

Exam II Test Review: Chemistry 1302

Chapter Four Review:

Important Scientists:

Scientist #1: Who Am I?

atomic
theory

- X I lived in the early 1900s and proposed a theory that matter is made of tiny, indestructable particles.
 - X I believed that atoms of the same element have the same mass and properties.
 - ✓ I said atoms combine in simple, whole-number ratios to form compounds.
 - 4. My theory helped revive ancient ideas from democritus.
- My name is: John Dalton

Scientist #2: Who Am I?

- 1. I was a Russian professor who loved organizing things.
 - 2. I noticed that when elements are arranged by increasing mass, certain properties repeat.
 - 3. I created a table that predicted the existence of elements not yet discovered.
 - 4. My law summarized observations but didn't explain the reason behind them.
- My name is: Dmitri Mendeleev

Scientist #3: Who Am I?

- 1. I discovered a particle smaller than the atom.
 - 2. I found that this particle had a negative charge and was present in many substances.
 - 3. I proposed the "plum pudding" model of the atom.
 - 4. My discovery showed that atoms are not indivisible after all.
- My name is: J.J. Thomson

Scientist #4: Who Am I?

- 1. I conducted an experiment using gold foil and alpha particles.
- 2. I expected particles to pass through, but some bounced back.
- 3. I concluded that atoms have a dense, positively charged center.

4. I proposed the nuclear model of the atom.

My name is: Ernest Rutherford

Subatomic Particles

● Particle #1: Who Am I?

1. I have a negative charge.

2. I am located in the outer cloud of the atom.

3. My mass is almost negligible compared to the other particles.

4. When I am gained or lost, I form an ion.

My name is: electron

● Particle #2: Who Am I?

1. I have a positive charge.

2. I am located in the nucleus of the atom.

3. My mass is about 1 amu.

4. The number of me in the nucleus determines the atomic number of the element.

My name is: proton

○ Particle #3: Who Am I?

1. I have no charge—I am neutral.

2. I am located in the nucleus of the atom.

3. My mass is about 1 amu, similar to another particle.

4. When my number changes, I form an isotope.

My name is: neutron

Periodic Families

Families share similar properties.

Group 1A: alkali metals

Group 2A: alkaline earth metals

Group 7A: halogens

Group 8A: noble gases

Group 3-12: transition metals

Left of PT: metals

Stairsteps of PT: metalloids

Right of PT: nonmetals

Elements

mass
atomic # \times charge

Symbol	Atomic Number	Mass Number	# of Protons	# of Electrons	# of Neutrons	Charge
$^{24}_{12}\text{Mg}$	12	24	12	12	12	Neutral
$^{35}_{17}\text{Cl}^{-1}$	17	35	17	18	18	-1
$^{40}_{20}\text{Ca}^{+2}$	20	40	20	18	20	+2
Phosphorus $^{31}_{15}\text{P}$	15	31	15	15	16	Neutral
$^{11}_6\text{C}^{+2}$	6	11	6	4	5	+2
$^{14}_7\text{N}^{-1}$	7	14	7	8	7	-1
Argon $^{40}_{18}\text{Ar}^{-2}$	18	40	18	20	22	Neutral -2

Gallium has two naturally occurring isotopes: Ga-69 with mass 68.9256 amu and a natural abundance of 60.11%, and Ga-71 with mass 70.9247 amu and a natural abundance of 39.89%. Calculate the atomic mass of gallium

$$\begin{array}{rcl}
 \text{Ga-69} & 68.9256 \times 60.11\% & = 41.43 \text{ amu} \\
 \text{Ga-71} & 70.9247 \times 39.89\% & = 28.29 \text{ amu} \\
 & & \hline
 & & 69.72 \text{ amu}
 \end{array}$$

Magnesium has three naturally occurring isotopes with masses of 23.99, 24.99 and 25.98 amu and natural abundances of 78.99%, 10.00%, and 11.01% respectively. Calculate the atomic mass of magnesium.

$$\begin{array}{rcl}
 23.99 \times 78.99\% & = & 18.95 \\
 24.99 \times 10.00\% & = & 2.499 \\
 25.98 \times 11.01\% & = & 2.860 \\
 & & \hline
 & & 24.30999
 \end{array}$$

24.31 amu

Chapter 5 Review:

1. Make a T-Chart comparing molecular and ionic compounds and how to name them:

molecular/covalent	ionic
- 2 non metals	- metal + nonmetal
- (-) + (-)	- (+) + (-)
- anions	- cations & anions
- ex) $\text{CO}_2, \text{H}_2\text{O}$	- ex) NaCl
- prefixes, -ide	- -ide



2. Make a T-Chart comparing how to name acids. $\Rightarrow \text{H}$

Elements (Binary Acids) H_2S	Polyatomic ions ending in -ate (Oxyacid)	Polyatomic ions ending in -ite (Oxyacid)
hydro___ic acid	___-ic acid Nitrate \Rightarrow Nitric acid	___-ous acid Nitrite \Rightarrow Nitrous acid

3. What is a polyatomic ion?

poly = many, multiple atoms



4. How many atoms are in $\text{Al}_2(\text{SO}_4)_3$?

$\text{Al} = 2$

$\text{S} = 2$

$\text{O} = 8$

5. Name each substance as a molecular compound, ionic compound, or polyatomic ion and name each accordingly.

Calcium Chloride - ionic



$+2 = -1(2)$
Dinitrogen Trisulfide molecular



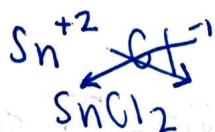
P_2O_3 - molecular

Diphosphorus Trioxide

KBr - ionic

Potassium Bromide

Tin (II) Chloride

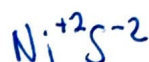


polyatomic

sulfate

sulfite

NiS - ionic



Nickel (II) sulfide

$\text{B}_2(\text{CrO}_4)_3$ - ionic

Boron chromate

6. Name the following acids:



Nitrous Acid



Hydrofluoric Acid

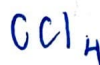


Carbonic acid



Hydrosulfuric acid

7. Calculate the formula mass of carbon tetrachloride.



$$\text{C: } 12.011 \times 1 = 12.011$$

$$\text{Cl: } 35.45 \times 4 = 141.8$$

$$12.011 + 141.8 = 153.811$$

$$\frac{153.8 \text{ amu}}{153.811}$$

8. Calculate the formula mass of dinitrogen monoxide. N_2O

$$N: 14.007 * 2 = 28.014$$

$$O: 15.999 * 1 = 15.999$$

$$\underline{44.013 \text{ amu}}$$

Chapter 6 Review:

1. What is Avogadro's Number?

$$6.022 \times 10^{23}$$

2. How do you convert between grams and moles?

periodic table

3. Calculate the mass percent composition of Nitrogen in Nitrogen oxide.

$$\frac{\text{part}}{\text{whole}} * 100$$

$$N = 14.007 * 2 = 28.014$$

$$O = 15.999 * 3 = 47.997$$

$$\underline{76.011 \text{ whole}}$$

$$\frac{28.014}{76.011} =$$

$$\boxed{36.85\%} N_2O_3$$

4. Determine the mass of hydrogen in 3.75 g of glucose, $C_6H_{12}O_6$.

$$3.75 \text{ g } C_6H_{12}O_6 \mid 1 \text{ mol } C_6H_{12}O_6$$

$$\mid 191.243 \text{ g } C_6H_{12}O_6$$

$$\frac{1.00794 \text{ g H}}{1 \text{ molecule H}}$$

$$= \frac{12.74 \times 10^{23} \text{ g H}}{12.74 \times 10^{23}}$$

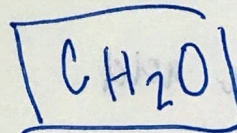
$$0.2517 \text{ g H}$$

5. A compound contains only carbon, hydrogen, and oxygen. When a sample of the compound is analyzed, it produces 40.00% of carbon, 6.71% of hydrogen, and 53.29% oxygen by mass. What is the empirical formula of this compound?

$$\frac{40.00 \text{ g C} \mid 1 \text{ mol C}}{12.011 \text{ g C}} = \frac{3.33}{3.33} = 1$$

$$\frac{6.71 \text{ g H} \mid 1 \text{ mol H}}{1.00794 \text{ g H}} = \frac{6.66}{3.33} = 2$$

$$\frac{53.29 \text{ g O} \mid 1 \text{ mol O}}{15.999 \text{ g O}} = \frac{3.33}{3.33} = 1$$



$$n = \frac{\text{molar mass}}{\text{empirical mass}} \Rightarrow \text{given}$$

6. What is the molecular formula the previous compound? molar mass 180 g/mol

$$C = 12.011 \times 1 = 12.011$$

$$H = 1.00794 \times 2 = 2.01588$$

$$O = 15.999 \times 1 = 15.999$$

$$\frac{180 \text{ g/mol}}{30.026 \text{ g}} = 6$$



Use the following space for extra practice:

0.450 g

How many atoms of O are in MgCO_3

$$\frac{0.450 \text{ g MgCO}_3}{84.286 \text{ g MgCO}_3} \times \frac{1 \text{ mol MgCO}_3}{1 \text{ mol MgCO}_3} \times \frac{6.022 \times 10^{23} \text{ atoms MgCO}_3}{1 \text{ mol MgCO}_3}$$

$$\frac{3 \text{ atoms O}}{1 \text{ FU MgCO}_3} = 9.45 \times 10^{21} \text{ atoms O}$$