

## Chemistry Level 2: Midterm I Chapters 1-5

### Teacher's Answers

1. Name the three basic particles in an atom; indicate its electric charge and what charge does it have:

<u>Protons,</u>	<u>+</u>	<u>positive</u>
<u>Neutrons,</u>	<u>none,</u>	<u>neutral</u>
<u>Electrons,</u>	<u>-</u>	<u>negative</u>

2. In its nucleus, an element has 126 protons, how many electrons does it have?

126 electrons

3. What is the atomic mass (in amu) of an atom that has 35 protons and 42 neutrons in its nucleus?

Add 35 protons to 42 neutrons for an atomic mass of 77 amu

4. In your own words explain the significance of the *Periodic Table of Elements*:

Answers may vary, but should include: the Periodic Table is a way to organize the known elements, each element is listed by atomic number, which is its number of protons, elements increase from left to right, Elements with similar chemical properties are lined up in the same column.

5. List the atomic numbers of the noble gases:

2, 10, 18, 36, 54, 86

List the atomic numbers of the alkali metals:

3, 11, 19, 37, 55, 87

List the atomic numbers of the halogens:

9, 17, 35, 53,

6. How many moles of atoms are in 12.01 grams of carbon?

1 mole

7. How many grams would 5 moles of carbon weigh?

Multiply 5 moles x 12.01 grams of carbon = 60.05 grams

8. Describe what an orbital is:

An orbital is the electron cloud that surrounds the core of an atom

9. Name and draw the three 2p orbitals:

See page Chapter Two: Chemical Bonding, page 29

2px, \_\_\_\_\_

2py, \_\_\_\_\_

2pz

10. What are the names of the two rules for filling electron

orbitals? The Pauli Principle and the Aufbau Principle

11. Explain what is special about the orbitals for the noble gases, and how are the orbitals for the alkali metals and halogens different from the noble gases?

Answers will vary: The noble gases have all their subshells filled, they don't share their electrons. Alkali metals have same electron configuration as the nearest noble gas, except for one extra electron in an s orbital. Each halogen atom is just one electron short of the nearest noble gas.

12. What is the difference between core and valence electrons?

Core electrons are the electrons that occupy the same orbitals as the nearest smaller noble gas atom. All other electrons are valence electrons. Valence have the capacity to form strong bonds. They are the "outer" electrons, placed in the atomic orbitals last.

13. The element Carbon had an electron configuration of  $1s^2 2s^2 2p^2$ , identify the core electrons and valence electrons.  
*1s<sup>2</sup> are the core electrons from Helium. The 2s<sup>2</sup> and 2p<sup>2</sup> are the valence electrons, which makes 4 valence electrons.*
14. Explain what an ion is.  
*When an atom(or molecule) gains or loses an electron, it is called an ion.*
15. How many electrons does lithium lose and fluorine gain to form the ionic compound, LiF?  
*Lithium loses 1 electron and fluorine gains 1 electron when it forms the ionic compound, LiF.*
16. Explain how a covalent bond can form.  
*Covalent bonds are formed between atoms that share their electrons.*
17. Name the molecular bonding orbital for molecular hydrogen.  
*Sigma bonding orbital and is denoted by the sigma symbol, see pg. 51 of Chapter 2, Chemical Bonding*
18. What kind of molecular orbital is formed by two side-by-side  $p$  orbitals?  
*Two side-by-side  $p$  orbitals form a pi bonding orbital,*
19. List the three types of hybrid orbitals:  
*sp hybrid, sp<sup>2</sup> hybrid, sp<sup>3</sup> hybrid*

20. Discuss what the basis for a chemical reaction is:

A chemical reaction occurs whenever bonds between atoms are created or destroyed.

21. Balance the following equations:

- a. Combination reaction  $\underline{2} \text{Na} + \text{Cl}_2 \text{ ---} \rightarrow 2\text{NaCl}$
- b. Decomposition reaction  $4\text{H}_2\text{O} \text{ ----} \rightarrow \underline{2} \text{O}_2 + \underline{4} \text{H}_2$
- c. Displacement reaction  $4\text{Na} + 4\text{H}_2\text{O} \text{ ----} \rightarrow \underline{4} \text{NaOH} + \underline{2} \text{H}_2$
- d. Exchange reaction  $2\text{HCl} + 2\text{NaOH} \text{ --} \rightarrow \underline{2} \text{NaCl} + \underline{2} \text{H}_2\text{O}$

22. Give the meaning of monoprotic and name one common monoprotic acid:

Mono comes from the Greek word that means "one", and protic refers to proton, so monoprotic acid releases one proton. A common monoprotic acid is: acetic acid(vinegar).

23. Define an Arrhenius acid and base.

An Arrhenius acid releases a hydrogen ion and an Arrhenius base releases a hydroxide ion.

24. Calculate the concentration molarity(M)

a. 2 moles of HCl in 5 liters.

$$\underline{2 \text{ moles divided by 5 liters} = 4 \text{ M}}$$

b. 4 moles of NaOH in 2 liters.

$$\underline{4 \text{ moles divided by 2 liters} = 2 \text{ M}}$$

c. 0.5 moles of HCl in 1 liter.

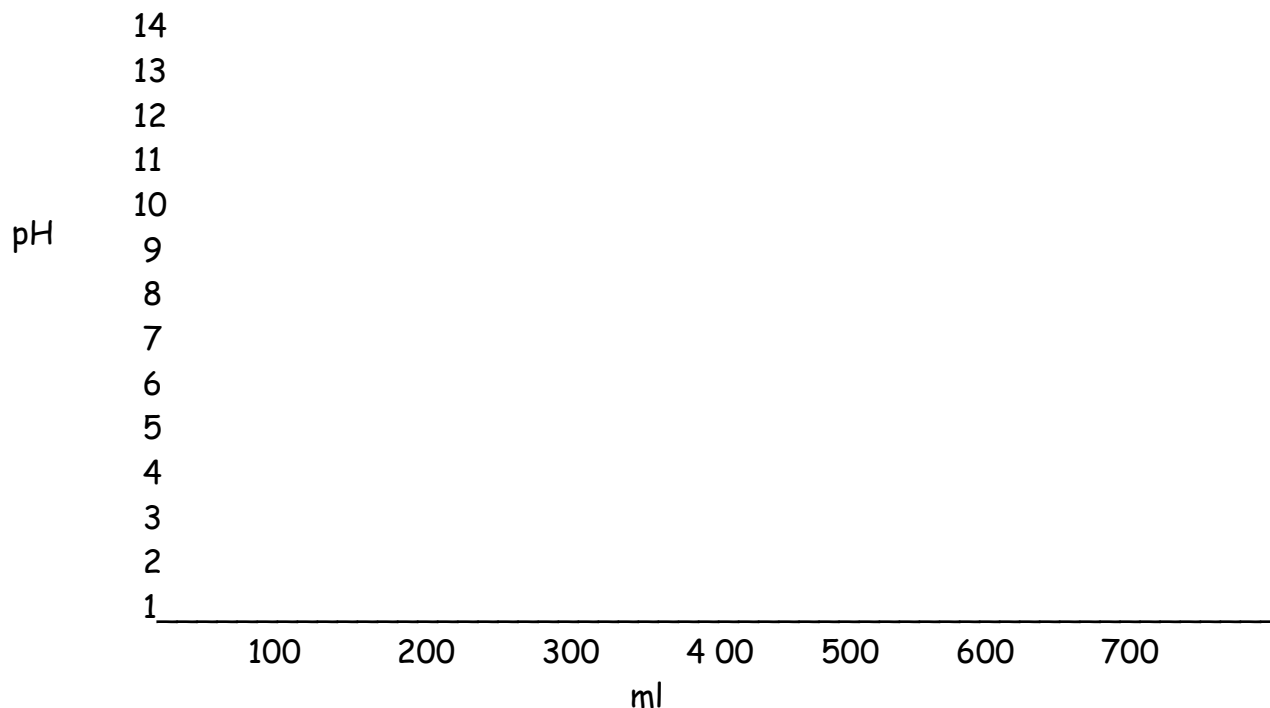
$$\underline{.5 \text{ moles divided by 1 liter} = .5 \text{ M}}$$

d. 72 grams of HCl in 1 liter.

$$\underline{72 \text{ grams of HCl} = 2 \text{ moles HCl.}}$$

$$\underline{2 \text{ moles divided by 1 liter} = 2 \text{ M}}$$

25. Draw a titration curve for NaOH(a strong base) titrated with HCl (a strong acid). Add labels-should include pH on the side and ml along the bottom (see Teacher' Manual, page 30, of the Laboratory Notebook is incorrect, please see Errata sheet on Homeschool blogsite Level 2 Chemistry, pages 28-30)



26. Write several paragraphs to describe how can you apply what you have learned in Chemistry to your everyday life: (Optional)

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