Name: KEY Period: _____ Date: _____

## Problem Set #4 – Average Mass & Molecular Nomenclature

Solve the following problems and report your final answer using the correct number of significant figures. Show all work!

1. The element "witchium" has three isotopes: $^{123}Wi$, $^{127}Wi$, and $^{128}Wi$, which are present in the following relative abundences: 43%, 21%, and 36%. Find the average mass of witchium.

(123 amu × 0.43) + (127 amu × 0.21) + (128 amu × 0.36)

53 amu + 27 amu + 46 amu = **126 amu**

2. Use the table to determine the average atomic mass of mercury.

| *Isotope* | *Atomic mass (amu)* | *natural abundance (%)* | |
|---|---|---|---|
| $^{196}Hg$ | 195.965 | 0.15 /100 | = 0.29 |
| $^{198}Hg$ | 197.967 | 9.97 /100 | = 19.7 |
| $^{199}Hg$ | 198.968 | 16.87 /100 | = 33.57 |
| $^{200}Hg$ | 199.968 | 23.10 /100 | = 46.19 |
| $^{201}Hg$ | 200.970 | 13.18 /100 | = 26.49 |
| $^{202}Hg$ | 201.971 | 29.86 /100 | = 60.31 |
| $^{204}Hg$ | 203.973 | 6.87 /100 | = 14.0 |
| | | | + |

200.6 amu

3. The average mass of neon is 20.18 amu. Ne occurs in two isotopes: $^{20}Ne$ and $^{22}Ne$. What are the relative abundances (in %) of these two isotopes?

$^{20}Ne = x\%$

$^{22}Ne = (100-x)\%$

$$\frac{20x + 22(100-x)}{100} = 20.18 \text{ amu}$$

$20x + 2200 - 22x = 2018$

$-2x = -182$

$x = 91$

**$^{20}Ne = 91\%$**

**$^{22}Ne = 9\%$**

4. The average mass of chromium's isotopes is 52.00 amu. $^{53}Cr$ has an exact atomic mass of 52.94 amu and an abundance of 15.00%. $^{51}Cr$ has an exact atomic mass of 51.05 and an abundance of 5.50%. What is the exact mass of $^{52}Cr$?

$^{53}Cr$ $^{52}Cr$ $^{51}Cr$

$(52.94\text{ amu} \times 0.15) + (0.795x) + (51.05\text{amu} \times 0.055) = 52.00\text{amu}$

$0.795x = 41.25125\text{ amu}$

$\boxed{x = 51.89\text{ amu}}$

5. Complete the following chart

| Name | Formula | Molecular Weight |
|---|---|---|
| Phosphorus triiodide | $PI_3$ | 411.67 amu |
| Carbon tetrahydride | $CH_4$ | 16.05 amu |
| Dinitrogen Pentoxide | $N_2O_5$ | 108.02 amu |
| Sulfur hexaflouride | $SF_6$ | 146.07 amu |
| Carbon Monoxide | CO | 28.01 amu |
| Carbon tetrachloride | $CCl_4$ | 153.81 amu |
| Chlorine | $Cl_2$ | 70.90 amu |
| dicarbon tetrahydride | $C_2H_4$ | 28.06 amu |