

## INFORMATION, SCRAP, AND COVER PAGE

\*\*\* KEEP YOUR WORK AND YOUR ANSWERS COVERED \*\*\*

This page contains information which may or may not be needed. This page can also be used for scrap paper or for cover paper. THIS PAGE WILL NOT BE COLLECTED. TEAR THIS PAGE OFF THE EXAM.

Temperature conversion  $T(\text{K}) = T(^{\circ}\text{C}) + 273$

Gases  $\text{atm} = 760 \text{ mmHg} = 760 \text{ Torr}$

$$PV = nRT$$

$$R = 0.08206 \frac{\text{L} \cdot \text{atm}}{\text{mol} \cdot \text{K}} = 8,314 \frac{\text{g} \cdot \text{m}^2}{\text{s}^2 \cdot \text{mol} \cdot \text{K}}$$

$$d = \frac{PM}{RT}$$

$$v_{\text{rms}} = \sqrt{\frac{3RT}{M}}$$

Energy units  $\text{Cal} = 4.184 \text{ kJ}$

Heat and Heat Capacity  $q = \Delta T \times \text{mass} \times c$

## Standard Molar Enthalpies of Formation (kJ or kJ/mol)

$\text{C}_3\text{H}_8(g)$	-104.70	$\text{CH}_3\text{OH}(g)$	-200.66	$\text{HClO}(aq)$	-120.9
$\text{CO}_2(g)$	-393.52	$\text{CH}_3\text{OH}(aq)$	-245.93	$\text{ClO}^-(aq)$	-107.1
$\text{CO}_2(aq)$	-413.80	$\text{Cl}^-(aq)$	-167.16	$\text{H}_2\text{O}(l)$	-285.83
$\text{CH}_3\text{OH}(l)$	-238.66	$\text{ClO}_2(g)$	97.00	$\text{H}_2\text{O}(g)$	-241.83

PRINT NAME \_\_\_\_\_

SIGN NAME \_\_\_\_\_

CIRCLE your recitation section in the list below.

- |                   |                   |
|-------------------|-------------------|
| 5: W 12:00 LF 102 | 6: Th 8:00 HM 209 |
| 7: F 10:00 HM 108 | 8: W 2:00 HM 106  |
| 9: Th 9:00 HM 215 | 10: F 1:00 HM 209 |
| 11: M 1:00 HM 101 |                   |

SCORED GRADE: \_\_\_\_\_

All answers should be with the correct significant figures.

Atomic weights are provided in the Periodic Table. These values must be used.

The Periodic Table and Information Page will not be collected. They may be used as scratch paper or as cover paper. Do not turn them in. If you wish to check your answers against the key, you can copy your answers to those pages.

Be certain your answers are clear. If an answer is not clear, it can be considered wrong.

Problems marked with \*\* in the margin are from the assigned homework. These total 23 points.

Place your name in the space provided at the top of each question page. This helps to identify the pages if they are accidentally separated during grading and processing.

Work promptly. Use your time effectively.

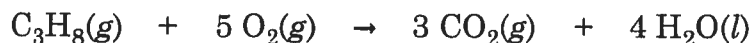
last name: \_\_\_\_\_

**\*\*KEEP YOUR WORK AND ANSWERS COVERED.\*\***

1. (24 pts) Indicate whether each statement is true (T) or false (F). Be certain T or F is clearly indicated.

- \_\_\_\_\_ At the equivalence point in a titration, the titrant is in excess.
- \_\_\_\_\_ At constant temperature, increasing the pressure of a gas increases its concentration.
- \_\_\_\_\_ The total pressure for a mixture of gases is the sum of the pressures of the individual components.
- \_\_\_\_\_ Increasing the volume of a gas sample allows the particles to move faster.
- \_\_\_\_\_ Helium escapes through a balloon skin faster than air due to size.
- \_\_\_\_\_ As the concentration of a gas phase decreases, more deviations from ideal behavior occur.
- \_\_\_\_\_ Vaporization of every liquid is endothermic.
- \_\_\_\_\_ The formation reaction of  $\text{HClO}(aq)$  is endothermic.

2. (6 pts) Consider the combustion of propane.



Circle the enthalpy (in kJ) which is involved in the combustion of 2.500 g  $\text{C}_3\text{H}_8$  at standard conditions.

-46.18	-56.31	-60.67	-76.80	-84.51	-95.83
-106.3	-117.4	-125.8	-136.4	-140.3	-151.7

last name: \_\_\_\_\_

- \*\* 3. (6 pts) At 94 °C, a 23.0 L container holds 12.3 g of CO<sub>2</sub> and 18.1 g of SO<sub>2</sub>. Circle the total pressure (in atm).

0.662	0.671	0.686	0.693	0.702	0.710
0.725	0.736	0.749	0.758	0.762	0.774

4. (6 pts) Consider three separate containers, one holding N<sub>2</sub>(g), one holding CH<sub>4</sub>(g) and one holding PF<sub>3</sub>(g). Each container is at 25 °C and each holds one mole of the given gas in 25.0 L. Answer the following questions. If all gases are the same, write 'same'.

Which gas has the highest pressure? \_\_\_\_\_

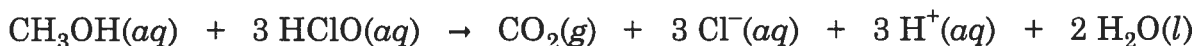
Which gas has the highest density? \_\_\_\_\_

Which gas has the highest kinetic energy? \_\_\_\_\_

- \*\* 5. (7 pts) 250. mL of 0.206 M K<sub>2</sub>C<sub>2</sub>O<sub>4</sub> are added to an aqueous solution of excess CaCl<sub>2</sub>. Circle the number of grams of precipitate which can be formed.

6.08	6.60	6.92	7.28	7.43	7.80
8.15	8.33	8.92	9.31	9.52	9.83

6. (5 pts) The following equation is balanced.



Circle the value for  $\Delta H^\circ$  (in kJ) for this reaction.

-644.2	-683.7	-745.0	-762.0	-858.0	-898.2
-913.6	-959.5	-1,003.2	-1,063.8	-1,130.9	-1,175.1

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7. (5 pts) A container holds 25.0 L hydrogen sulfide gas at 35 °C and 700. Torr. Circle the number of grams of hydrogen sulfide which are contained.

4.52	6.63	9.65	11.6	12.8	17.3
22.5	26.0	27.8	30.1	31.1	34.8

- \*\* 8. (5 pts) Some plastics are made from a gas which is 86% carbon and 14% hydrogen. The empirical formula is CH<sub>2</sub>. The density at STP is 1.88 g/L. What is the molecular formula of this compound? \_\_\_\_\_

- \*\* 9. (5 pts) Write the formation equation for BrNO(*l*).

10. (6 pts) Consider the following reaction.



The reaction is conducted using 3.10 L of Cl<sub>2</sub> at 104 °C and 1.56 atm. Circle the grams of CCl<sub>4</sub> which can be obtained.

2.17	4.21	6.01	8.68	10.3	12.4
14.8	16.8	20.6	22.7	24.0	26.9