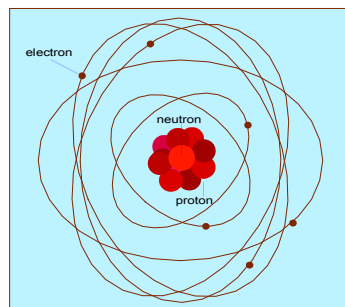


Honors Chemistry 2:

Unit 1 Review

Atoms, Molecules, & Ions



Students should be able to:

- ✓ Distinguish between protons, neutrons, and electrons and be able to describe the composition of an atom of any particular element in terms of these subatomic particles.
- ✓ Describe the basic anatomy of an atom and the ratio of the diameter of the nucleus to that of the atom.
- ✓ Know the difference between an atom, an ion, and a molecule.
- ✓ Have a basic knowledge of the periodic table, which includes being able to predict whether an element is a metal or a nonmetal, and what will be the probable charge of its ion.
- ✓ Distinguish between empirical, molecular, and structural formulas.
- ✓ Be able to write the correct name of an inorganic compound from its formula and vice versa.

Keywords:

- Atom
- nucleus
- electron
- atomic number
- metal
- molecular formula
- ionic compound
- anion
- molecule
- proton
- atomic mass unit
- mass number
- nonmetal
- empirical formula
- polyatomic ion
- periodic group
- ion
- neutron
- isotope
- nuclide
- metalloid
- molecular compound
- cation

I. The Atomic Theory of Matter

A. What is Dalton's Atomic Theory of Matter:

Dalton's Postulates:

1.

2.

3.

4.

B. What is Dalton's "Law of Multiple Proportions"?

II. The Discovery of Atomic Structure

A. What is a Cathode Ray Tube?

→What was discovered by using a cathode ray tube?

B. What contribution did J.J. Thomson make to the modern model of the atomic structure?

C. What and how did Robert Millikan discover in his famous "Oil-drop experiment"?

Click to see experiment: <http://www.youtube.com/watch?v=XMfYHag7Liw&safe=active>

D. What is radioactivity?

1. What is an alpha particle (α)?
2. What is a beta particle (β)?

E. What was Rutherford's "Gold-Foil Experiment"?

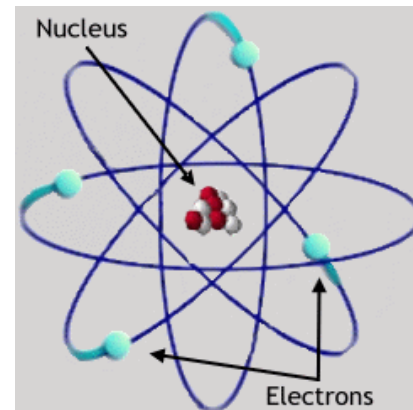
1. What conclusions did Rutherford draw from the results of his experiment?

F. Compare and Contrast the different models of the atom as proposed by:

	<i>Dalton</i>	<i>Thomson</i>	<i>Rutherford</i>
Similarities			
Differences			

III. The Modern View of Atomic Structure

A. The Basic Structure of the Atom:



B. Size and Mass of the Atom:

1. The Atomic Mass Unit –

2. The Angstrom (Å) –

C. Atomic Numbers –

D. Mass Numbers –

E. Isotopes –

$$\text{Average atomic mass} = \frac{\sum (\% \text{ of each isotope}) (\text{atomic mass of each isotope})}{100}$$

IV. The Periodic Table

A. Families & Groups of Elements:

1. Group 1 =
2. Group 2 =
3. Group 17 =
4. Group 18 =
5. *Groups 3 – 12 =*

B. Periods:

		THE PERIODIC TABLE																	
		Group										Group							
		1A	2A											3A	4A	5A	6A	7A	8A
Period 1												1 H 1							2 He 4
2	3 Li 7	4 Be 9											5 B 11	6 C 12	7 N 14	8 O 16	9 F 19	10 Ne 20	
3	11 Na 23	12 Mg 24	I . T R A N S I T I O N M E T A L S										13 Al 27	14 Si 28	15 P 31	16 S 32	17 Cl 35.5	18 Ar 40	
4	19 K 39	20 Ca 40	21 Sc 45	22 Ti 48	23 V 51	24 Cr 52	25 Mn 55	26 Fe 56	27 Co 59	28 Ni 59	29 Cu 64	30 Zn 65	31 Ga 70	32 Ge 73	33 As 75	34 Se 79	35 Br 80	36 Kr 84	
5	37 Rb 86	38 Sr 88	39 Y 89	40 Zr 91	41 Nb 93	42 Mo 96	43 Tc 99	44 Ru 101	45 Rh 103	46 Pd 106	47 Ag 108	48 Cd 112	49 In 115	50 Sn 119	51 Sb 122	52 Te 128	53 I 127	54 Xe 131	
6	55 Cs 133	56 Ba 137	57 La* 139	72 Hf 178	73 Ta 181	74 W 184	75 Re 186	76 Os 190	77 Ir 192	78 Pt 195	79 Au 197	80 Hg 201	81 Tl 204	82 Pb 207	83 Bi 209	84 Po 210	85 At 210	86 Rn 222	
			7 Fr 223	87 Ra 226	88 Ac** 226	104	105	106	107	108	109	110	111	112					

*Lanthanides	58 Ce 140	59 Pr 141	60 Nd 144	61 Pm 147	62 Sm 150	63 Eu 152	64 Gd 157	65 Tb 159	66 Dy 163	67 Ho 165	68 Er 167	69 Tm 169	70 Yb 173	71 Lu 175
**Actinides	90 Th 232	91 Pa 231	92 U 238	93 Np 237	94 Pu 242	95 Am 243	96 Cm 247	97 Bk 251	98 Cf 251	99 Es 254	100 Fm 253	101 Md 256	102 No 254	103 Lr 257

A.

KEY:

Metal	Semi Metal	Non-metal
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13 Al 27	14 Si 28	15 P 31
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In this example Al is a metal, Si is a semi-metal and P is a non-metal.

B. Metal vs. Nonmetal Elements

<i>Metal Characteristics</i>	<i>Nonmetal Characteristics</i>

V. Molecules and Ions

A. Molecules –

1. Diatomic Molecules –

B. Chemical Formulas –

1. Molecular Formulas –

2. Empirical Formulas –

3. Structural Formulas –

C. Ions –

1. Anions –

2. Cations –

3. Polyatomic Ions -

Common Polyatomic ions		
Name	Charge	Formula
Ammonium	1+	NH_4^+
Carbonate	2-	CO_3^{2-}
Chromate (VI)	2-	CrO_4^{2-}
Dichromate (VI)	2-	$\text{Cr}_2\text{O}_7^{2-}$
Ethanedioate / Oxalate	2-	$\text{C}_2\text{O}_4^{2-}$
Hydrogen carbonate	1-	HCO_3^-
Hydrogen sulfate	1-	HSO_4^-
Hydroxide	1-	OH^-
Manganate (VII) (Permanganate)	1-	MnO_4^-
Nitrate	1-	NO_3^-
Nitrite	1-	NO_2^-
Phosphate	3-	PO_4^{3-}
Sulfate	2-	SO_4^{2-}
Sulfite	2-	SO_3^{2-}

D. Predicting Ionic Charge –

E. Ionic Compounds –

VI. Naming Inorganic Compounds

A. Naming Ionic Compounds –

1. Cations –

2. Anions –

Examples: Zinc Chloride = _____

Fe_2O_3 = _____

NH_4NO_3 = _____

Copper (II) Sulfate = _____

B. Naming Acids

1. Binary Acids (contain 2 elements) – start with “hydro-” followed by the name of the anion, replacing the suffix “-ine” with “-ic.”

Examples: HCl =

Hydrobromic Acid =

H_2S =

2. Ternary Acids (or Oxyacids) – replace the suffix in the name of the polyatomic ion according to the following rule:

“-ate” → “-ic”

“-ite” → “-ous”

Then add the word “acid.”

Formula and name of oxyanion		Formula and name of oxyacid	
ClO^-	Hypochlorite	HClO	
ClO_2^-	Chlorite	HClO_2	
ClO_3^-	Chlorate	HClO_3	
ClO_4^-	Perchlorate	HClO_4	

Examples: $\text{H}_2\text{SO}_4 =$

Nitric Acid =

$\text{H}_2\text{SO}_3 =$

C. Naming Molecular Compounds

1. Using Prefixes –

# of atoms of element	Prefix
1	
2	
3	
4	
5	
6	

2. Examples

Formula	Name
H_2O	
CCl_4	
	Carbon monoxide
CO_2	
	Sulfur hexafluoride
	Nitrogen dioxide