**NOTES #1 : Calculating Gram Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_**

**Formula Mass (abbreviated as *gfm*) Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Block\_\_\_**

**The gram formula mass of a substance is the**

**formula mass of that substance expressed in grams.**

First, we must calculate the **formula mass** of the substance in a.m.u. using the atomic masses for each element given on the periodic table. This numerical value is expressed in grams and is the **gram formula mass** (abbreviated as ***gfm*** ).

**NOTE: 1.000 atomic mass unit is NOT equal to 1.000 gram when measuring mass. This change in units is ONLY to allow measurements and calculations to be done within the mole concept.**

Therefore, if the atomic mass of sodium, Na, is 23.00 a.m.u., the **gram formula mass** of sodium

is written as 23.00 g. The gfm of the sodium **ion**, Na +1, would be the same: 23.00 g, since the loss of the electron does not significantly affect the mass of the nucleus.

**To calculate the gfm of a compound**: count the number of atoms/ions of EACH **element** that is present in one formula unit. Multiply the atomic mass of each element by the TOTAL number of atoms/ions of that element present in the formula. Add all of the masses to obtain the gfm for the compound. Write the answer in grams rounded to the appropriate number of sig. figs.

Example 1: Calculate the gfm of H2O.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Substance | ElementsPresent | Number ofAtoms/Ionsof ElementPresent | Atomic Massof Element (a.m.u.) | Total Massof Elementin Formula (a.m.u.) |
| H2O |  H |  2 |  1.008 |  2.016 |
|  O |  1 |  16.00 |  16.00 |

 Total formula mass: 18.016 a.m.u.

 **Total gfm: 18.02 g (sig. figs.!)**

Example 2: Calculate the gfm of Cu2SO4.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Substance | ElementsPresent | Number ofAtoms/Ionsof ElementPresent | Atomic Massof Element (a.m.u.) | Total Massof Elementin Formula (a.m.u.) |
| Cu2SO4 |  Cu |  2 |  63.55 |  127.1 |
|  S |  1 |  32.07 |  32.07 |
|   O |  4 |  16.00 |  64.00 |

 Total formula mass: 223.17 a.m.u

 **Total gfm: 223.2 g (sig. figs.!**

**PRACTICE: Calculate the gfm of (NH4)3PO4.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Substance | ElementsPresent | Number ofAtoms/Ionsof ElementPresent | Atomic Massof Element (a.m.u.) | Total Massof Elementin Formula (a.m.u.) |
| **(NH4)3PO4** |  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

 Total formula mass of 1 formula unit of (NH4)3PO4 : a.m.u

 **Total gfm of 1 formula unit of (NH4)3PO4****: g (sig. figs.!)**

**PRACTICE: Calculate the gfm of Al2(SO4)3.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Substance | ElementsPresent | Number ofAtoms/Ionsof ElementPresent | Atomic Massof Element (a.m.u.) | Total Massof Elementin Formula (a.m.u.) |
|  **Al2(SO4)3** |  |  |  |  |
|  |  |  |  |
|  |  |  |  |

 Total formula mass of 1 formula unit of Al2(SO4)3: a.m.u

 **Total gfm of 1 formula unit of Al2(SO4)3: g (sig. figs.!)**

**PRACTICE: Calculate the gfm of Ba(C2H3O2)2 .**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Substance | ElementsPresent | Number ofAtoms/Ionsof ElementPresent | Atomic Massof Element (a.m.u.) | Total Massof Elementin Formula (a.m.u.) |
| **Ba(C2H3O2)2** |  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

 Total formula mass of 1 formula unit of **Ba(C2H3O2)2**: a.m.u

 **Total gfm of 1 formula unit of Ba(C2H3O2)2: g (sig. figs.!)**

**PRACTICE: Calculate the gfm of K2CO3.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Substance | ElementsPresent | Number ofAtoms/Ionsof ElementPresent | Atomic Massof Element (a.m.u.) | Total Massof Elementin Formula (a.m.u.) |
|  **K2CO3** |  |  |  |  |
|  |  |  |  |
|  |  |  |  |

 Total formula mass of 1 formula unit of **K2CO3**: a.m.u

 **Total gfm of 1 formula unit of K2CO3: g (sig. figs.!)**