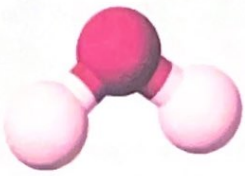
2/21/22

Exam Week Worksheet

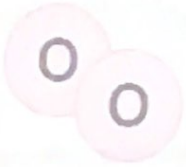
Chapter 1 (Element/Compound/Mixture, Physical/Chemical Properties/Changes, Conversion, Density, Sig Figs)

1. Is the following an element, compound or mixture?

Mixture



Compound




Element

2. Is the above mixture homogenous or heterogenous mixture?

Heterogenous mixture

3. Are the following physical change, chemical change, physical property or chemical property?

| | | | |
|---|---|---|---|
| Density of Zinc is 7.13 g/mL | Physical Property | The substance in lab had a smooth texture | Physical Property |
| In lab you cut the substance into small pieces | Physical Change | Iron will rust when combined with oxygen | Chemical Property |
| Chromium does not oxidize | Chemical Property | When mixing substances the mixture changed color | Chemical Change |
| You added two substances together, and the mixture was hot to handle | Chemical Change | After setting the substance on the hot plate it started to melt | Physical Change |

4. Conversions
   a. How many km are in 2.88 m

$$2.88\ m \times \frac{1\ km}{1000\ m} = 2.88 \times 10^{-3}\ km$$

   b. How many kilograms in 43.007 nanograms? (4.3007 x 10^-11 kg)

$$43.007\ ng \times \frac{10^{-9}\ g}{1\ ng} \times \frac{10^{-3}\ kg}{1\ g} = 4.3007 \times 10^{-11}\ kg$$

   c. As an astute observer walking around on continental crust (granite), you might decide to test the hypothesis that the Earth is made entirely of granite. You weigh a 1.00 cubic ft piece of granite on your home scale and find that it weighs 171 lbs. Thus you determine that the granite has a density of 171 lb/ft3. Convert your granite's density to g/cm3. **(2.74)**
   1 lb = 453.592 g
   2.54cm=1 in

$$\frac{171\ lb}{ft^3} \times \frac{453.592\ g}{1\ lb} \times \left(\frac{1\ ft}{12\ in}\right)^3 \times \left(\frac{1\ in}{2.54\ cm}\right)^3 = 2.74\ g/cm^3$$

5. 30.0 g of hydrochloric acid (HCl) needs to be added to the graduated cylinder. Determine the volume of HCl that needs to be added. (Density of HCl=1.164 g/mL)

$d = 1.164\ g/mL$
$m = 30.0\ g$
$V = ?$

$d = \frac{m}{v}(v)$
$dv = m$
$V = \frac{m}{d} = \frac{30.0\ g}{1.164\ g/mL} = 25.8\ mL$

6. The density of ethanol is 0.789 g/mL at 20 C. Find the mass of a sample of ethanol that has a volume of 152.2mL at this temperature.

$d = 0.789\ g/mL$
$m = ?$
$V = 152.2\ mL$

$m = dv$
$m = (0.789\ g/mL)(152.2\ mL)$
$= 120\ g$

7. Determine the number of sig figs in each system of equations

| | |
|---|---|
| 56.987 x 4.987 – 6.5978 + 2.389 | 280.0 |
| 6.32-4.567+ (21.43/7.453) | 4.54 |
| (90.089-3.245)/(101.98+2.98) | 0.82740 |

Chapter 2 (History, protons/neutrons/electrons, atomic and molecular weight, isotopes)

1. What did Antoine Lavoisier observe?

   The total mass of reactants always equal the total mass of products

2. Who observed that a particular compound always has the same proportions at its constituent elements?

   Joseph Proust

3. What was John Dalton's hypothesis to explain the observations? A
   a. Billiard ball atomic model
   b. Plum pudding atomic model
   c. Nuclear Atomic Model
4. Explain each atomic model
   a. Billiard ball atomic model

      Atoms are tiny, indivisible, uniformly dense solid spheres, atoms of the same element are identical, chemical compounds from when atoms of different elements combine in a chemical reaction, in a chemical reaction, atoms are NOT crated, destroyed or converted to other kinds of atoms

   b. Plum pudding atomic model

      Revised hypothesis from discovery of the electron by J.J Thomson. An atom contains negatively-charges electrons that are dispersed through the sphere of positive charge.

c. Nuclear Atomic model

Rutherford hypothesized that most of an atom's mass and all of its positive charge are concentrated in a tiny core called the nucleus (which is very high density and highly charged)

5.

| Element Symbol | Shorthand Representation $^{A}X$ | X-A | $^{A}_{Z}X$ | Atomic Number | Mass Number | # of protons | # of neutrons | # of electrons |
|---|---|---|---|---|---|---|---|---|
| N | $^{15}N$ | N-15 | $^{15}_{7}N$ | 7 | 15 | 7 | 8 | 7 |
| Ar | $^{40}Ar$ | Ar-40 | $^{40}_{18}Ar$ | 18 | 40 | 18 | 22 | 18 |
| Se | $^{79}Se$ | Se-79 | $^{79}_{34}Se$ | 34 | 79 | 34 | 45 | 34 |
| $Li^{+}$ | $^{7}Li^{+}$ | $Li^{+}$-7 | $^{7}_{3}Li$ | 3 | 7 | 3 | 4 | 2 |
| $O^{-}$ | $^{16}O^{-}$ | $O^{-}$-16 | $^{16}_{8}O$ | 8 | 16 | 8 | 8 | 9 |

6. Lithium has an average atomic weight of 6.941 amu and has two naturally occurring isotopes, $^{6}Li$ and $^{7}Li$. Their masses are 6.0151 amu and 7.0160 amu respectively. What are the percent abundances of the isotopes of Lithium?

**$^{6}Li$: 7.49%, $^{7}Li$: 92.51%**

| | masses | % abundance |
|---|---|---|
| $^{6}Li$ | 6.0151 | $1-x$ |
| $^{7}Li$ | 7.0160 | $x$ |

average atomic weight = 6.941 amu

$6.941 = (6.0151)(1-x) + (7.0160)(x)$

$6.941 = 6.0151 - 6.0151x + 7.0160x$

$6.941 = 6.0151 + 1.0009x$

$-6.0151 \quad -6.0151$

$\frac{0.9259}{1.0009} = \frac{1.0009x}{1.0009}$

$0.9251 = x$

$^{7}Li = 92.51\%$

$^{6}Li = 1 - .9251$

$= 0.0749$

$= 7.49\%$

7. Calculate the elemental atomic mass of Mg if the naturally occurring isotopes are $^{24}Mg$, $^{25}Mg$ and $^{26}Mg$. Their masses and abundances are as follows:

| Isotope | Atomic Mass | Isotopic Abundance |
|---|---|---|
| $^{24}Mg$ | 23.98504 amu | 78.70% |
| $^{25}Mg$ | 24.98584 amu | 10.13% |
| $^{26}Mg$ | 25.98259 amu | 11.17% |

Atomic weight

Atomic weight = (23.98504)(.7870) + (24.98584)(.1013) + (25.98259)(.1117)

= 18.88 + 2.531 + 2.902

= 24.31 amu

8. Which of the following is a polyatomic ion? A
   a. $NO_3^-$
   b. $Na^+$
   c. $Ca^{2+}$
9. What is the charge of the zinc ion? A
   a. $Zn^{2+}$
   b. $Zn^+$
   c. $Zn^{3+}$
   d. $Zn^-$
10. What is the charge of the silver ion? B
   a. $Ag^{2+}$
   b. $Ag^+$
   c. $Ag^{3+}$
   d. Ag
11. How many molecules (particles) are there in 5.487 grams of $C_6H_{12}O_6$?

$5.487g \times \frac{1\,mol}{180.18g} \times \frac{6.022 \times 10^{23}\ molecules}{1\,mol} = 1.834 \times 10^{22}$ particles of $C_6H_{12}O_6$ in 5.487 g

a. How many atoms of Carbon?

$1.834 \times 10^{22}$ particles of $C_6H_{12}O_6 \times \frac{6\ C\ atoms}{1\ particle\ of\ C_6H_{12}O_6} = 1.100 \times 10^{23}$ C atoms

b. How many atoms of hydrogen?

$1.834 \times 10^{22}$ particles of $C_6H_{12}O_6 \times \frac{12\ H\ atoms}{1\ particle\ of\ C_6H_{12}O_6} = 2.201 \times 10^{23}$ H atoms

c. How many atoms of oxygen?

$1.834 \times 10^{22}$ particles of $C_6H_{12}O_6 \times \frac{6\ O\ atoms}{1\ particle\ of\ C_6H_{12}O_6} = 1.100 \times 10^{23}$ O atoms

12. How many grams are in $1.20 \times 10^{25}$ atoms of fluorine gas?

$1.20 \times 10^{25}$ atoms $F_2 \times \frac{1\ mol\ F_2}{6.022 \times 10^{23}\ atoms} \times \frac{38.00\ g}{1\ mol} = 757.2$ grams of $F_2$

Chapter 3 (Naming)

1. Name the following compounds.

| | | | |
|---|---|---|---|
| $NH_4Cl$<br>Ammonium Chloride | $Mn_2(SO_3)_3$<br>Manganese (III) sulfite | $P_2O_5$<br>Diphosphorus pentoxide | Silicon dioxide<br>$SiO2$ |
| Calcium Acetate<br>$Ca(CH3COO^-)_2$ | $SF_6$<br>Sulfur hexafluoride | $P_4O_{10}$<br>Tetraphosphorus decoxide | Ammonium fluoride<br>$NH_4F$ |
| $CoCO_3$<br>Cobalt (II) carbonate | $Cu(NO_2)_2$<br>Copper (II) nitrite | $C_5O_7$<br>Pentacarbon heptoxide | NaBr<br>Sodium bromide |