Your Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ P\_\_\_\_\_ Chemistry

Your Score\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Possible\_\_171\_\_

**Bring a calculator to class everyday(IT WILL BE CHECKED DAILY FOR POINTS!)**

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C10 Molar Super Highway

**M**

**O**

**L**

**A**

**R**

**S**

**U**

**P**

**E**

**R**

**H**

**I**

**G**

**HW**

**A**

**Y**

***GIVEN*** Mass

It must be in grams,

if not

convert to grams!

***GIVEN***

Volume

It must be in liters,

if not

convert to liters!

***GIVEN***

Representative

Particles

*NEED*

Representative

Particles

*NEED*

Mass

In

Grams

*NEED*

Volume

in

liters

1\_mole

\_\_\_(always)\_\_

molar mass

You must calculate this!

1\_mole

\_\_\_(always)\_\_\_

22.4\_liters

(always)

1\_mole

\_\_\_(always)\_\_

6.02E23

(always)

6.02E23

\_\_\_(always)\_\_

1\_mole

(always)

molar mass

You must

calculate this!

\_\_\_\_\_\_\_\_\_\_

1\_mole

(always)

22.4\_liters

\_\_\_\_(always)\_\_\_\_

1\_mole

(always)

Chapter 10: Chemical Quantities

1. Avogadro’s Number or NA

2. empirical formula

3. molar mass

4. molar volume

5. mole or mol

6. percent composition

7. representative particle

8. standard temperature and pressure or STP

9. Molecular Formula

Please Calculate Molar mass

|  |  |  |
| --- | --- | --- |
| H2O |  |  |
| H | 1 x 2.0 | = 2  |
| O | 1 x 16.0 | = 16 |
|  | H2O =  | 18.0\_g |

|  |  |  |
| --- | --- | --- |
| Tl |  |  |
|  |  |  |
|  | Tl =  |   |

|  |  |  |
| --- | --- | --- |
| Fe(CN)2 |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  | Fe(CN)2 = |  |

|  |  |  |
| --- | --- | --- |
| N2 |  |  |
|  |  |  |
|  | N2 =  |   |

|  |  |  |
| --- | --- | --- |
| (NH4)2O2 |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  | (NH4)2O2 = |  |
|  |  |  |

|  |  |  |
| --- | --- | --- |
| Sn(HSO4)2 |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  | Sn(HSO4)2= |  |

C10 Moles to Mass and vica versa

Please Convert the # of Moles to the Mass

1. 1 mole of H2SO4 =

|  |  |  |
| --- | --- | --- |
| **1 *mole of H2SO4*** | **98.1 grams H2SO4**  |  **= 98.1 grams of H2SO4** |
|  | ***1 mole of H2SO4*** |  |

2. 10 moles of NaOH

3. 5 moles of NH4OH

4. 1.25 moles of Fe(C2H3O2)3

5. .75 moles of CuSO4

6. .50 moles CaSO4 • 2H2O

7. .11 moles MnCl2 • 4H2O

8. .05 moles C12H22O11

9. .01 moles Pb(OH)2

10. .17 moles K2SO4

11. .39 moles CaSO3

Please Convert the Mass to the # of Moles

12. 249.7 grams of CuSO4 • 5H2O

|  |  |  |
| --- | --- | --- |
| **249.7 grams *of CuSO4 • 5H2O*** | **1 mole of CuSO4 • 5H2O** | **= 1 mole of CuSO4 • 5H2O** |
|  | 249.7 grams *of CuSO4 • 5H2O* |  |

13. 435\_g of N2O5

14. 155\_g of (NH4)3PO4

15. 48\_g of MgSO4

16. 247\_g Al(NO3)3

17. 75\_g of Li3PO4

18. 333\_g of SO2

19. 1523\_g of MgCO3

20. 21\_g of Na2CO3

21. 785\_g of CH2Cl2COOH

C10 Moles to Volume and vica versa

Please Convert the # of Moles to liters of volume 1 mole of any gas at STP has a volume of 22.4\_liters

1. 10 moles of CO2

|  |  |  |
| --- | --- | --- |
| **10 *moles of CO2*** | **22.4\_l of CO2**  |  **= 224\_l of CO2** |
|  | ***1 mole of CO2*** |  |

2. .60 moles of SO2(g)

3. 3.50 moles of He2(g)

4. 3.20 x 10-3 moles of CO2(g)

5. .960 moles of CH4(g)

6. 3.72 moles of N2(g)

7. .45 moles CO(g)

8. .15 moles H2CCH2(g)

9. .01 moles HCCH(g)

10. .007 moles H2(g)

11. .39 moles Ar(g)

Please Convert liters of volume to the # of Moles

12. 100 liters of O2(g)

|  |  |  |
| --- | --- | --- |
| **100 liters of O2(g)** | **1 mole of O2(g)** | **= 4.46 mole of O2(g)** |
|  | 22.4 liters of O2(g) |  |

13 .15 liters of N2O5(g)

14. 114 liters of NH3(g)

15. 48 liters of H2CCHOH(g)

16. 1521\_l O3(g)

17. 1\_l CCl4(g)

18. .42\_l SO2(g)

19. 250\_ml Kr(g)

20. 45\_cc NO2(g)

21. 457\_cm3 SF7(g)

DC C10 Moles to RP and vica versa

Please Convert the # of Moles to the # of Representative Particles

1. 1 mole of H2SO4 =

|  |  |  |
| --- | --- | --- |
| **1 *mole of H2SO4*** | **6.02 x 1023 formula units H2SO4** |  **= 6.02 x 1023 formula units H2SO4** |
|  | ***1 mole of H2SO4*** |  |

2. 10 moles of sodium hydroxide

3. 5 moles of NH4OH

4. 1.25 moles of Fe(C2H3O2)3

5. .75 moles of Cupric sulfate

6. .50 moles CaSO4 • 2H2O

7. .11 moles MnCl2 • 4H2O

8. .05 moles C12H22O11

9. .01 moles Lead (II) hydroxide

10 .17 moles K2SO4

11 .39 moles Calcium sulfite

Please Convert the # of Representative Particles to the # of Moles

1. 6.02 x 1023 molecules of CuSO4 • 5H2O

|  |  |  |
| --- | --- | --- |
| ***6.02 x 1023 formula units CuSO4 • 5H2O*** | **1 mole of CuSO4 • 5H2O** | **= 1 mole of CuSO4 • 5H2O** |
|  | *6.02 x 1023 formula units of CuSO4 • 5H2O* |  |

1. 4.50 x 1021 molecules of dinitrogen pentoxide
2. 2.31 X 1015 formula units of (NH4)3PO4
3. 1.1 x 1025 formula units of MgSO4
4. 4.05 x 1011 formula units of Aluminum nitrate
5. 2.13 x 1030 formula units of Li3PO4
6. 9.9 x 103 molecules of Sulfur dioxide
7. 1.1 x 101 formula units of MgCO3
8. 5.00 x 100 formula units of Sodium Carbonate
9. 1.913 x 1017 molecules of CH2Cl2COOH

**Ch C10 Chemical Quantities Packet**

**Moles Mass Volume No. of Particles**

|  |  |  |  |
| --- | --- | --- | --- |
| 1 mole | 28 g N2 | 22.4 liter | 6.0 x 1023 |
| 3 moles |  g O2 | 67.2 liter |  |
|  | 8 g H2 |  | 2.4 x 1024 |
| 5 moles | 220 g CO2 |  |  |
|  |  | 44.8 liters SO2 | 1.2 x 1024 |
| 12 moles |  g NH3 |  | 7.2 x 1024 |
|  | 8 g O2 | 5.6 liter |  |
| 0.60 moles |  g N2 |  |  |
|  | 80 g O2 |  |  |
|  |  g NH3 | 56.0 liter |  |
|  |  g CH4 |  | 8 x 1023 |
|  | 0.66g CO2 |  |  |
| 1400 moles |  g CO |  |  |
|  |  g SO2 | 336 mL |  |
|  |  g O2 |  | 3 x 1021 |
|  | 8000g H2 |  |  |
| 28 moles NH3 |  |  |  |
|  |  g CCl4 |  | 9.5 x 1026 |
|  |  | 1680 liter CH4 |  |
|  |  g C2H6 |  | 9.0 x 1028 |

Ch C10 Chemical Quantities Packet

Please convert the # of liters of volume to the # of moles, mass, and number of representative particles. All Gases are @ STP. You must show **all work** & **units.**

1. 10\_l CO2
2. 250\_ml SO2(g)
3. 67.2\_l He2(g)

Please convert the # of representative particles to the # of moles, mass, and # of liters of volume. All Gases are @ STP. You must show **all work** & **units.**

1. 7.633 x 1023 molecules CO(g)

1. 2.58 x 1022 molecules CH4(g)
2. 1.91 x 1023 molecules H2CCH2(g)

**Ch C10 Chemical Quantities Packet**

28. Calculate the percent composition of the compounds that are formed from the following reactions

These are examples of the first problem type or 1. % composition of a unknown compound.

a. 9.03\_g Mg combines completely with 3.48\_g of N

b. 29.0\_g of Ag combines completely with 4.30\_g of S

c. 222.6\_g of Na combines completely with 77.4\_g of O

29. Calculate the % composition for each of these five compounds

These are examples of the second problem type or 2. % composition of a known compound

a. ethane, C2H6

b. sodium bisulfate, NaHSO4

c. calcium acetate, Ca(C2H3O2)2

d. hydrogen cyanide, HCN

e. water, H2O

30. Using the results of Problem 29, calculate the amount of hydrogen in the following amounts of these compounds

These are examples of the third problem type or 3. % composition of a element in a known amount of a known compound.

a.350\_g C2H6

b. 20.2\_g NaHSO4

c. 124\_g Ca(C2H3O2)2

d. 378\_g HCN

e. 100\_g H2O

Chemistry More Practice: Moles

Use your worksheets and your textbook as resources to complete this practice test. If you use a friend, be sure you understand the problem. Getting the answer is useless of you do not know how to solve the problem.

1. How many moles of carbon is 9.27 x 1026 atoms?
2. How many molecules are there in 10.0 moles of CO2? How many atoms?
3. How many nitrate ions are in 5 moles of potassium nitrate, KNO3?
4. How many grams are in 3.20 moles of water?
5. How many moles are in 1,000 grams of sodium chloride, NaCl?
6. What is the gram-formula mass of Na2CO3 • 10H2O?
7. The density of a gaseous compound of nitrogen and oxygen is 1.34 g/L. Determine the gram molecular mass of the compound. Is the compound NO or N2O?
8. How many silicon atoms are in a silicon chip that is pure silicon and weighs 1.00 grams?
9. Determine the volume in liters of 0.75 moles of nitrogen gas, N2.
10. How many moles are in 200 liters of chlorine gas, Cl2?
11. A 6.4 piece of copper combines completely with 1.6 grams of oxygen. What is the % composition of this compound?
12. What is the weight of 1 atom of uranium, U?
13. Calculate the % composition of H2SO4? Calculate the mass of sulfur in 400 grams of H2SO4.

Empirical Formulas



Molecular Formulas



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  **1A** |   **2A** |  | **3A 4A 5A 6A 7A** | **8A** |
| 1 |  |  3B 4B 5B 6B 7B 8B 9B 10B 1B 2B |  | 2 |
| H 1 | He |
| 1.00794 | 4.00260 |
| 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Li 2 | Be | B | C | N | O | F | Ne |
| 6.941 | 9.01218 | 10.81 | 12.0111 | 14.0067 | 15.9994 | 18.9984 | 20.179 |
| 11 3 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| Na | Mg | Al | Si | P | S | Cl | Ar |
| 22.9898 | 24.305 | 26.9815 | 28.0855 | 30.9738 | 32.06 | 35.453 | 39.948 |
| 19 4 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | *35* | 36 |
| K | Ca | Sc | Ti | V | Cr | Mn | Fe | Co | Ni | Cu | Zn | Ga | Ge | As | Se | *Br* | Kr |
| 39.0983 | 40.08 | 44.9559 | 47.88 | 50.9415 | 51.996 | 54.938 | 55.847 | 58.933 | 58.69 | 63.546 | 65.39 | 69.72 | 72.59 | 74.9216 | 78.96 | *79.904* | 83.80 |
| 37 5 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 |
| Rb | Sr | Y | Zr | Nb | Mo | Tc | Ru | Rh | Pd | Ag | Cd | In | Sn | Sb | Te | I | Xe |
| 85.4678 | 87.62 | 88.9059 | 91.224 | 92.9064 | 95.94 | (98) | 101.07 | 102.906 | 106.42 | 107.868 | 112.41 | 114.82 | 118.71 | 121.75 | 127.60 | 126.905 | 131.29 |
| 55 6 | 56 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | *80* | 81 | 82 | 83 | 84 | 85 | 86 |
| Cs | Ba | Lu | Hf | Ta | W | Re | Os | Ir | Pt | Au | *Hg* | Tl | Pb | Bi | Po | At | Rn |
| 132.905 | 137.33 | 174.967 | 178.49 | 180.948 | 183.85 | 186.207 | 190.2 | 192.22 | 195.08 | 196.967 | *200.59* | 204.383 | 207.2 | 208.980 | (209) | (210) | (222) |
| 87 7 | 88 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 |  | 114 |  | 116 |  | 118 |
| Fr | Ra | Lr | Rf | Db | Sg | Ns | Hs | Mt | Ds | Uuu | Uub |  | Uuq |  | Uuh |  | Uuo |
| (223) | 226.025 | (260) | (261) | (262) | (266) | (262) | (265) | (266) | (271) | (272) | (277) |  | (289) |  |  |  |  |
|  |  |
|  6 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 |
| La | Ce | Pr | Nd | Pm | Sm | Eu | Gd | Tb | Dy | Ho | Er | Tm | Yb |
|  | 138.906 | 140.12 | 140.908 | 144.24 | (145) | 150.36 | 151.96 | 157.25 | 158.925 | 162.50 | 164.930 | 167.26 | 168.934 | 173.04 |
|  7 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 | 101 | 102 |
| Ac | Th | Pa | U | Np | Pu | Am | Cm | Bk | Cf | Es | Fm | Md | No |
| 227.028 | 232.038 | 231.036 | 238.03 | 237.05 | (244) | (243) | (247) | (247) | (251) | (252) | (257) | (258) | (259) |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Monatomic** | **Ions** |  |  |  |  |
| Formula | Name | Name | Formula | Name | Alternative |
| ***+1*** | ***Cations*** |  | -1 Charge | Anions |  |
| H+ | Hydrogen |  | **H-** | **Hydride** |  |
| Li+ | Lithium  |  | **F-** | **Fluoride** |  |
| Na+ | Sodium |  | **Cl-** | **Chloride** |  |
| K+ | Potassium |  | **Br-** | **Bromide** |  |
| Rb+ | Rubidium |  | **I-** | **Iodide** |  |
| Cs+ | Cesium |  | -1 Charge | Anions |  |
| Cu+1 | Copper **(I)** | Cupr**ous** | **C2H3O2-** | **Acetate** |  |
| **Hg2+2** | Mercury **(I)** | Mercur**ous** | **ClO-** | **Hypochlorite** |  |
| Ag+ | Silver |  | **ClO2-** | **Chlorite** |  |
| Au+ | Gold |  | **ClO3-** | **Chlorate** |  |
| NH4 +1 | Ammonium  |  | **ClO4-** | **Perchlorate** |  |
| ***+2*** | ***Cations*** |  | **CN-** | **Cyanide** |  |
| Be+2 | Beryllium |  | **HCO3-** | **Hydrogen carbonate** | **Bicarbonate** |
| Mg+2 | Magnesium |  | **HSO3-1** | **Hydrogen Sulfite** |  |
| Ca+2 | Calcium |  | **HSO4-1** | **Hydrogen Sulfate** | **Bisulfate** |
| Sr+2 | Strontium |  | **H2PO4-1** | **Dihydrogen Phosphate** |  |
| Ba+2 | Barium |  | **MnO4-** | **Permanganate** |  |
| Ra+2 | Radium |  | **NO2-** | **Nitrite** |  |
| Zn+2 | Zinc |  | **NO3-** | **Nitrate** |  |
| Cd+2 | Cadmium  |  | **OH-** | **Hydroxide** |  |
| Cu+2 | Copper *(II)*  | Cupr*ic* | **SCN-** | **Thiocyanate** |  |
| Hg+2 | Mercury *(II)* | Mercur*ic* | **C2H3O2-** | **Acetate** |  |
| Fe+2 | Iron **(II)**  | Ferr**ous** | -2 Charge | Anions |  |
| Cr+2 | Chromium **(II)** | Chrom**ous** | **O-2** |  **Oxide** |  |
| Mn+2 | Manganese **(II)** | Mangan**ous** | **S-2** |  **Sulfide** |  |
| Co+2 | Cobalt **(II)** | Cobalt**ous** | **Se-2** |  **Selenide** |  |
| Ni+2 | Nickel (II) |  | **CO3-2** | **Carbonate** |  |
| Sn+2 | Tin **(II)** | Stann**ous** | **C2O4-2** | **Oxalate** |  |
| Pb+2 | Lead **(II)** | Plumb**ous** | **CrO4-2** | **Chromate** |  |
| **3+** | **Cations** |  | **Cr2O7-2** | **Dichromate** |  |
| B+3 | Boron |  | **HPO4-2** | **Hydrogen Phosphate** |  |
| Al+3 | Aluminum |  | **O2-2** | **Peroxide** |  |
| Ga+3 | Gallium |  | **SO3-2** | **Sulfite** |  |
| In+3 | Indium |  | **SO4-2** | **Sulfate** |  |
| Tl+3 | Thallium |  | **SiO3-2** | **Silicate** |  |
| Sb+3 | Antimony (III) |  | -3 Charge | Anions |  |
| As+3 | Arsenic (III) |  | **N-3** | **Nitride** |  |
| Bi+3 | Bismuth (III) |  | **P-3** | **Phosphide** |  |
| Ni+3 | Nickel (III) ion |  | **PO3-3** | **Phosphite** |  |
| Fe+3 | Iron *(III)* | Ferr*ic* | **PO4-3** | **Phosphate** |  |
| Cr+3 | Chromium *(III)*  | Chrom*ic* | **AsO4-3** | **Arsenate** |  |
| Mn+3 | Manganese *(III)* | Mangan*ic* |  |  |  |
| Co+3 | Cobalt *(III)* | Cobalt*ic* |  |  |  |
| Ti+3 | Titanium *(III)* | Titan**ous** |  |  |  |
| **4+** | **Cations** |  |  |  |  |
| Mn+4 | Manganese (IV) |  |  |  |  |
| Sn+4 | Tin *(IV)* ion | Stann*ic* ion |  |  |  |
| Pb+4 | Lead *(IV)* ion | Plumb*ic* ion |  |  |  |
| **5+** | **Cations** |  |  |  |  |
| Sb+5 | Antimony (V) |  |  |  |  |
| As+5 | Arsenic (V) |  |  |  |  |