

# Cornell Notes

P. 1

Name Ashley Martinez

Date 9/29/11

Topic Chapter 3 Notes / Atom

Class/Subject Chemistry / Fraguero

8 am

Matter

Matter has energy.

Energy

What makes matter?

What is an atom?

anything that has shape and volume.

3 physical states: solid, liquid, gas and plasma

Energy

- potential
- Chemical potential energy stored in chemical bonds that hold matter together
- kinetic
- energy of motion

units of measurement for energy: cal, joule

$1 \text{ cal} = (1\text{g})(1^\circ\text{C})$

$1 \text{ cal} = 4.184\text{J}$

Atoms  $\rightarrow$  protons, neutrons, electrons

450 BC

- Democritus proposed that the "stuff" that makes up the world around us is composed of tiny, indivisible particles. - Atoms

\*Memorize Dalton's Atomic theory of matter.  
 Quiz on Monday.

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\* Quiz Monday on: - Dalton's Atomic theory of Matter  
 - Def. for Atomic # and Neutral Atom  
 - location + charge for protons, neutrons and electrons.

# Cornell Notes

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Atom :

Remaining  
Questions

Further  
Experiments

• Smallest particle of an element

• Chemical identity.

What holds atoms together?

Late 1700's

- Antoine Lavoisier's Law of Conservation of Matter

1799

- Joseph Louis Proust

- The law of constant composition

• A given compound always contains the same elements in the same proportions by mass.

1803 John Dalton and the Atomic Theory of Matter

• Each element is composed of extremely small particles called atoms

• All atoms of a given element are identical but they differ from those of any other element



Dalton's Atomic  
theory of  
Matter

8:15 am

Memorize

# Cornell Notes

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Class/  
Subject

Chem / FragoSD

Memorize {  
Dalton's atomic  
Theory of matter  
continued

Atoms + Visibility

Structure of  
the atom

\* Memorize {

- Atoms are neither created nor destroyed in any chemical reaction.
- a given compound has always the same composition.

\* Even the largest atom is too small to be seen with a regular microscope.

Scanning tunneling microscope:  
- Provides pictures of atoms

Atoms are made up of 3 subatomic particles.

• Protons

- Found inside the nucleus
- Positive charge.

• Neutrons

- Found inside the nucleus
- Neutral (no charge)

\* Need to know location + charge for quiz on Monday.

# Cornell Notes

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\* Memorize

Atomic mass  
Unit (amu)

Atomic Numbers

\* Memorize  
for Quiz  
on Monday

## Electrons

- Found outside the nucleus in electron orbitals.
- Negatively charged.

Used to express the mass of atoms.

- Mass of protons + neutrons is 1 amu
- Mass of electrons is 0 amu

An atom's ID comes from the number of protons in its nucleus.

Atomic # : The number of protons in the nucleus of an atom. (# of protons)

Neutral atom : has the same # of protons and electrons.

\* Need to Memorize atomic # def. + Neutral atom def. for quiz on Monday.

# Cornell Notes

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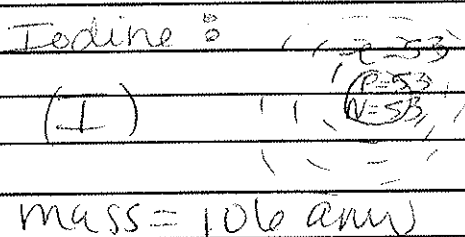
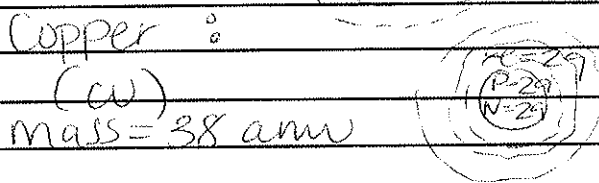
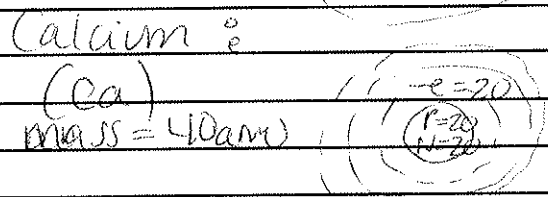
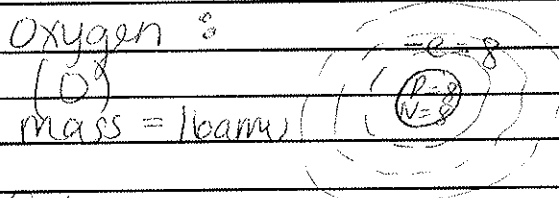
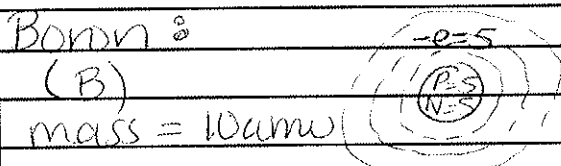
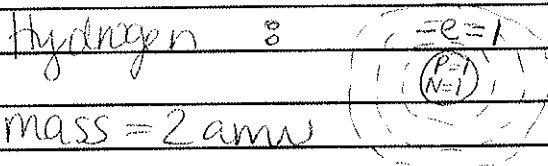
Topic

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Subject

Draw the atoms for the following elements including the location of protons, neutrons and electrons. Assume all atoms are electrically neutral.

$$\text{mass} = p + n$$

Homework →

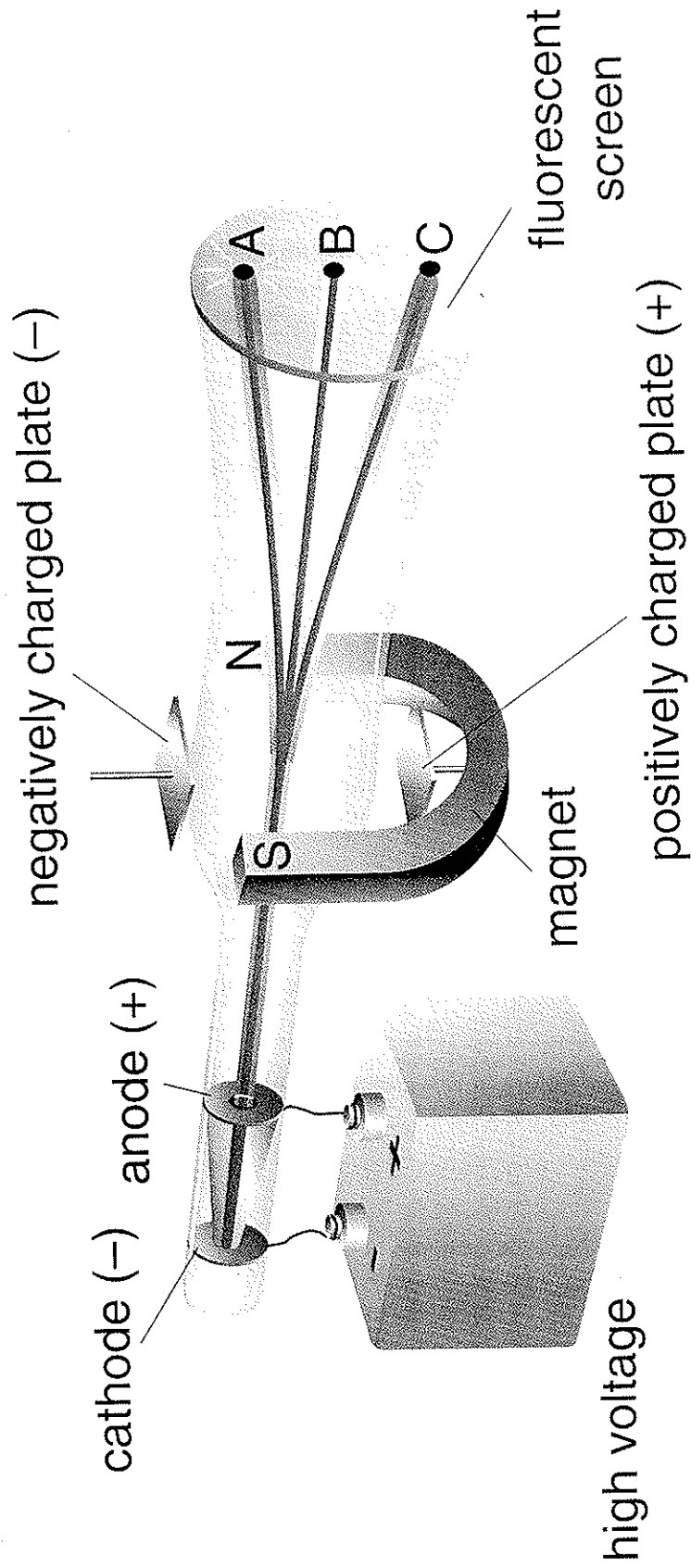


3.3 Practice Probs # 1-10  
3.3 Review # 1-5



### 3 Transparency Master

*J.J. Thomson's Cathode Ray Tube*



## 3-3 Apply

### *Calculating Atomic Mass*

Samples of an unknown element X were collected and their masses were recorded. Use the information presented in the data table to answer the following questions.

| Isotope | Mass (amu) | Percent Abundance | Mass Number |
|---------|------------|-------------------|-------------|
| 1       | 37.765     | 9.67              |             |
| 2       | 39.056     | 78.68             |             |
| 3       | 40.003     | 11.34             |             |
| 4       | 41.060     | 0.31              |             |

1. Fill in the mass number for each sample of element X in the data table.
2. What is the most common isotope of element X?  
\_\_\_\_\_
3. Calculate the average atomic mass of element X.  
\_\_\_\_\_
4. Use your periodic table to identify element X based on its average atomic mass.  
\_\_\_\_\_
5. What is the atomic number of this element?  
\_\_\_\_\_
6. Draw one atom of this element. Make sure to correctly represent the number of protons and electrons in the atom.  
\_\_\_\_\_
7. This atom forms an ion with a charge of 1+. Draw a picture representing an ion of this element.  
\_\_\_\_\_

## 3-3 Practice Problems

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1. How many protons and electrons are present in a vanadium atom?
2. How many protons and electrons are present in a nitrogen atom?
3. How many protons and electrons are present in an argon atom?
4. How many protons and electrons are present in a potassium atom?
5. How many protons and electrons are present in a platinum atom?
6. What is the name of the element that has atoms that contain 5 protons?
7. What is the name of the element that has atoms that contain 17 protons?
8. What is the name of the element that has atoms that contain 25 protons?
9. What is the name of the element that has atoms that contain 82 protons?
10. What is the name of the element that has atoms that contain 92 protons?
11. Write the chemical symbol for the ion with 12 protons and 10 electrons.
12. Write the chemical symbol for the ion with 74 protons and 68 electrons.
13. Write the chemical symbol for the ion with 95 protons and 89 electrons.
14. Write the chemical symbol for the ion with 33 protons and 36 electrons.

## 3-3 Practice Problems (continued)

15. Write the chemical symbol for the ion with 29 protons and 27 electrons.
16. How many protons, neutrons, and electrons are present in the  ${}_{28}^{59}\text{Ni}^{2+}$  ion?
17. How many protons, neutrons, and electrons are present in the  ${}_{40}^{91}\text{Zr}^{4+}$  ion?
18. How many protons, neutrons, and electrons are present in the  ${}_{58}^{140}\text{Ce}^{3+}$  ion?
19. How many protons, neutrons, and electrons are present in the  ${}_{34}^{79}\text{Se}^{2-}$  ion?
20. How many protons, neutrons, and electrons are present in the  ${}_{21}^{45}\text{Sc}^{3+}$  ion?
21. How many protons, neutrons, and electrons are present in the  ${}_{6}^{13}\text{C}^{4-}$  ion?
22. Write the complete chemical symbol for the ion with 84 protons, 125 neutrons, and 80 electrons.
23. Write the complete chemical symbol for the ion with 27 protons, 32 neutrons, and 25 electrons.
24. Write the complete chemical symbol for the ion with 73 protons, 108 neutrons, and 68 electrons.
25. Write the complete chemical symbol for the ion with 31 protons, 39 neutrons, and 28 electrons.

## 3-3 Review and Reinforcement

### Modern Atomic Theory

Complete the following table.

|    | Subatomic Particle | Location       | Charge | Mass (amu) |
|----|--------------------|----------------|--------|------------|
| 1. |                    | inside nucleus | 1+     |            |
| 2. | neutron            |                |        | 1          |
| 3. |                    |                | 1-     | 0          |

If the statement is true, write "true." If it is false, change the underlined word or words to make the statement true. Write your answer on the line provided.

- \_\_\_\_\_ 4. Moseley discovered that all atoms of an element have the same number of neutrons in their nuclei.
- \_\_\_\_\_ 5. In an individual, neutral atom, the number of protons always equals the number of electrons.
- \_\_\_\_\_ 6. When an atom loses or gains one or more electrons, it is called an ion.
- \_\_\_\_\_ 7. The average mass of an element's atoms is called the atomic number.
- \_\_\_\_\_ 8. 1 atomic mass unit (amu) is equal to one twelfth of the mass of a carbon-12 atom.
- \_\_\_\_\_ 9. Atoms with the same number of protons but different numbers of electrons are called isotopes.

Answer each of the following questions in the space provided.

10. How do two isotopes of oxygen, oxygen-16 and oxygen-18, differ from each other in structure? Does this difference affect the chemical properties of these two atoms?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

11. How can you calculate the net charge of an ion if you know the number of protons, neutrons, and electrons it contains?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

### 3-3 Review and Reinforcement (continued)

Use the periodic table to determine how many protons, neutrons, and electrons are present in each of the following atoms. Write your answers in the spaces provided.

| Atom             | Protons | Neutrons | Electrons |
|------------------|---------|----------|-----------|
| 12. iodine-125   | _____   | _____    | _____     |
| 13. potassium-39 | _____   | _____    | _____     |
| 14. iron-56      | _____   | _____    | _____     |

Write the chemical symbol for each of the ions described below.

- \_\_\_\_\_ 15. 17 protons and 18 electrons  
 \_\_\_\_\_ 16. 3 protons and 2 electrons  
 \_\_\_\_\_ 17. 12 protons and 10 electrons  
 \_\_\_\_\_ 18. 8 protons and 10 electrons

Use the periodic table to determine the number of protons and electrons in each of the following ions. Write your answers in the spaces provided.

| Ion                  | Protons | Electrons |
|----------------------|---------|-----------|
| 19. $\text{Cu}^{2+}$ | _____   | _____     |
| 20. $\text{F}^-$     | _____   | _____     |
| 21. $\text{H}^+$     | _____   | _____     |
| 22. $\text{Na}^+$    | _____   | _____     |