

Math Practice Problems

	<b>Mass (g)</b>	<b>Volume (cm<sup>3</sup>)</b>	<b>Density (g/cm<sup>3</sup>)</b>
	<i>Example:</i> 4725	350	$4725 \div 350 = 13.5$
a.	171	15	_____
b.	148	40	_____
c.	475	250	_____
d.	680	1000	_____

1)  $3.461728 + 14.91 + 0.980001 + 5.2631$

2)  $23.1 + 4.77 + 125.39 + 3.581$

3)  $22.101 - 0.9307$

4)  $0.04216 - 0.0004134$

5)  $564,321 - 264,321$

1)  $(3.4617 \times 10^7) \div (5.61 \times 10^{-4})$

2)  $[(9.714 \times 10^5) (2.1482 \times 10^{-9})] \div [(4.1212) (3.7792 \times 10^{-5})]$ . Watch your order of operations on this problem.

3)  $(4.7620 \times 10^{-15}) \div [(3.8529 \times 10^{12}) (2.813 \times 10^{-7}) (9.50)]$

4)  $[(561.0) (34,908) (23.0)] \div [(21.888) (75.2) (120.00)]$

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1)  $(2.68 \times 10^{-5}) \times (4.40 \times 10^{-8})$

2)  $(2.95 \times 10^7) \div (6.28 \times 10^{15})$

3)  $(8.41 \times 10^6) \times (5.02 \times 10^{12})$

4)  $(9.21 \times 10^{-4}) \div (7.60 \times 10^5)$

1 <b>H</b> Hydrogen 1.00794																	2 <b>He</b> Helium 4.003
3 <b>Li</b> Lithium 6.941	4 <b>Be</b> Beryllium 9.012183											5 <b>B</b> Boron 10.811	6 <b>C</b> Carbon 12.0107	7 <b>N</b> Nitrogen 14.00674	8 <b>O</b> Oxygen 15.99904	9 <b>F</b> Fluorine 18.9984032	10 <b>Ne</b> Neon 20.1797
11 <b>Na</b> Sodium 22.989770	12 <b>Mg</b> Magnesium 24.3050											13 <b>Al</b> Aluminium 26.981538	14 <b>Si</b> Silicon 28.0855	15 <b>P</b> Phosphorus 30.973761	16 <b>S</b> Sulfur 32.066	17 <b>Cl</b> Chlorine 35.4527	18 <b>Ar</b> Argon 39.948
19 <b>K</b> Potassium 39.0983	20 <b>Ca</b> Calcium 40.078	21 <b>Sc</b> Scandium 44.955910	22 <b>Ti</b> Titanium 47.867	23 <b>V</b> Vanadium 50.9415	24 <b>Cr</b> Chromium 51.9961	25 <b>Mn</b> Manganese 54.938049	26 <b>Fe</b> Iron 55.845	27 <b>Co</b> Cobalt 58.933200	28 <b>Ni</b> Nickel 58.6934	29 <b>Cu</b> Copper 63.546	30 <b>Zn</b> Zinc 65.39	31 <b>Ga</b> Gallium 69.723	32 <b>Ge</b> Germanium 72.61	33 <b>As</b> Arsenic 74.92160	34 <b>Se</b> Selenium 78.96	35 <b>Br</b> Bromine 79.904	36 <b>Kr</b> Krypton 83.80
37 <b>Rb</b> Rubidium 85.4678	38 <b>Sr</b> Strontium 87.62	39 <b>Y</b> Yttrium 88.90585	40 <b>Zr</b> Zirconium 91.224	41 <b>Nb</b> Niobium 92.90638	42 <b>Mo</b> Molybdenum 95.94	43 <b>Tc</b> Technetium (98)	44 <b>Ru</b> Ruthenium 101.07	45 <b>Rh</b> Rhodium 102.90550	46 <b>Pd</b> Palladium 106.42	47 <b>Ag</b> Silver 107.8682	48 <b>Cd</b> Cadmium 112.411	49 <b>In</b> Indium 114.818	50 <b>Su</b> Tin 118.710	51 <b>Sb</b> Antimony 121.760	52 <b>Te</b> Tellurium 127.60	53 <b>I</b> Iodine 126.90447	54 <b>Xe</b> Xenon 131.29
55 <b>Cs</b> Cesium 132.90545	56 <b>Ba</b> Barium 137.327	57 <b>La</b> Lanthanum 138.9055	72 <b>Hf</b> Hafnium 178.49	73 <b>Ta</b> Tantalum 180.9479	74 <b>W</b> Tungsten 183.84	75 <b>Re</b> Rhenium 186.207	76 <b>Os</b> Osmium 190.23	77 <b>Ir</b> Iridium 192.217	78 <b>Pt</b> Platinum 195.078	79 <b>Au</b> Gold 196.96655	80 <b>Hg</b> Mercury 200.59	81 <b>Tl</b> Thallium 204.3833	82 <b>Pb</b> Lead 207.2	83 <b>Bi</b> Bismuth 208.98038	84 <b>Po</b> Polonium (209)	85 <b>At</b> Astatine (210)	86 <b>Rn</b> Radon (222)
87 <b>Fr</b> Francium (223)	88 <b>Ra</b> Radium (226)	89 <b>Ac</b> Actinium (227)	104 <b>Rf</b> Rutherfordium (261)	105 <b>Db</b> Dubnium (262)	106 <b>Sg</b> Seaborgium (263)	107 <b>Bh</b> Bohrium (264)	108 <b>Hs</b> Hassium (265)	109 <b>Mt</b> Meitnerium (266)	110 (269)	111 (272)	112 (277)						

58 <b>Ce</b> Cerium 140.116	59 <b>Pr</b> Praseodymium 140.90765	60 <b>Nd</b> Neodymium 144.24	61 <b>Pm</b> Promethium (145)	62 <b>Sm</b> Samarium 150.36	63 <b>Eu</b> Europium 151.964	64 <b>Gd</b> Gadolinium 157.25	65 <b>Tb</b> Terbium 158.92534	66 <b>Dy</b> Dysprosium 162.50	67 <b>Ho</b> Holmium 164.93032	68 <b>Er</b> Erbium 167.26	69 <b>Tm</b> Thulium 168.93421	70 <b>Yb</b> Ytterbium 173.04	71 <b>Lu</b> Lutetium 174.967
90 <b>Th</b> Thorium 232.0381	91 <b>Pa</b> Protactinium 231.03688	92 <b>U</b> Uranium 238.0289	93 <b>Np</b> Neptunium (237)	94 <b>Pu</b> Plutonium (244)	95 <b>Am</b> Americium (243)	96 <b>Cm</b> Curium (247)	97 <b>Bk</b> Berkelium (247)	98 <b>Cf</b> Californium (251)	99 <b>Es</b> Einsteinium (252)	100 <b>Fm</b> Fermium (257)	101 <b>Md</b> Mendelevium (258)	102 <b>No</b> Nobelium (259)	103 <b>Lr</b> Lawrencium (262)

## Mole Conversion Problems

Complete the following practice problems for mole conversion. Show your work and units!

1. How many moles are in 72.9 g of HCl? Molar mass HCl =  $36.46 \frac{g}{mol}$

$$\frac{72.9g}{36.46 \frac{g}{mol}} = \boxed{1.999 \text{ mol}}$$

2. How many moles are in 79.85 g Fe<sub>2</sub>O<sub>3</sub>? Molar mass =  $159.7 \frac{g}{mol}$

$$\frac{79.85g}{159.7 \frac{g}{mol}} = \boxed{0.5 \text{ mol}}$$

3. How many molecules are in 720 g of C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>? Molar mass =  $180.18 \frac{g}{mol}$

$$\frac{720g}{180.18 \frac{g}{mol}} = 3.996 \text{ mol} \quad 3.996 \text{ mol} \times (6.02 \times 10^{23} \frac{\text{particles}}{\text{mol}}) = \boxed{2.406 \times 10^{24} \text{ particles}}$$

4. How many grams are in 3.5 mol of Ca<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub>? Molar mass =  $310.18 \frac{g}{mol}$

$$310.18 \frac{g}{mol} \times 3.5 \text{ mol} = \boxed{1085.63 \text{ g}}$$

5. How many molecules are in 8550g of SO<sub>2</sub>? Molar mass =  $64.07 \frac{g}{mol}$

$$\frac{8550g}{64.07 \frac{g}{mol}} = 133.45 \text{ mol} \quad 133.45 \text{ mol} \times (6.02 \times 10^{23} \frac{\text{particles}}{\text{mol}}) = \boxed{8.03 \times 10^{25} \text{ particles}}$$

6. How many grams are in  $3.01 \times 10^{24}$  molecules of (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>? Molar mass =  $132.17 \frac{g}{mol}$

$$\frac{3.01 \times 10^{24} \text{ particles}}{6.02 \times 10^{23} \frac{\text{particles}}{\text{mol}}} = 5 \text{ mol} \quad 5 \text{ mol} \times 132.17 \frac{g}{mol} = \boxed{660.85 \text{ g}}$$

7. How many molecules are in 85 g of AgNO<sub>3</sub>? Molar mass =  $169.88 \frac{g}{mol}$

$$\frac{85g}{169.88 \frac{g}{mol}} = 0.5 \text{ mol} \quad 0.5 \text{ mol} \times (6.02 \times 10^{23} \frac{\text{particles}}{\text{mol}}) = \boxed{3.01 \times 10^{23}}$$

8. How many grams are in  $1.204 \times 10^{24}$  molecules of CH<sub>3</sub>COOH? Molar mass =  $60.06 \frac{g}{mol}$

$$\frac{1.204 \times 10^{24} \text{ particles}}{6.02 \times 10^{23} \frac{\text{particles}}{\text{mol}}} = 2.0 \text{ mol} \quad 2.0 \text{ mol} \times 60.06 \frac{g}{mol} = \boxed{120.12 \text{ g}}$$

Date \_\_\_\_\_ Name \_\_\_\_\_ Per \_\_\_\_\_

9. Convert 86.84 g of LiBr to moles: Molar mass =  $86.84 \frac{g}{mol}$

$$\frac{86.84 \text{ g}}{86.84 \frac{g}{mol}} = \boxed{1.0 \text{ mol}}$$

10. Convert 8.045 g of  $\text{H}_2\text{CO}_3$  to moles: Molar mass =  $62.03 \frac{g}{mol}$

$$\frac{8.045 \text{ g}}{62.03 \frac{g}{mol}} = \boxed{0.1297 \text{ mol}}$$

11. How many grams of lithium are there in 3.45 moles? Molar mass =  $6.94 \frac{g}{mol}$

$$6.94 \frac{g}{mol} \times 3.45 \text{ mol} = \boxed{23.943 \text{ g}}$$

12. How many moles of nitrogen are there in  $4.3 \times 10^{23}$  molecules?

$$\frac{4.3 \times 10^{23} \text{ particles}}{6.02 \times 10^{23} \frac{\text{particles}}{\text{mol}}} = \boxed{.714 \text{ mol}}$$

13. How many cadmium atoms are there in  $6.57 \times 10^3$  moles?

$$6.57 \times 10^3 \text{ moles} \times (6.02 \times 10^{23} \frac{\text{particles}}{\text{mol}}) = \boxed{3.955 \times 10^{27} \text{ particles}}$$

14. How many grams of  $\text{SO}_2$  are  $4.5 \times 10^{24}$  molecules? Molar mass =  $64.07 \frac{g}{mol}$

$$\frac{4.5 \times 10^{24} \text{ particles}}{6.02 \times 10^{23} \frac{\text{particles}}{\text{mol}}} = 7.475 \text{ mol} \quad 7.475 \text{ mol} \times 64.07 \frac{g}{mol} = \boxed{478.93 \text{ g}}$$

15. How many copper atoms are in 5.6 mole of  $\text{Cu}_2\text{O}_3$ ?

$$5.6 \text{ mol} \times (6.02 \times 10^{23} \frac{\text{particles}}{\text{mol}}) = \boxed{3.37 \times 10^{24} \text{ particles}}$$

16. How many grams of sulfur are in  $3.45 \times 10^{22}$  molecules of  $\text{SO}_2$ ? Molar mass Sulfur =  $32.07 \frac{g}{mol}$

$$\frac{3.45 \times 10^{22} \text{ particles}}{6.02 \times 10^{23} \frac{\text{particles}}{\text{mol}}} = 0.0573 \text{ mol} \quad 0.0573 \text{ mol} \times 32.07 \frac{g}{mol} = \boxed{1.838 \text{ g}}$$

Polychlorides have O atoms (ate / ite)  
 Per-ate 5  
 Per-ite 4  
 Hite 3  
 Hite 2  
 Hite 1

# Periodic Table of the Elements

Mercury I =  $Hg_2^{2+}$   
 Mercury II =  $Hg^{2+}$   
 Nitric acid  $HNO_3$   
 Sulfuric acid  $H_2SO_4$   
 Copper I  $HClO$  hypochlorous acid  
 Copper II  $HClO_2$  chlorous acid

1 H 1.00794	2 He 4.002602																
3 Li 6.941	4 Be 9.012182											5 B 10.811	6 C 12.0107	7 N 14.00674	8 O 15.9994	9 F 18.9984032	10 Ne 20.1797
11 Na 22.989770	12 Mg 24.3050											13 Al 26.981538	14 Si 28.0855	15 P 30.973761	16 S 32.06	17 Cl 35.4527	18 Ar 39.948
19 K 39.0983	20 Ca 40.078	21 Sc 44.955910	22 Ti 47.867	23 V 50.9415	24 Cr 51.9961	25 Mn 54.938049	26 Fe 55.845	27 Co 58.933200	28 Ni 58.6934	29 Cu 63.546	30 Zn 65.39	31 Ga 69.723	32 Ge 72.61	33 As 74.92160	34 Se 78.96	35 Br 79.904	36 Kr 83.80
37 Rb 85.4678	38 Sr 87.62	39 Y 88.90585	40 Zr 91.224	41 Nb 92.90638	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.90550	46 Pd 106.42	47 Ag 107.8682	48 Cd 112.411	49 In 114.818	50 Sn 118.710	51 Sb 121.760	52 Te 127.60	53 I 126.90447	54 Xe 131.29
55 Cs 132.90545	56 Ba 137.327	57 La 138.9055	58 Ce 140.116	59 Pr 140.90765	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.964	64 Gd 157.25	65 Tb 158.92534	66 Dy 162.50	67 Ho 164.93032	68 Er 167.26	69 Tm 168.93421	70 Yb 173.04	71 Lu 174.967	
87 Fr (223)	88 Ra (226)	89 Ac (227)	104 Rf (261)	105 Db (262)	106 Sg (263)	107 Bh (262)	108 Hs (265)	109 Mt (266)	110 Dz (269)	111 Nh (272)	112 Fl (277)	113 Nh (283)	114 Nh (284)	115 Nh (285)	116 Nh (286)	117 Nh (287)	118 Nh (288)

$CS^+$   $Mg^{2+}$   
 $Rb^+$   $Ra^{2+}$   
 $Li^+$   $Ba^{2+}$

58 Ce 140.116	59 Pr 140.90765	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.964	64 Gd 157.25	65 Tb 158.92534	66 Dy 162.50	67 Ho 164.93032	68 Er 167.26	69 Tm 168.93421	70 Yb 173.04	71 Lu 174.967
90 Th 232.0381	91 Pa 231.03588	92 U 238.0289	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (262)

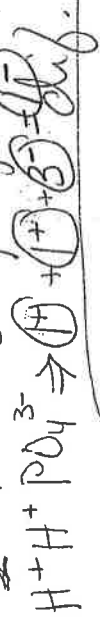
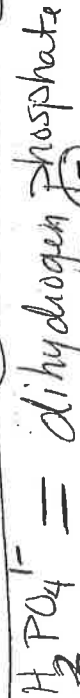
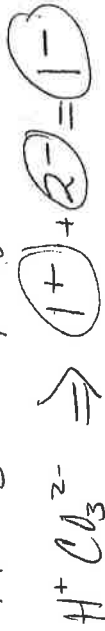
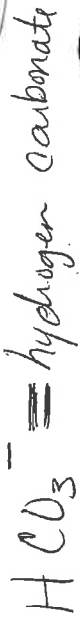
S.E. Van Brumer, 7/22/99  
 1995 IUPAC masses and Approved Names from <http://www.chem.qmw.ac.uk/iupac/ATWV>  
 masses for 107-111 from C&EN, March 13, 1995, P 35  
 112 from <http://www.gsi.de/z112c.html>  
 114 from C&EN July 19, 1999  
 116 and 118 from <http://www.jbl.gov/Science/Articles/Archive/Elements-116-118.html>

Magnesium chloride  
 $Mg^{2+} Cl^-$   $MgCl_2$

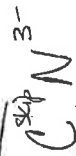
$Al_2S_3$   $Al^{3+} S^{2-}$  = aluminum sulfide

$N_2$   $O_2$   $F_2$   
 $Cl_2$   $Br_2$   $I_2$   
 $H_2$   
 Diatomic  
 7-  
 Shaper

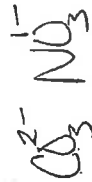
extra H atoms



Monatomic



Polyatomic



Acids no O = Hydro-ic acid

-ate changes to -ic acid

-ite " " -ous acid

Oxygen atoms

	in	out
per	ate	4
	ate	3
	ite	2
hypo	ite	1

+	1-	2-
$NH_4^+$ ammonium	$OH^-$ hydroxide $CN^-$ cyanide $CH_3COO^-$ acetate	$O_2^{2-}$ peroxide

mono  
di  
tri  
tetra  
penta  
hexa  
hepta  
octa  
nona  
deca

same

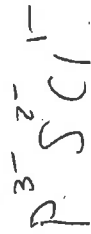
Monatomic



Polyatomic



Polyatomic



hydrochloric acid



hydrosulfuric acid



hydrocyanic acid

$N^{2-} O_7$   
di-nitrogen heptoxide  
 $CH_4$   
carbon tetrachloride  
 $Br_8$   
octabromine  
 $C$   
tricarbide