

# PRACTICE EXAM

Printed Name: \_\_\_\_\_

Student Number: \_\_\_\_\_

Signature: \_\_\_\_\_

CHEMISTRY 1410

SECOND EXAM

100 POINTS

Each multiple choice question is worth 3 points. Read each question very carefully. The four numerical questions on the exam are worth 10 points each. Be sure to show your work on the numerical problems as partial credit will be based upon the work shown. **NOTE: TO RECEIVE PARTIAL CREDIT FOR ANY NUMERICAL PROBLEM, THE WORK SHOWN MUST BE CONSISTENT WITH THE ANSWER GIVEN!!**

**MULTIPLE CHOICE:** (60 Points) Each of following twenty multiple choice questions is worth 3 points. Circle the correct response.

**QUESTION 1:** Which of the following is NOT an example of a strong acid?

- (a)  $\text{HClO}_4$
- (b)  $\text{HCN}$
- (c)  $\text{H}_2\text{SO}_4$
- (d)  $\text{HI}$
- (e)  $\text{HCl}$

**QUESTION 2:** What is the oxidation number of arsenic in  $\text{AsO}_4^{-3}$  ?

- (a) +3
- (b) +5
- (c) +6
- (d) +4
- (e) None of the above answers are correct.

QUESTION 3: Which of the following is NOT an example of a base?

- (a) LiOH
- (b) NaOH
- (c) Sr(OH)<sub>2</sub>
- (d) Ba(OH)<sub>2</sub>
- (e) HC<sub>2</sub>H<sub>3</sub>O<sub>2</sub>

QUESTION 4: What precipitate(s), if any, would form from the mixing of a copper (II) chloride solution with a mercurous nitrate solution?

- (a) Only HgCl
- (b) Both Hg<sub>2</sub>Cl<sub>2</sub> and Cu(NO<sub>3</sub>)<sub>2</sub>
- (c) Only Cu(NO<sub>3</sub>)<sub>2</sub>
- (d) Only Hg<sub>2</sub>Cl<sub>2</sub>
- (e) Only CuNO<sub>3</sub>

~~QUESTION 5: How many grams of NaOH would be needed to prepare 500 mLs of 6.00 Molar NaOH?~~

- (a) 72 grams
- (b) 40 grams
- (c) 120 grams
- (d) 240 grams
- (e) None of the above answers are correct

QUESTION 6: What would be the products formed in the reaction of  $\text{H}_2\text{SO}_4$  and  $\text{Sr}(\text{OH})_2$  ?

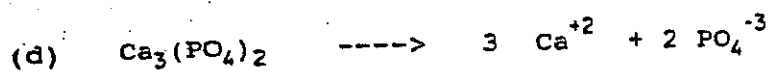
- (a) Only  $\text{SrSO}_4$
- (b) Only  $\text{H}_2\text{O}$
- (c) Both  $\text{H}_2\text{O}$  and  $\text{Sr}_2\text{SO}_4$
- (d) Only  $\text{Sr}_2\text{SO}_4$
- (e) Both  $\text{H}_2\text{O}$  and  $\text{SrSO}_4$

QUESTION 7: What is the oxidation number of Cl in  $\text{ClO}_3^-$  ?

- (a) -1
- (b) +1
- (c) +3
- (d) +5
- (e) The correct answer is not given.

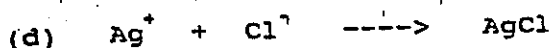
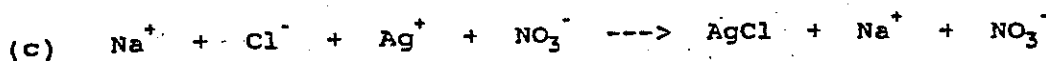
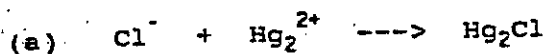
QUESTION 8: Assume that  $\text{Ca}_3(\text{PO}_4)_2$  is completely ionized in water. Which of the following correctly describes the dissociation of calcium phosphate,  $\text{Ca}_3(\text{PO}_4)_2$ , in water.

- (a)  $\text{Ca}_3(\text{PO}_4)_2 \rightarrow 3 \text{Ca} + 2 \text{PO}_4$
- (b)  $\text{Ca}_3(\text{PO}_4)_2 \rightarrow 3 \text{Ca} + 2 \text{P} + 4 \text{O}_2$
- (c)  $\text{Ca}_3(\text{PO}_4)_2 \rightarrow 3 \text{Ca}^{+2} + 2 \text{P}^{+5} + 8 \text{O}^{-2}$



(e) None of the above answers is correct

QUESTION 9: Which of the following is the correct net ionic equation describing the reaction of sodium chloride with mercurous nitrate



(e) There would be no reaction as all species are completely soluble in water.

QUESTION 10: What is the volume of 0.275 Molar HCl required to completely neutralize 25.00 mL of 0.550 Molar NaOH?

(a) 20.00 mL

(b) 25.00 mL

(c) 30.00 mL

(d) 50.00 mL

(e) None of the above reactions are correct.

QUESTION 11: What is the volume of 0.550 Molar HCl required to completely neutralize 25.00 mL of 0.275 Molar  $\text{Ba}(\text{OH})_2$ ?

(a) 12.50 mL

- (b) 25.00 mL
- (c) 50.00 mL
- (d) 35.00 mL
- (e) None of the above reactions are correct.

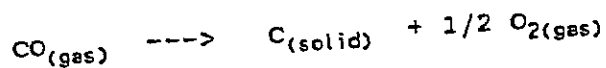
QUESTION 12: Which of the following compounds does not completely ionize in water?

- (a)  $K_2Cr_2O_7$
- (b)  $Sr(OH)_2$
- (c)  $Na_2SO_4$
- (d)  $AgNO_3$
- (e)  $PbSO_4$

QUESTION 13: Given:  $C_{(solid)} + O_{2(gas)} \rightarrow CO_{2(gas)} \quad \Delta H = -393.5 \text{ kJ}$

and  $2 CO_{(gas)} + O_{2(gas)} \rightarrow 2 CO_{2(gas)} \quad \Delta H = -566.0 \text{ kJ}$

Calculate the  $\Delta H$  for the following reaction:



- (a)  $\Delta H = 110.5 \text{ kJ}$
- (b)  $\Delta H = -110.5 \text{ kJ}$
- (c)  $\Delta H = 172.5 \text{ kJ}$

- (D)  $\Delta H = - 172.5 \text{ kJ}$   
(E)  $\Delta H = - 959.5 \text{ kJ}$

QUESTION 14: For which of the following chemicals:

$\text{O}_2(\text{gas})$ ,  $\text{Cl}_2(\text{gas})$ ,  $\text{H}_2\text{O}(\text{gas})$  and  $\text{O}(\text{gas})$

is  $\Delta H_f^\circ$  not equal to zero.

- (A) For only  $\text{H}_2\text{O}(\text{gas})$   
(B) For  $\text{O}_2(\text{gas})$  and  $\text{Cl}_2(\text{gas})$   
(C) For  $\text{O}(\text{gas})$  only  
(D) For  $\text{H}_2\text{O}(\text{gas})$  and  $\text{O}(\text{gas})$   
(E) None of the above answers are correct. The  $\Delta H_f^\circ$  of all four chemicals is equal to zero.

QUESTION 15: Which of the following is a correct statement of the first law of thermodynamics.

- (A) Energy can neither be created nor destroyed.
- 
- (B) That in an ordinary chemical reaction one must conserve mass.  
(C) That in balancing a chemical reaction, the overall charge on the reactants and products side must be equal; otherwise the reaction is not balanced.  
(D) That one can exactly know both the energy and the position of an electron in an atom.  
(E) The mass number of an isotope is numerically equal to the number of protons in the atom plus the number of neutrons.

QUESTION 16: Which of the following is not an example of an intensive property. An intensive property is one whose numerical value does not depend upon the amount of material.

- (A) Density
- (B) Specific heat
- (C) Boiling point temperature
- (D) Heat Capacity
- (E) All of the properties listed above are intensive properties

QUESTION 17: How many kilojoules of heat are needed to raise the temperature of 10.00 kg of liquid water from 24.6 °C to 56.2 °C. The specific heat of liquid water is 4.184 Joules/gram °C.

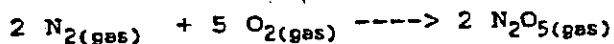
- (A) 0.904 kJ
- (B) 307.5 kJ
- (C) 1322 kJ
- (D) 903.7 kJ
- (E) 737.2 kJ

QUESTION 18: Which of the following statements is true.

- (A)  $q = 0$  whenever heat is transferred from the surroundings to the system; whereas  $w = 0$  whenever work is done by the surroundings on the system.
- (B)  $q < 0$  whenever heat is transferred from the surroundings to the system; whereas  $w > 0$  whenever work is done by the surroundings on the system.

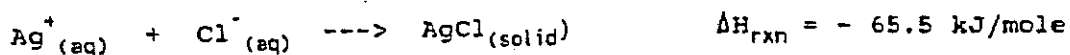
- (C)  $q > 0$  whenever heat is transferred from the surroundings to the system; whereas  $w < 0$  whenever work is done by the surroundings on the system.
- (D)  $q > 0$  whenever heat is transferred from the surroundings to the system; whereas  $w > 0$  whenever work is done by the surroundings on the system.
- (E)  $q < 0$  whenever heat is transferred from the surroundings to the system; whereas  $w < 0$  whenever work is done by the surroundings on the system.

QUESTION 19: In the following oxidation-reduction reaction



- (A) Nitrogen has been reduced as it has gained electrons, whereas oxygen has been oxidized as it has lost electrons.
- (B) Nitrogen has been oxidized as it has gained electrons, whereas oxygen has been reduced as it has lost electrons.
- (C) Nitrogen has been reduced as it has lost electrons, whereas oxygen has been gained as it has lost electrons.
- (D) Nitrogen has been oxidized as it has lost electrons, whereas oxygen has been reduced as it has gained electrons.
- (E) None of the above statements are correct.

QUESTION 20: When solutions containing silver ions and chloride ions are mixed, silver chloride precipitates:



What is the  $\Delta H$  for the formation of only 0.400 moles of AgCl.

- (A) - 65.5 kJ because the enthalpy of a reaction does not depend upon the amount of product produced.

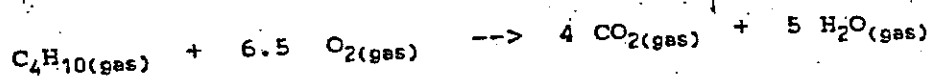


- (B) 13.1 kJ  
(C) - 26.2 kJ  
(D) - 13.1 kJ  
(E) 26.2 kJ

NUMERICAL AND NON-MULTIPLE CHOICE QUESTIONS:

Each numerical and non-multiple choice question is worth 10 points.

QUESTION 21: Calculate the  $\Delta H^\circ$  for the following chemical reaction:



Information given:

$$\text{C}_4\text{H}_{10}(\text{gas}): \Delta H_f^\circ = - 135.8 \text{ kJ/mole}$$

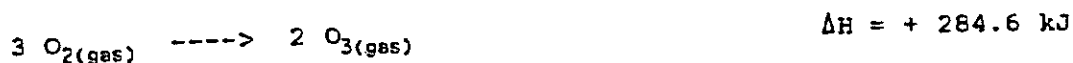
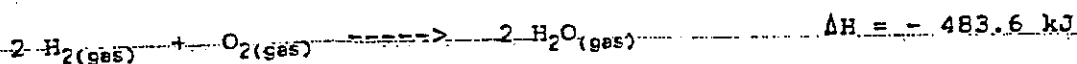
$$\text{CO}_2(\text{gas}): \Delta H_f^\circ = - 393.5 \text{ kJ/mole}$$

$$\text{H}_2\text{O}(\text{gas}): \Delta H_f^\circ = - 241.8 \text{ kJ/mole}$$

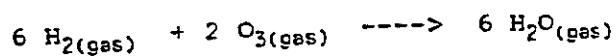
$$\text{H}_2\text{O}(\text{liquid}): \Delta H_f^\circ = - 285.8 \text{ kJ/mole}$$

QUESTION 22: Calculate the Molarity of the sodium and sulfate ions in a solution prepared by dissolving 58.35 grams of  $\text{Na}_2\text{SO}_4$  in 500 mLs of distilled water. Note:  $\text{Na}_2\text{SO}_4$  completely dissociates. You should have two answers, one answer for the molarity of sodium ions, and a second answer for the molarity of sulfate ions. Be sure to label which ion goes with which number.

QUESTION 23: From the following heats of reaction:



Calculate the heat of the reaction



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QUESTION 24: Pure acetic acid is a liquid with a density of 1.049 grams/mL.

What is the molarity of a solution of acetic acid made by dissolving 15.00 mL of liquid acetic acid in enough water to make 750.0 mL of solution? The molecular formula of acetic acid is  $\text{HC}_2\text{H}_3\text{O}_2$ .

