

Chemistry Final Exam Review

Name: _____

Date: _____

2011-2012

Overview: _____

This final exam review covers the basics from a whole year of basic chemistry studies. It is not a comprehensive review – meaning that there may be questions on the final test that are worded in a different way or may challenge you to relate concepts with each other.

Memory Verses that may appear on the Test:

Psalm 92:5

“O LORD, how great are thy works! and thy thoughts are very deep.”

II Peter 3:10

“But the day of the Lord will come as a thief in the night; in the which the heavens shall pass away with a great noise, and the elements shall melt with fervent heat, the earth also and the works that are therein shall be burned up.”

Hebrews 1:10

“And, Thou, Lord, in the beginning hast laid the foundation of the earth; and the heavens are the works of thine hands:”

I recommend studying very diligently for this exam as it is worth 200 test grade points. You may choose to study together, creating flash cards, mnemonic devices, and other helpful resources. I will be happy to answer any questions brought to my attention during these days of review. Enjoy!

Over-arching Essential Questions:

1. *Why is it important to study chemistry?*
2. *How has the adoption of the S.I. system of units simplified communication between scientists?*
3. *How does the presence of water on Earth, in all three states of matter, create conditions ripe for many types of chemical changes?*
4. *Why are accurate measurements important in science?*
5. *What major advances in chemistry have come about in the last century?*
6. *How has the science of spectroscopy revolutionized science in the last 200 years?*
7. *Can humans create foundational chemical principles or merely discover them?*
8. *What is the general trend in entropy exhibited by all forms of matter, according to the 2nd law of Thermodynamics?*
9. *Why should consumers care about the types of chemicals included in their foods, pharmaceuticals, personal care products, etc?*
10. *How are modern chemistry and ancient alchemy different? The same?*

Chapter 1:

1. Matter is anything that has _____ and takes up _____.
2. What scientist is considered the “Father of Modern Chemistry”? (pg. 21)
3. A proposed explanation for an observed phenomenon is a... (pg. 22)
4. A well tested explanation for a broad set of observations is a... (pg. 23)

Chapter 2:

5. Define mass. (pg. 39)

The S.I. unit for mass is... Temperature... Length... Amount of substance...?

6. Be able to name the 3 basic states of matter in order of increasing entropy (pg. 41-42):
7. *Be able to distinguish between a homogenous and heterogeneous mixture.*
8. What occurs when a *chemical change* takes place? (pg. 53)
9. A solid that settles out of an aqueous solution is called a... (pg. 54)
10. What is stated by the Law of Conservation of Mass? (pg. 55)
11. What happens to matter, in theory, at 0K ?

Chapter 3:

12. *Be able to convert numbers to/from scientific notation.* (pg. 63-71)
13. Know the **S.I. Units** (and applicable prefixes) for the following:
length, mass, temperature, time, amount of substance, volume, energy
(pg. 73-75, 79)
14. Be able to convert temperatures C – F – K
15. Density is expressed as the amount of _____ in a given _____
The S.I. units used to express density are: _____/_____
(pg. 89-92)

Chapter 4:

16. Cite the historical contributions to chemistry of each of the following:
NOTE: Some of these scientists are NOT in Chapter 4.

Democritus:

Dalton:

Lavoisier:

J.J. Thompson:

Millikan:

Rutherford:

Chadwick:

Bohr:

Avogadro:

Woehler:

Kekule:

17. What are the basic three atomic particles?

18. Explain this statement: *Atoms are mostly empty space.* (pg. 107-108)

19. *Be able to find (using the Periodic Table):*

atomic mass, atomic #, and quantity of each of the 3 basic atomic particles of any given isotope of an element. (pg. 110-113)

20. How are *isotopes* of an element different from each other? (pg. 112)

Chapter 5:

21. A region in space where there is a high likelihood of finding an electron is called an... (pg. 131)

22. The amount of energy required to raise an electron from an atomic orbital energy level to the next highest energy level is the discrete quantity known as a:

23. The modern description of atoms is given by this model... (pg. 130)

24. What was Niels Bohr's atomic model known as?

25. *Be able to complete an electron configuration for any element.* (pg. 133)

26. Light "particles" (given off when an atom absorbs and releases energy) are called... (pg. 144)

27. Chemistry is focused on the study of this atomic particle...

Chapter 6:

28. You will need to be able to obtain pertinent information for this test from the Periodic Table of Elements. You will be allowed to use your laminated, colorful Periodic Table (only). (also ref. pg. 162-163)
29. Who is considered the “Father of the Periodic Table of Elements”? (pg. 156)
30. What are the 3 basic classes of elements?
31. What is unique about the Noble Gases? (pg. 164, 188)
32. What is the **octet rule**?

Chapter 7:

33. Electrons in the highest occupied orbital are called... (pg. 187)
34. Be able to identify cations and anions and what elements are likely to form each type of ion. (pg. 188-192)
35. Complete Lewis Dot Diagrams...
36. Distinguish between ionic, metallic and covalent bonds. (pg. 194-206, 213-214)

Chapter 8:

37. Be able to identify given chemical formulae by what kind of bond is formed (ie. ionic vs. covalent)
38. Recognize structural, molecular, ball-and-stick ways of representing molecules and compounds.
39. Be able to give an example of a molecular formula. (pg. 215)
40. Give examples of molecules containing *single, double, and triple covalent bonds* (pg. 216-220):
41. What is meant by *bond disassociation*? (pg. 226-227)
42. Why would a molecule be polar? (pg. 239-240) How does the polar characteristic of water enable it to be a “universal” solvent?
43. What can VSEPR theory help to predict? (pg. 232-233)

Chapter 9:

44. Be able to name monatomic and polyatomic ions (see Polyatomic Ions handout and pg. 253-254).

Polyatomic ions:

1+ ion:	Positive ions		
	Ammonium	NH_4^{1+}	Hydronium
Negative ions			
1- ions		2- ions	
Acetate	$\text{C}_2\text{H}_3\text{O}_2^{1-}$	Carbonate	CO_3^{2-}
Chlorate	ClO_3^{1-}	Chromate	CrO_4^{2-}
Chlorite	ClO_2^{1-}	Dichromate	$\text{Cr}_2\text{O}_7^{2-}$
Cyanide	CN^{1-}	Hydrogen	HPO_4^{2-}
Dihydrogen Phosphate	$\text{H}_2\text{PO}_4^{1-}$	Phosphate	PO_4^{3-}
Hydrogen Carbonate	HCO_3^{1-}	Peroxide	O_2^{2-}
Hydrogen Sulfate	HSO_4^{1-}	Sulfate	SO_4^{2-}
Hydroxide	OH^{1-}	Sulfite	SO_3^{2-}
Hypochlorite	ClO^{1-}	Thiosulfate	$\text{S}_2\text{O}_3^{2-}$
Nitrate	NO_3^{1-}		
Nitrite	NO_2^{1-}		
Perchlorate	ClO_4^{1-}		
Permanganate	MnO_4^{1-}		
Thiocyanate	SCN^{1-}		

Image: <http://www.behsscience.com/apchem>

45. How could elements be bonded covalently but function as an ion?
(pg. 257)

46. Know when and when not to use latin prefixes to indicate quantities in chemical formulae (for instance **carbon dioxide = CO_2** , but **K_2CrO_4 is simply potassium chromate.**)

47. Be able to name and write formulae for both ionic and covalent compounds. **Complete pg. 281 #57 as example.** (sections 9.2-9.3)

Chapter 10:

48. Write Avogadro's number: _____

Explain how it relates to the S.I. unit known as the *mole*. (pg. 290)

49. How many atoms are in 1.75 mol CHCl_3 ? (pg. 295-296)

50. How can you find the mass of 1 mol of any single element? Any compound? (pg. 297-299)

51. What is the ideal volume occupied by any gas at STP?

What are the conditions represented by STP? (pg. 300-301)

_____° and _____ kPa

52. Be able to determine % composition.

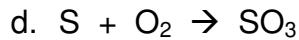
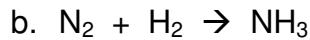
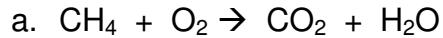
53. *Know how are empirical and molecular formulae different.* (pg. 309-312)

Chapter 11:

54. In the equation $\text{Fe} + \text{O}_2 \rightarrow \text{Fe}_2\text{O}_3$, can you identify the *reactant(s)* and the *product(s)*? (pg. 322)

55. *Be able to write a word equation from a chemical equation and vice versa.* (Use #52 to write examples. pg. 323)

56. Be able to balance equations like these ones: (also see Pg. 347 #52)



57. *Be able to name and describe 4 of the basic types of chemical reaction types.* (pg. 338-339)

58. *Know what gas is necessary for a combustion reaction.* (pg. 340)

Chapter 12:

59. *Be able to use coefficients to skillfully balance equations.*

Chapter 14:

60. Understand why gases are easily compressed.
61. What are the 3 basic factors affecting gas pressure?
62. Know the distinction between **diffusion** and **effusion**.
63. The **ideal gas constant**: $R = 8.31 \text{ (L·kPa) / (K·mol)}$
64. Be able to use the gas law equations listed below to show your knowledge of the properties of gases.

Key Gas Law Equations

- Boyle's law:

$$P_1 \times V_1 = P_2 \times V_2$$

- Charles's law:

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

- Gay-Lussac's law:

$$\frac{P_1}{T_1} = \frac{P_2}{T_2}$$

- Combined gas law:

$$\frac{P_1 \times V_1}{T_1} = \frac{P_2 \times V_2}{T_2}$$

- Ideal gas law:

$$P \times V = n \times R \times T \text{ or } PV = nRT$$

- Dalton's law:

$$P_{\text{total}} = P_1 + P_2 + P_3 + \dots$$

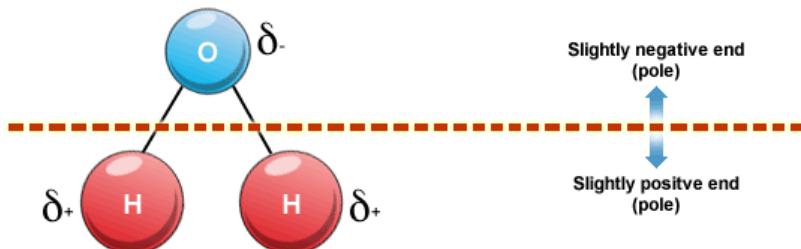
- Graham's law:

The rate of effusion of a gas is inversely proportional to the square root of its molar mass; this relationship is also true for the diffusion of gases.

$$\frac{\text{Rate}_A}{\text{Rate}_B} = \sqrt{\frac{\text{molar mass}_B}{\text{molar mass}_A}}$$

Chapter 15:

1. What property of **water** enables it to be a widely useful *solvent*?



Chapter 19:

65. Identify a substance as *acidic* or *basic* based on its pH number. (pg. 598)

66. What is the **pH value of pure water?** (pg. 598)

67. Reactions involving an acid combining with a base in aqueous solution are called... (pg. 612)

68. What is hydronium?

69. Arrhenius vs. Bronsted-Lowry descriptions of acids

Chapter 22-24:

70. Be able to name organic molecules by looking at their structures!

71. What is **spectroscopy** useful for?

72. What is an **electrolyte**?

Concentration of Hydrogen ions compared to distilled water	Examples
10,000,000	pH 0 Battery acid
1,000,000	pH 1 Hydrochloric acid
100,000	pH 2 Lemon juice, vinegar
10,000	pH 3 Grapefruit, soft drink
1,000	pH 4 Tomato juice, acid rain
100	pH 5 Black coffee
10	pH 6 Urine, saliva
1	pH 7 "Pure" water
1/10	pH 8 Sea water
1/100	pH 9 Baking soda,
1/1,000	pH 10 Great Salt Lake
1/10,000	pH 11 Ammonia solution
1/100,000	pH 12 Soapy water
1/1,000,000	pH 13 Bleach
1/10,000,000	pH 14 Liquid drain cleaner