

The Periodic Table of the Elements

1 H Hydrogen 1.00794																	2 He Helium 4.003																	
3 Li Lithium 6.941	4 Be Beryllium 9.012182															9 F Fluorine 18.9984032	10 Ne Neon 20.1797																	
11 Na Sodium 22.989770	12 Mg Magnesium 24.3050															17 Cl Chlorine 35.4527	18 Ar Argon 39.948																	
19 K Potassium 39.0983	20 Ca Calcium 40.078	21 Sc Scandium 44.955910	22 Ti Titanium 47.867	23 V Vanadium 50.9415	24 Cr Chromium 51.9961	25 Mn Manganese 54.938049	26 Fe Iron 55.845	27 Co Cobalt 58.933200	28 Ni Nickel 58.6934	29 Cu Copper 63.546	30 Zn Zinc 65.39	31 Ga Gallium 69.723	32 Ge Germanium 72.61	33 As Arsenic 74.92160	34 Se Selenium 78.96	35 Br Bromine 79.904	36 Kr Krypton 83.80																	
37 Rb Rubidium 85.4678	38 Sr Strontium 87.62	39 Y Yttrium 88.90585	40 Zr Zirconium 91.224	41 Nb Niobium 92.90638	42 Mo Molybdenum 95.94	43 Tc Technetium (98)	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.90550	46 Pd Palladium 106.42	47 Ag Silver 107.8682	48 Cd Cadmium 112.411	49 In Indium 114.818	50 Sn Tin 118.710	51 Sb Antimony 121.760	52 Te Tellurium 127.60	53 I Iodine 126.90447	54 Xe Xenon 131.29																	
55 Cs Cesium 132.90545	56 Ba Barium 137.327	57 La Lanthanum 138.9055	72 Hf Hafnium 178.49	73 Ta Tantalum 180.9479	74 W Tungsten 183.84	75 Re Rhenium 186.207	76 Os Osmium 190.23	77 Ir Iridium 192.217	78 Pt Platinum 195.078	79 Au Gold 196.96655	80 Hg Mercury 200.59	81 Tl Thallium 204.3833	82 Pb Lead 207.2	83 Bi Bismuth 208.98038	84 Po Polonium (209)	85 At Astatine (210)	86 Rn Radon (222)																	
87 Fr Francium (223)	88 Ra Radium (226)	89 Ac Actinium (227)	104 Rf Rutherfordium (261)	105 Db Dubnium (262)	106 Sg Seaborgium (263)	107 Bh Bohrium (262)	108 Hs Hassium (265)	109 Mt Meitnerium (266)	110 Uu Ununium (269)	111 Uu Ununium (272)	112 Uu Ununium (277)	113 Uu Ununium (279)	114 Uu Ununium (285)																					
																		67 Ho Holmium 164.93032	68 Er Erbium 167.26	69 Tm Thulium 168.93421	70 Yb Ytterbium 173.04	71 Lu Lutetium 174.967												
																		98 Cf Californium (251)	99 Es Einsteinium (252)	100 Fm Fermium (257)	101 Md Mendelevium (258)	102 No Nobelium (259)	103 Lr Lawrencium (262)											
																		66 Dy Dysprosium 162.50	65 Tb Terbium 158.92534	64 Gd Gadolinium 157.25	63 Eu Europium 151.964	62 Sm Samarium 150.36	61 Pm Promethium (145)	60 Nd Neodymium 144.24	59 Pr Praseodymium 140.90765	58 Ce Cerium 140.116	97 Bk Berkelium (247)	96 Cm Curium (247)	95 Am Americium (243)	94 Pu Plutonium (244)	93 Np Neptunium (237)	92 U Uranium 238.0289	91 Pa Protactinium 231.03588	90 Th Thorium 232.0381

GRAM FORMULA MASS

Name _____

Determine the gram formula mass (the mass of one mole) of each compound below.

1. KMnO_4 _____

2. KCl _____

3. Na_2SO_4 _____

4. $\text{Ca}(\text{NO}_3)_2$ _____

5. $\text{Al}_2(\text{SO}_4)_3$ _____

6. $(\text{NH}_4)_3\text{PO}_4$ _____

7. $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ _____

8. $\text{Mg}_3(\text{PO}_4)_2$ _____

9. $\text{Zn}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot 2\text{H}_2\text{O}$ _____

10. $\text{Zn}_3(\text{PO}_4)_2 \cdot 4\text{H}_2\text{O}$ _____

11. H_2CO_3 _____

12. $\text{Hg}_2\text{Cr}_2\text{O}_7$ _____

13. $\text{Ba}(\text{ClO}_3)_2$ _____

14. $\text{Fe}_2(\text{SO}_3)_3$ _____

15. $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$ _____

MOLES AND MASS

Name _____

Determine the number of moles in each of the quantities below.

1. 25 g of NaCl	_____
2. 125 g of H ₂ SO ₄	_____
3. 100. g of KMnO ₄	_____
4. 74 g of KCl	_____
5. 35 g of CuSO ₄ •5H ₂ O	_____

Determine the number of grams in each of the quantities below.

1. 2.5 moles of NaCl	_____
2. 0.50 moles of H ₂ SO ₄	_____
3. 1.70 moles of KMnO ₄	_____
4. 0.25 moles of KCl	_____
5. 3.2 moles of CuSO ₄ •5H ₂ O	_____

THE MOLE AND VOLUME

Name _____

For gases at STP (273 K and 1 atm pressure), one mole occupies a volume of 22.4 L. What volume will the following quantities of gases occupy at STP?

1. 1.00 mole of H_2

2. 3.20 moles of O_2

3. 0.750 mole of N_2

4. 1.75 moles of CO_2

5. 0.50 mole of NH_3

6. 5.0 g of H_2

7. 100. g of O_2

8. 28.0 g of N_2

9. 60. g of CO_2

10. 10. g of NH_3

THE MOLE AND AVOGADRO'S NUMBER

Name _____

One mole of a substance contains Avogadro's Number (6.02×10^{23}) of molecules.

How many molecules are in the quantities below?

1. 2.0 moles

2. 1.5 moles

3. 0.75 mole

4. 15 moles

5. 0.35 mole

How many moles are in the number of molecules below?

1. 6.02×10^{23}

2. 1.204×10^{24}

3. 1.5×10^{20}

4. 3.4×10^{26}

5. 7.5×10^{19}

MIXED MOLE PROBLEMS

Name _____

Solve the following problems.

1. How many grams are there in 1.5×10^{25} molecules of CO_2 ?

2. What volume would the CO_2 in Problem 1 occupy at STP?

3. A sample of NH_3 gas occupies 75.0 liters at STP. How many molecules is this?

4. What is the mass of the sample of NH_3 in Problem 3?

5. How many atoms are there in 1.3×10^{22} molecules of NO_2 ?

6. A 5.0 g sample of O_2 is in a container at STP. What volume is the container?

7. How many molecules of O_2 are in the container in Problem 6? How many atoms of oxygen?

PERCENTAGE COMPOSITION

Name _____

Determine the percentage composition of each of the compounds below.



K = _____

Mn = _____

O = _____



H = _____

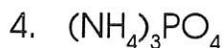
Cl = _____



Mg = _____

N = _____

O = _____

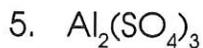


N = _____

H = _____

P = _____

O = _____



Al = _____

S = _____

O = _____

Solve the following problems.

6. How many grams of oxygen can be produced from the decomposition of 100. g of KClO_3 ? _____

7. How much iron can be recovered from 25.0 g of Fe_2O_3 ? _____

8. How much silver can be produced from 125 g of Ag_2S ? _____

Name _____

DETERMINING EMPIRICAL FORMULAS

What is the empirical formula (lowest whole number ratio) of the compounds below?

1. 75% carbon, 25% hydrogen

2. 52.7% potassium, 47.3% chlorine

3. 22.1% aluminum, 25.4% phosphorus, 52.5% oxygen

4. 13% magnesium, 87% bromine

5. 32.4% sodium, 22.5% sulfur, 45.1% oxygen

6. 25.3% copper, 12.9% sulfur, 25.7% oxygen, 36.1% water

DETERMINING MOLECULAR FORMULAS (TRUE FORMULAS)

Name _____

Solve the problems below.

1. The empirical formula of a compound is NO_2 . Its molecular mass is 92 g/mol. What is its molecular formula?

2. The empirical formula of a compound is CH_2 . Its molecular mass is 70 g/mol. What is its molecular formula?

3. A compound is found to be 40.0% carbon, 6.7% hydrogen and 53.5% oxygen. Its molecular mass is 60. g/mol. What is its molecular formula?

4. A compound is 64.9% carbon, 13.5% hydrogen and 21.6% oxygen. Its molecular mass is 74 g/mol. What is its molecular formula?

5. A compound is 54.5% carbon, 9.1% hydrogen and 36.4% oxygen. Its molecular mass is 88 g/mol. What is its molecular formula?

COMPOSITION OF HYDRATES

Name _____

A hydrate is an ionic compound with water molecules loosely bonded to its crystal structure. The water is in a specific ratio to each formula unit of the salt. For example, the formula $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ indicates that there are five water molecules for every one formula unit of CuSO_4 . Answer the questions below.

1. What percentage of water is found in $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$?

2. What percentage of water is found in $\text{Na}_2\text{S} \cdot 9\text{H}_2\text{O}$?

3. A 5.0 g sample of a hydrate of BaCl_2 was heated, and only 4.3 g of the anhydrous salt remained. What percentage of water was in the hydrate?

4. A 2.5 g sample of a hydrate of $\text{Ca}(\text{NO}_3)_2$ was heated, and only 1.7 g of the anhydrous salt remained. What percentage of water was in the hydrate?

5. A 3.0 g sample of $\text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$ is heated to constant mass. How much anhydrous salt remains?

6. A 5.0 g sample of $\text{Cu}(\text{NO}_3)_2 \cdot n\text{H}_2\text{O}$ is heated, and 3.9 g of the anhydrous salt remains. What is the value of n?
