Review Topics



Ch 1, sections 1 - 2 <u>Homework</u>: Chapter 3: 35, 37, 47, 49*, 51*, 57*, Ch 3 & Ch 4 59*, 63*, 93, 97* Chapter 4: 25*, 27, 33*, 43*, 49, 57* Review Atomic Structure, Molecular Structure, Stoichiometry, States of Matter and Descriptive Chemistry chapters throughout the semester*

* = 'important' homework questions

<u>Review</u>: What follows is a recap of the most important topics covered in CHM 101. We will use this material throughout CHM 102, so please ensure that you are familiar with the following questions, as well as the Ch3 & 4 HWK questions, before we move on to the Ch 11 material.

<u>Top Tip</u>: Committing to a rolling review of the ACS / Chem. 101 material is a potentially grade altering decision – *this cannot be over stressed* (see below)

1. The Mole



What is a mole (in chemistry terms)?

How is the mole defined?



When is nation nerd, sorry, Mole Day?

<u>Question</u>: How many atoms of oxygen in 1.5 moles of O_2 ?

2. Molar Mass

What is the definition of molar mass (\mathcal{M}) ?

How can you find the molar mass of any chemical using just the periodic table?

<u>Question</u>: What is the molar mass of carbon dioxide (\mathcal{M}_{CO2})?

What is the relationship between molar mass, #grams and # moles of any chemical?

<u>Question</u>: How many moles of carbon dioxide are there in 27.4 grams of CO_2 ?

3. Balancing Chemical Equations



Write a balanced chemical equation for the combustion of ethanol (C_2H_6O). <u>Hint</u>: what are the products of combustion for natural (organic) materials?

4. 'Slides and Ladders' (Limiting Reactant Problems)

What mass of CO_2 (g) is formed from the combustion of 4.05 g ethanol? What volume of CO_2 (g) is formed at STP?

5. Concentration / Volume Relationships for Solutions

What is the relationship between the concentration of a solution, the # moles of solute it contains and the volume it occupies?

<u>Question</u>: How many grams of HNO_3 (aq) are there in 100 mL of a 6M nitric acid solution?

<u>Question</u>: What volume of $12 \text{ M H}_2\text{SO}_4$ (aq) is needed to completely neutralize 25.0 grams of NaOH(s)? <u>Hint</u>: Use a combined slides and ladders approach.



Most of the equations we have met in this handout feature # moles as a variable. Thus, moles can in many ways be considered the chemists' link between macro and micro scale quantities.



<u>Task</u>: Write down as many equations you can featuring the mole. Use this information to construct a 'spider' (flow) chart illustrating how all these conversions 'go through' moles.

"A little review"



The following questions were taken from your 1st practice midterm:

<u>Question 4a</u> (5 points): The products of combustion for *any* carbohydrate in oxygen gas are carbon dioxide and water. Use this information to write a balanced equation for the combustion of sugar ($C_6H_{12}O_6(s)$)

<u>ANS</u>: $C_6H_{12}O_6(s) + 6O_2(g) \rightarrow 6 CO_2(g) + 6 H_2O(g)$

<u>Question 4b</u> (10 points): What mass of carbon dioxide gas would be collected from the complete combustion of 5.00 grams of sugar ($C_6H_{12}O_6(s)$)?

ANS: 7.33 g (3 sf)

<u>Question 4c</u> (10 points): What volume of carbon dioxide gas (at STP) would be collected from the complete combustion of 5.00 grams of sugar $(C_6H_{12}O_6(s))$?

ANS: 3.74 L (3 sf)



A great way to ensure a good grade on your final exam is to practice ACS style questions*. To help you with this, a pair of ACS study guides have been put on reserve in the library. Additionally, if you are going to take the MCAT or PCAT etc., the ACS guide is makes for an excellent resource for these tests' respective chemistry sections. If you wish to purchase a copy (\$12 ea.) log on to: <u>http://www3.uwm.edu/dept/chemexams/guides/details_guides.cfm?ID=162</u> *Ask me to tell you the 'BB' story

Sample Final Exam Questions (CHM 101 syllabus, taken from the 'Final Exam Review' Lecture Notes)

1. In all neutral atoms, there are equal numbers of:

a.	electrons and protons	c.	electrons and neutrons
b.	protons and neutrons	d.	electrons and positrons

2. Which pair of particles has the same number of electrons?

a.	F^{-}, Mg^{2+}	c.	P^{3-}, Al^{3+}
b.	Ne, Ar	d.	Br ⁻ , Se

3. What is the mass percent of oxygen in $Ca(NO_3)_2$?

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a.29.3 %c.58.5 %b.47.1 %d.94.1%
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4. A 24.0 g sample of carbon contains how many atoms:

a.	$6.02 ext{ } ext{x10}^{23}$	c.	3.01×10^{23}
b.	$1.20 \text{ x} 10^{24}$	d.	$2.04 \text{ x} 10^{24}$

5. When 1.187 g of a metallic oxide is reduced with excess hydrogen, 1.054 g of the metal is produced. What is the metallic oxide?

a.
$$Ag_2O$$
 c. K_2O
b. Cu_2O d. Tl_2O

6. A single molecule of a certain compound has a mass of 3.4×10^{-22} g. Which value comes closest to the mass of a mole of this compound?

7. The electronic configuration for the Ca atom is:

a.	$1s^22s^22p^63s^23p^64s^23d^2$	c.	$1s^22s^22p^63s^23p^64s^2$
b.	$1s^2 2s^2 2p^6 3s^2$	d.	$1s^{2}2s^{2}2p^{6}3s^{2}3p^{6}4s^{2}3d^{10}4p^{2}$

8. Two moles of any gas will occupy what volume at STP?

a.	22.4 L	c.	4.48 L
b.	11.2 L	d.	44.8 L

Answers:

1.	a.	5.	b.
2.	a.	6.	d.
3.	c.	7.	c.
4.	b.	8.	d.