ}$?
- The reaction is **endothermic**, and the bonds of the products are **stronger** than the bonds of the reactants.
 - The reaction is **exothermic**, and the bonds of the products are **stronger** than the bonds of the reactants.
 - The reaction is **endothermic**, and the bonds of the products are **weaker** than the bonds of the reactants.
 - The reaction is **endothermic**, and the bonds of the products are **weaker** than the bonds of the reactants.
 - None of the above are true.

- _____ 4. Which of the following substances (with specific heat capacity provided) would show the greatest temperature change upon absorbing 100.0 J of heat?
- 10.0 g Ag, $C_{\text{Ag}} = 0.235 \text{ J/g}^\circ\text{C}$
 - 10.0 g H₂O, $C_{\text{H}_2\text{O}} = 4.18 \text{ J/g}^\circ\text{C}$
 - 10.0 g ethanol, $C_{\text{ethanol}} = 2.42 \text{ J/g}^\circ\text{C}$
 - 10.0 g Fe, $C_{\text{Fe}} = 0.449 \text{ J/g}^\circ\text{C}$
 - 10.0 g Au, $C_{\text{Au}} = 0.128 \text{ J/g}^\circ\text{C}$

- _____ 5. How much energy is evolved during the reaction of 48.7 g of Al, according to the reaction below? Assume that there is excess Fe_2O_3 .

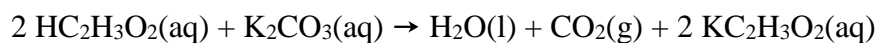


- a. 415 kJ
b. 207 kJ
c. 241 kJ
d. 130 kJ
e. 769 kJ
- _____ 6. Identify a substance that IS in a standard state.
- a. Fe (s)
b. Ne (s)
c. CH_4 (s)
d. H^+ (g)
e. Al^{3+} (s)
- _____ 7. Choose the reaction that illustrates ΔH°_f for $\text{Ca}(\text{NO}_3)_2$.
- a. $\text{Ca}(\text{s}) + \text{N}_2(\text{g}) + 3\text{O}_2(\text{g}) \rightarrow \text{Ca}(\text{NO}_3)_2(\text{s})$
b. $\text{Ca}^{2+}(\text{aq}) + 2 \text{NO}_3^-(\text{aq}) \rightarrow \text{Ca}(\text{NO}_3)_2(\text{aq})$
c. $\text{Ca}(\text{s}) + 2 \text{N}(\text{g}) + 6 \text{O}(\text{g}) \rightarrow \text{Ca}(\text{NO}_3)_2(\text{s})$
d. $\text{Ca}(\text{NO}_3)_2(\text{aq}) \rightarrow \text{Ca}^{2+}(\text{aq}) + 2 \text{NO}_3^-(\text{aq})$
e. $\text{Ca}(\text{NO}_3)_2(\text{s}) \rightarrow \text{Ca}(\text{s}) + \text{N}_2(\text{g}) + 3\text{O}_2(\text{g})$
- _____ 8. How many of the following compounds are soluble in water?
- CaSO_4 $\text{Pb}(\text{NO}_3)_2$ NaBr Na_3PO_4
- A) 0
B) 1
C) 2
D) 3
E) 4
- _____ 9. Which of the following types of compounds or molecules is/are able to conduct electricity when dissolved in water?
- A) strong electrolyte
B) weak electrolyte
C) non-electrolyte
D) **both** strong and weak electrolytes
E) **both** weak and non-electrolytes
- _____ 10. Which is TRUE concerning how a gas phase sample responds to temperature?
- A) The particles move more quickly when the temperature is decreased.
B) The particles move more quickly when the temperature is increased.
C) Temperature does not affect the speed of a gas phase particle.

D) The response of the particles to a change in temperature depends on the type of gas you are dealing with. Some move faster and some move more slowly.

- _____11. A gas mixture is made up of 3 gases. The partial pressures of the gases are .583 Pa, 1.12 Pa, and 0.798 Pa. What is the total pressure of the sample?
- A) 2.50 Pa
 - B) 6.26 Pa
 - C) 5.00 Pa
 - D) 1.12 Pa
 - E) 1.91 Pa
- _____12. Assuming you have a gas sample of constant temperature and number of moles, when the volume of the sample halves, what happens to the pressure of the sample?
- A) it halves
 - B) there is no change in the pressure
 - C) it doubles
 - D) it increases by a factor of 1.5
 - E) it increases by a factor of three.
- _____13. A gas occupies 3.33 L at 35°C and 4.62 atm. How many moles of the gas are present in the sample?
- A) 5.36 moles
 - B) 0.609 moles
 - C) 0.187 moles
 - D) 1.64 moles
 - E) this cannot be determined

1. Write the **balanced net ionic equation** (with phases!) for the following balanced reaction:



Net Ionic Equation: (6 Points)

2. Write **UN-balanced molecular** equations (**including phases**) for the reactions described below:

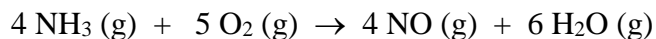
a. (6 Pts) Aqueous solutions of aluminum nitrate and sodium carbonate are combined.

b. (6 Pts) The reaction of aqueous HNO_3 and aqueous $\text{Ca}(\text{OH})_2$.

c. (6 Pts) The reaction of aqueous Fe_2SO_4 and solid, elemental Ca.

d. (6 Pts) The reaction of aqueous HClO_4 and aqueous Li_2CO_3 .

3. (10 Points) Use the reaction below to complete the following.



- a) What is the oxidation number for N in NH_3 ? _____
- b) What is the oxidation number for O in O_2 ? _____
- c) What is the oxidation number for O in NO ? _____
- d) Which element is oxidized? _____
- e) Which reactant is the oxidizing agent (oxidizing reactant)? _____

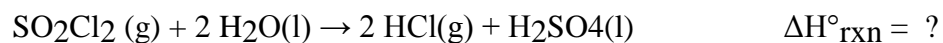
Problems: The following problems require work and calculations to be shown! Answers with no work will not receive credit! Report all answers to 3 sig figs, and make sure to include units with all answers.

1. (7 Points) If the density of hydrazine, N_2H_4 , is 1.02 g/mL. It decomposes according to the following chemical equation. How many milliliters are needed to produce enough gas to fill a 5.25L container with 0.75 atm at 20.0°C?



- a. (3 Points) Using the balanced reaction above, calculate the partial pressure of N_2 gas in the container after the reaction above has completed. (Assume you put exactly enough hydrazine in the container so that the container's pressure is exactly 0.75 atm, and that the container was empty before the reaction began)

1. (6 Points) Use the ΔH°_f information provided to calculate $\Delta H^\circ_{\text{rxn}}$ for the following:

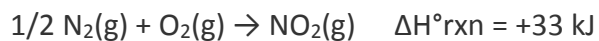
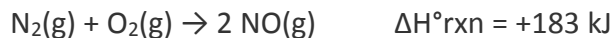


<u>ΔH°_f (kJ/mol)</u>	
$\text{SO}_2\text{Cl}_2(\text{g})$	-364
$\text{H}_2\text{O}(\text{l})$	-286
$\text{HCl}(\text{g})$	-92
$\text{H}_2\text{SO}_4(\text{l})$	-814

2. (6 Points) Use the standard reaction enthalpies given below to determine $\Delta H^\circ_{\text{rxn}}$ for the following reaction:



Given:



3. (8 Points) A piece of iron (mass = 25.0 g) at 398 K is placed in a styrofoam coffee cup containing 25.0 mL of water at 298 K. Assuming that no heat is lost to the cup or the surroundings, what will the final temperature of the water be? The specific heat capacity of iron = 0.449 J/g°C and water = 4.18 J/g°C.