

Review Package #3

1. Complete the following table.

Symbol	Atomic Mass	Atomic Number	Number of Protons	Number of Neutrons	Number of Electrons
Cr	52	24	24	28	24
P (neutral)	32	15	15	17	15
Te ²⁻	127	52	52	75	54
Fe ³⁺	56	26	26	30	23
Ca	41	20	20	21	20
Hg ²⁺	201	80	80	121	78
Kr	83	36	36	47	36
Br	78	35	35	43	36
Ga ³⁺	70	31	31	39	28
N ³⁻	14	7	7	7	10

2. Complete the following table:

Isotope	Protons	Neutrons	Electrons
¹⁹⁴ Ir ³⁺	77	117	74
²⁰² Hg ²⁺	80	122	78
¹²⁵ Te ²⁻	52	73	54
²⁶³ Sg	106	157	106
² H ⁺	1	1	0

3. Element "X" is composed of the following naturally occurring isotopes:

Isotope	% Abundance
⁷⁹ X	50.69
⁸¹ X	49.31

Calculate the average atomic mass of element "X" to 3 decimal places.

$$\text{avg Atomic Mass} = (79 \cdot 0.5069 + 81 \cdot 0.4931) = 79.9862 = 79.986 \text{ g/mol}$$

Element "X" is actually the real element Br

4. In order to become stable,

an atom of Sr will lose 2 electrons and become the ion Sr^{+2}

an atom of As will gain 3 electrons and become the ion As^{-3}

an atom of Al will lose 3 electrons and become the ion Al^{+3}

an atom of Se will gain 2 electrons and become the ion Se^{-2}

an atom of N will gain 3 electrons and become the ion N^{-3}

an atom of I will gain 1 electrons and become the ion I^{-}

an atom of Cs will lose 1 electrons and become the ion Cs^{+}

an atom of Te will gain 2 electrons and become the ion Te^{-2}

5. Write the core-notation electron configuration for the elements listed below.

a. Be $[\text{He}] 2s^2$

b. C $[\text{He}] 2s^2 2p^2$

c. N $[\text{He}] 2s^2 2p^3$

d. Na $[\text{Ne}] 3s^1$

e. S $[\text{Ne}] 3s^2 3p^4$

f. Ar $[\text{Ne}] 3s^2 3p^6$

g. V $[\text{Ar}] 4s^2 3d^3$

h. Cu $[\text{Ar}] 4s^1 3d^{10-9}$

i. Ge $[\text{Ar}] 4s^2 3d^{10} 4p^2$

j. Br $[\text{Ar}] 4s^2 3d^{10} 4p^5$

Elements and the periodic Table:

1. What is a period of the periodic table?

across a row \longleftrightarrow

2. What is a group or family of the periodic table?

up and down a column \updownarrow

3. Complete the following table:

Family Members	Family Name	Number of Valence Electrons	Charge on the ions usually formed
Li, Na, K, Rb, Cs, Fr	alkali metals	1	+1
B, Al, Ga, In, Tl	Boron Family	3	+3
F, Cl, Br, I, At	Halogen	7	-1
Be, Mg, Ca, Sr, Ba, Ra	Alkaline Earth Metals	2	+2
N, P, As, Sb, Bi	Nitrogen Family	5	-3
He, Ne, Ar, Kr, Xe, Rn	Noble Gases	8	0
O, S, Se, Te, Po	Oxygen Family	6	-2

4. Define the following Terms:

a. Atomic Radius: Distance from nucleus to outer electrons

b. Ionization Energy: The energy required to remove an electron from the outer shell of an atom

c. Electronegativity: a relative measure of the strength that an atom pulls on electrons with a bond

5. Correctly fill in the blanks below with either "increases" or decreases

a. As you move from left to right across the periodic table:

Atomic Radius: Decreases

Ionization Energy: Increases

Electronegativity: Increases

b. As you move down the periodic table:

Atomic Radius: Increases

Ionization Energy: Decreases

Electronegativity: Decreases

6. Which of the following has the LARGEST atomic radius?

- i. Li, Na, K, Rb Rb
- ii. Na, Mg, Al, Si Na
- iii. Mg, Os, Cl Os
- iv. Na^+ , Mg^{2+} , Al^{3+} Na^+
- v. P^{3-} , S^{2-} , Cl^- P^{3-}
- vi. N, O, F, Cl Cl

7. Which of the following has the LARGEST ionization energy?

- i. Li, Na, K, Rb Li
- ii. Na, Mg, Al, Si Si
- iii. Mg, Os, Cl Cl
- iv. Na^+ , Mg^{2+} , Al^{3+} Al^{3+}
- v. P^{3-} , S^{2-} , Cl^- Cl^-
- vi. N, O, F, Cl N

8. Which of the following has the SMALLEST electronegativity value?

- i. Li, Na, K, Rb Rb
- ii. Na, Mg, Al, Si Na
- iii. Mg, Os, Cl Os
- iv. Na^+ , Mg^{2+} , Al^{3+} Na^+
- v. P^{3-} , S^{2-} , Cl^- Cl^-
- vi. N, O, F, Cl N

Chemical Bonding:

1. Define valence electrons: Electrons in the outer shell (n) of an atom

2. Describe what is happening to the electrons involved in a:

a. Covalent Bond:

Electrons are equally shared the atom involved in the bond

b. Polar Covalent Bond:

Electrons are shared but not equally by atoms in the bond

c. Ionic Bond:

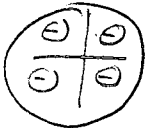
Electrons are transferred from one atom to another (ions formed)

6. Complete the following table.

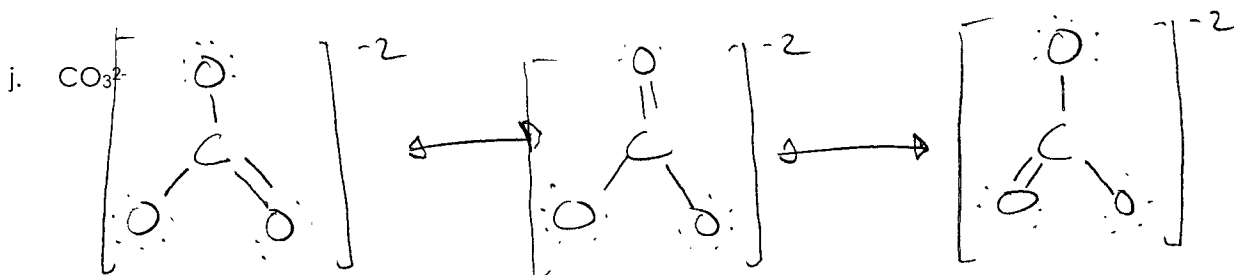
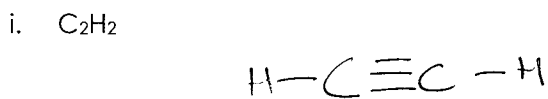
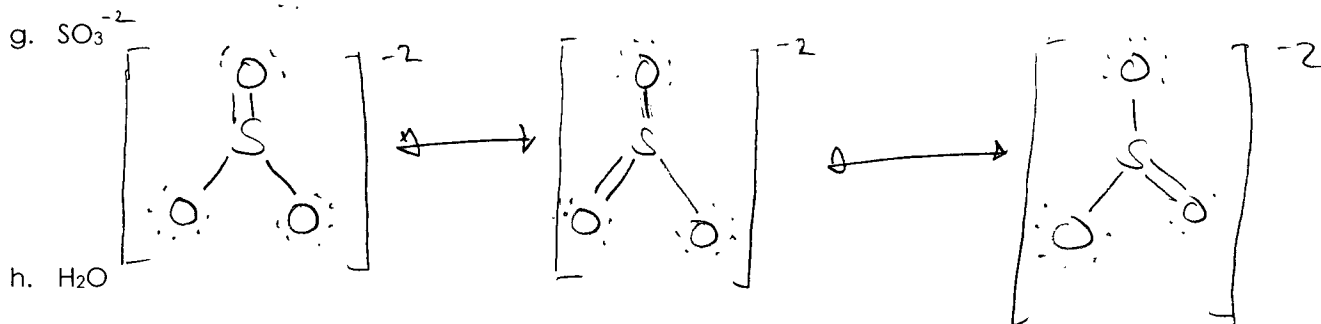
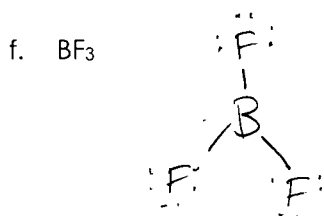
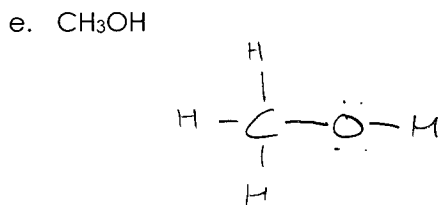
Symbol	Number of Protons	Number of Neutrons	Number of Electrons	Core Electron Configurations
${}_{31}^{70}\text{Ga}^{3+}$	31	39	28	$[\text{Ar}] 4s^0 3d^{10} 4p^0$
${}_{17}^{37}\text{Cl}^{-}$	17	20	18	$[\text{Ne}] 3s^2 3p^6$
${}_{19}^{39}\text{K}^{+}$	19	20	18	$[\text{Ne}] 3s^2 3p^6$
${}_{29}^{65}\text{Cu}^{2+}$	29	36	27	$[\text{Ar}] 4s^0 3d^9$
${}_{16}^{32}\text{S}^{2-}$	16	16	18	$[\text{Ne}] 3s^2 3p^6$
${}_{15}^{30}\text{P}^{3-}$	15	15	18	$[\text{Ne}] 3s^2 3p^6$
${}_{38}^{87}\text{Sr}^{2+}$	38	49	36	$[\text{Ar}] 4s^2 3d^{10} 4p^6$
${}_{27}^{59}\text{Co}^{2+}$	27	32	25	$[\text{Ar}] 4s^0 3d^7$

7. In the table below briefly summarize the MAJOR contribution(s) the scientist made to our understanding of the atom.

Scientist	Major Contributions(s)
Dalton	<ul style="list-style-type: none"> ① All matter consists of tiny particles ~ atoms ② All atoms are indestructible ③ Elements are characterized by the mass of the atoms ④ When elements react their atoms combine in simple whole number ratios

Bohr	<p>Electrons reside in quantized energy shells</p> <p>The emission spectrum of an atom is related to the relaxation of electrons from higher to lower energy levels</p>
Thompson	<p>Plum - pudding (Raisin Bran Model)</p> <p>The Atom is made of smaller subatomic particles</p>  <p>negative electrons nested within an overall positive charge</p>
Chadwick	<p>Neutrons make up for the unaccounted for mass within an atom</p>
Rutherford	<p>Gold Foil experiment - protons (+) exist within the nucleus</p> <p>The atom is made of mostly empty space</p> <p>Electrons make up the volume</p> <p>Nucleus makes up the mass</p>

3. Draw the Lewis Structures for each of the following



5. In an ionic bond, electrons are
a. shared equally by two atoms
b. shared unequally by two atoms
c. transferred from a metal to a non-metal
d. transferred from a non-metal to a metal
e. closer to one end of a molecule, forming a temporary dipole

Answer c

6. In a covalent bond, electrons are
f. shared equally by two atoms
g. shared unequally by two atoms
h. transferred from a metal to a non-metal
i. transferred from a non-metal to a metal
j. closer to one end of a molecule, forming a temporary dipole

Answer f

7. In a polar covalent bond, electrons are
k. shared equally by two atoms
l. shared unequally by two atoms
m. transferred from a metal to a non-metal
n. transferred from a non-metal to a metal
o. closer to one end of a molecule, forming a temporary dipole

Answer l

8. In London forces, electrons are
p. shared equally by two atoms
q. shared unequally by two atoms
r. transferred from a metal to a non-metal
s. transferred from a non-metal to a metal
t. closer to one end of a molecule, forming a temporary dipole

Answer t