

Semester 2 Final Exam Review Sheet

Your final exam for CP Chemistry will be on _____ June ____, 2009

About your final exam:

- There are 100 questions, and your final exam is worth _____ points.
- You will be given a calculator, scratch paper, a periodic table, and reference material for the test.
- There will be a curve on this test – you will only receive the curve if you turn in this completed review sheet by its due date. (late review sheets = no curve)
- Tuesday, June 2 is the **last** day to ask questions about the final or receive extra help.

About this review sheet:

- Questions must be completed on loose leaf paper and you need to show all work for the FLM and mole problems.
- Due the start of your scheduled final exam.
- Extra Help: Please arrive at the beginning of any lunch period to ask for help on this review sheet.
- You will not be given class time to work on this review sheet. At the end of each period, you usually have time to work on homework – you could use that time to work on this review.

What you need to bring to class on the day of the final

- A number 2 pencil
- Something quiet to do when you finish your test (sorry, no electronics).
- NOT your cell phone (having your cell phone on during the final can be interpreted as academic dishonesty, using your cell phone during the final (even if you are finished) is considered academic dishonestly and will be written up as cheating).

What you need to study

- Emphasis is on Chapters 12-21. However, since chemistry is cumulative, the final is broken down by units from the entire year. Questions are picked for relevance to this semester's topics.
- This review sheet. Please remember that it is easy to change numbers/formulas from the test to the review sheet, so do not memorize these answers – it will not help you (at all).
- Online: frohnclass.com → test review → click pretests to find a copy of this review sheet, released standard exam questions, a review game, a practice test, and previous year's review guides.

Investigation and Experimentation

1. If acid gets on your skin or clothes, wash at once with what?
2. How many decimeters are there in 0.231 meters?
3. A student must measure 10.0 mL of liquid for an experiment. Which is the appropriate tool to measure the liquid?
4. Solve the following problem and round your answer to the appropriate number of significant figures:
 $15.5 \times 0.095 \div 2.31 = \underline{\hspace{2cm}}$
5. Solve the following problem and round your answer to the appropriate number of significant figures:
the sum of 121.20 km and 49.0 km

Atomic and Molecular Structure

9. Which element has the greatest electronegativity value?
10. What elements are known as halogens? Alkali metals? Alkaline earth metals? Noble gases?
11. The element represented by $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$ has an atomic number of _____?
12. The elements on the periodic table are ordered on the _____ what?
13. What are the correct number of valence electrons for the corresponding atoms? a) I b) B c) Ge d) Xe

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- Find the number of protons, neutrons, and electrons for Chlorine-38 and Uranium-238
- Which group has an electron configuration that makes it unlikely to react with other atoms?

Chemical Bonds

- What is the Lewis structure for an ammonium ion, NH_4^+ ?
- Metal and non-metal react to form what kind of bonds?
- What kind of bond occurs when two atoms share electrons?
- What are the seven diatomic elements?
- Which atom will form an ionic bond with an oxygen atom? a) O b) C c) Li d) N

Nomenclature and Writing Formulas

- What are the formulas for sulfuric acid and phosphoric acid?
- What is the correct chemical formula for the ionic compound ammonium sulfate?
- The empirical formula for a common drying agent is P_2O_5 . The compound has a molar mass of 284 g/mol. What is the molecular formula for this compound?
- What is the empirical formula for a compound that is 31.9% potassium, 28.9% chlorine, and 39.2% oxygen?
- In the chemical formula CaCl_2 , the 2 is called a(n) ____.
- What is the correct formula for the compound formed by tin(IV) and the chromate ion?
- The name of SO_3 is ?
- What is the correct formula for the ionic compound aluminum bromide?
- Why is there a Roman numeral next to certain metal ions, such as tin(II) and tin(IV)?

Conservation of Matter and Stoichiometry

- Balance the following?
 $\text{H}_3\text{PO}_4 + \text{MgCO}_3 \rightarrow \text{Mg}_3(\text{PO}_4)_2 + \text{CO}_2 + \text{H}_2\text{O}$
- In the following reaction: $\text{Zn} + 2 \text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$ 105.8 grams of ZnCl_2 was actually formed, although the theoretical yield was 112.4 grams. What is the percent yield?
- What is the molar mass of the compound potassium carbonate?
- Given the following reaction: $4 \text{NH}_3 + 7 \text{O}_2 \rightarrow 4 \text{NO}_2 + 6 \text{H}_2\text{O}$ solve the following problem:
7.60 mol $\text{NH}_3 =$ _____ mol O_2
- Which set of coefficients will balance the following reaction: ___Na + ___ $\text{H}_2\text{O} \rightarrow$ ___NaOH + ___ H_2
- How many moles of oxygen are produced from 5.21 moles of potassium chlorate in this equation? $2\text{KClO}_3(s) \rightarrow 2\text{KCl}(s) + 3\text{O}_2(g)$
- What type of reaction is represented by the following equation: $2 \text{C}_4\text{H}_{10} + 13\text{O}_2 \rightarrow 4 \text{CO}_2 + 5 \text{H}_2\text{O}$
- How many moles of S atoms are in 131.78 g of S?
- In a double replacement reaction, hydrochloric acid and sodium hydroxide react to produce what?
- What type of reaction is represented by the following equation: $2\text{KClO}_3(s) \rightarrow 2\text{KCl}(s) + 3\text{O}_2(g)$
- In the following chemical equation: $2 \text{Cu} + \text{O}_2 \rightarrow 2 \text{CuO}$ what are reactants and products?

Gaseous State of Matter

- If the volume of a gas in a container were reduced to one third the original volume at constant temperature, what would the pressure of the gas in the new volume be?
- Find the volume of a gas in liters if 4.95 mol has a pressure of 0.760 atm at a temperature of 52°C.
- In the following reaction, how many liters of oxygen (at STP) would be needed to completely react with 5.2 g of Al? $4\text{Al} + 3\text{O}_2 \rightarrow 2\text{Al}_2\text{O}_3$
- Unlike in an ideal gas, in a real gas a) all particles have the same kinetic energy b) the particles cannot diffuse c) all particles move in the same direction d) the particles exert attractive forces on each other e) both b and d
- Graham's Law says that the rate of diffusion of a gas is _____ proportional to the square root of its

- _____ mass. This means that lighter gases diffuse faster.
46. The temperature of a substance changes 40 degrees Celsius. How many degrees would its temperature change on the Kelvin scale?
 47. The volume of balloon filled with He occupies a volume 505 mL at room conditions of 24°C and 755 torr. What volume will the balloon have at 98.0°C and 1000.0 torr?
 48. Temperature is a measure of what?
 49. The pressure of a gas is _____ proportional to its Kelvin temperature.
 50. Here are the following conversion factors for pressure: 760 Torr = 760 mm Hg = 29.9 in Hg = 101 kPa = 1 atm
Convert 657 torr to kPa, atm, in of Hg, and mm of Hg
 51. Which of these changes would **not** cause an increase in the pressure of a gaseous system? a) additional amounts of the same gas are added to the container b) another gas is added to the container c) the temperature is increased d) the container is made larger
 52. A mixture contains O₂ at 560 torr pressure, He at 460 torr pressure and Ne at 360 torr pressure. What is the total pressure exerted by the mixture?

Solutions

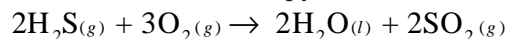
53. Define the following terms a) freezing b) condensing c) melting d) subliming
 54. 150 mL of 70% alcohol by volume contains ____ mL of the alcohol.
 55. How many **particles in solution** are produced by each formula unit of potassium carbonate, K₂SO₄?
- Define the following:
56. unsaturated
 57. colligative property
 58. saturated
 59. molality
 60. Molarity
 61. You are given 120 grams of a 25% sugar solution by mass. This solution contains ____ grams of sugar and ____ grams of water
 62. Use a solubility chart from your text to determine the greatest amount of KBr that may be dissolved in 100g of water at 65°C.
 63. How many moles of NaCl are present in 150. mL of 1.60 M solution?
 64. An equal number of moles of NaCl and CaCl₂ are dissolved in equal volumes of water. Which solution has the higher boiling point? Lower freezing point? Higher vapor pressure?
 65. The molarity of a solution containing 4.20 mol of acetic acid in 150. mL of solution is ?

Thermodynamics

66. For the reaction $\text{CaO(s)} + \text{H}_2\text{O(l)} \rightarrow \text{Ca(OH)}_2\text{(s)}$, $\Delta H = -65.2 \text{ kJ}$. This value means that 65.2 kJ of heat is _____ during the process.
67. What is the amount of heat (in calories and joules) required to raise the temperature of 150.0 g of aluminum by 10°C? (specific heat of aluminum = $0.21 \frac{\text{cal}}{\text{g}^\circ\text{C}}$)
68. A table of heats of formation shows

compound	$\Delta H \left(\frac{\text{kcal}}{\text{mole}} \right)$
O ₂ (g)	-5
H ₂ O (l)	0
SO ₂ (g)	-68
H ₂ S (g)	-71

What is the heat (enthalpy) of reaction for this equation?



69. The specific heat of water is 4.18 J/g°C. To heat 125.2 g of water from 20.0°C to 55.0°C will require
70. The heat of vaporization for water is 540 calories per gram. What is the minimum number of calories needed to change 42.0 grams of water at 100 degrees C to steam at the same temperature and pressure?

71. How many joules are in 145 calories? (1 cal = 4.18 J)
72. Calculate the energy required to produce 5.20 mol Cl₂O₇ on the basis of the following balanced equation.
 $2\text{Cl}_2(\text{g}) + 7\text{O}_2(\text{g}) + 130 \text{ kcal} \rightarrow 2\text{Cl}_2\text{O}_7(\text{g})$
73. What would likely happen if you were to touch the flask in which an endothermic reaction were occurring?
 Exothermic?
74. Calculate the amount of heat needed to convert 73.9 g of ice at 0.0^o C to water at 0.0^o C. The heat of fusion of ice is 335 J/g.

Rate and Equilibria

- 75.
76. Activation energy is the energy to ?
77. $4\text{HCl}(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{H}_2\text{O}(\text{l}) + 2\text{Cl}_2(\text{g}) + 113\text{kJ}$ Which way does the reaction shift with the following actions?
 a) decreasing the oxygen concentration b) increasing the system's pressure c) adding water to the system d) heating the equilibrium mixture
78. How does a catalyst speed up the rate of a given chemical reaction?
79. Find the equilibrium constant for the reaction $2\text{A} + \text{B} \rightleftharpoons 3\text{C} + \text{D}$
 a) $\frac{[3\text{C}][\text{D}]}{[2\text{A}][\text{B}]}$ b) $\frac{[\text{A}]^2[\text{B}]}{[\text{C}]^3[\text{D}]}$ c) $\frac{[2\text{A}][\text{B}]}{[3\text{C}][\text{D}]}$ d) $\frac{[\text{C}]^3[\text{D}]}{[\text{A}]^2[\text{B}]}$
80. What increases the rate of a reaction?
- 81.
82. $\text{NO}_2(\text{g}) + \text{CO}(\text{g}) \leftrightarrow \text{NO}(\text{g}) + \text{CO}_2(\text{g})$
 The reaction shown above occurs inside a closed flask. Which way does the reaction shift if you
 a) raise the total pressure inside the flask
 b) vent some CO₂ gas from the flask
 c) pump CO gas into the closed flask
 d) Increase the NO concentration in the flask

Acid Base

83. What are the acids in the following equilibrium reaction?
 $\text{CN}^- + \text{H}_2\text{O} \leftrightarrow \text{HCN} + \text{OH}^-$
84. What volume of 1.71 M NaOH is required to titrate 25.00 mL of 0.54 M H₂SO₄? (Hint: there are 2 H⁺ in H₂SO₄)
85. Which is a hydrogen ion donator? a) NH₃ b) NaOH c) HCl d) CO₂
86. Which solution is most acidic? a) $[\text{OH}^-] = 2.2 \times 10^{-7} \text{ M}$ b) $[\text{H}^+] = 1 \times 10^{-5} \text{ M}$
 c) $[\text{OH}^-] = 1 \times 10^{-4} \text{ M}$ d) pOH = 10
87. If the hydrogen ion concentration of a solution is $2.4 \times 10^{-12} \text{ M}$, is the solution acidic, alkaline, or neutral?
88. 10.30 mL of 1.203 M NaOH are required to titrate 5.00 mL of a hydrochloric acid solution. The molarity of the acid solution is ?
89. The pH of a 0.0001 M solution of HNO₃ is ?
90. What is the pH of a solution whose $[\text{H}^+]$ is 0.1582 M?
- 91.
92. Acids a) accept anhydrous compounds b) donate hydrogen ions c) accept inert compounds
 d) donate hydroxide ions

Oxidation Reduction

93. Calculate the oxidation number of C in $\text{C}_2\text{O}_4^{2-}$

Define the following:

94. oxidizing agent

95. oxidized

96. reduced

97. half-reaction

98. battery

99. At which electrode does oxidation occur in a voltaic cell?

100. In the following unbalanced reaction, which atom is reduced? Oxidized? Who is the reducing agent? Oxidizing agent?

