

Chemical Reactions Part #1 Review

Average Atomic Mass

1. Rubidium is a soft, silvery-white metal that has two common isotopes, ^{85}Rb and ^{87}Rb . If the abundance of ^{85}Rb is 72.2% and the abundance of ^{87}Rb is 27.8%, what is the average atomic mass of rubidium?
2. Uranium is used in nuclear reactors and is a rare element on earth. Uranium has three common isotopes. If the abundance of ^{234}U is 0.01%, the abundance of ^{235}U is 0.71%, and the abundance of ^{238}U is 99.28%, what is the average atomic mass of uranium?
3. Titanium has five common isotopes: ^{46}Ti (8.0%), ^{47}Ti (7.8%), ^{48}Ti (73.4%), ^{49}Ti (5.5%), ^{50}Ti (5.3%). What is the average atomic mass of titanium?
4. Copper used in electric wires comes in two flavors (isotopes): ^{63}Cu and ^{65}Cu . ^{63}Cu has an atomic mass of 62.9298 amu and an abundance of 69.09%. The other isotope, ^{65}Cu , has an abundance of 30.91%. The average atomic mass between these two isotopes is 63.546 amu. Calculate the actual atomic mass of ^{65}Cu .
5. Magnesium consists of three naturally occurring isotopes. The percent abundance of these isotopes is as follows: ^{24}Mg (78.70%), ^{25}Mg (10.13%), and ^{26}Mg (11.7%). The average atomic mass of the three isotopes is 24.3050 amu. If the atomic mass of ^{25}Mg is 24.98584 amu, and ^{26}Mg is 25.98259 amu, calculate the actual atomic mass of ^{24}Mg .

Naming Compounds & Molar Masses

6. Name each of the following chemical compounds and list their molar masses to the nearest g/mol:

(a) AgNO_3 silver nitrate Mass = $107.9 + 14 + 3(16) = 170\text{g}$

(b) PbSO_4 lead (II) sulfate Mass = 303g

(c) CoCl_2 cobalt chloride Mass = 130g

(d) $\text{Sn}(\text{CO}_3)_2$ tin (IV) carbonate Mass = 239g

7. Write the formulas of each of the following chemical compounds and list their molar masses to the nearest g/mol:

(a) copper (I) oxide Cu_2O Mass = 143g

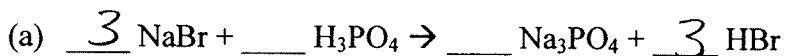
(b) ammonium phosphate $(\text{NH}_4)_3\text{PO}_4$ Mass = 149g

(c) vanadium (V) cyanide $\underline{V(CN)_5}$ Mass = $\underline{181g}$

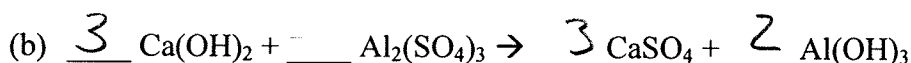
(d) platinum (IV) hydroxide $\underline{Pt(OH)_4}$ Mass = $\underline{263g}$

Balancing Equations and Type of Reaction

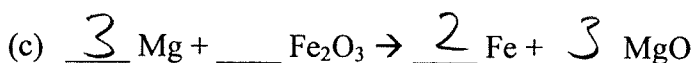
8. Balance the following equations and indicate the type of reaction taking place:



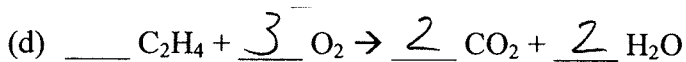
Type of reaction: double displacement



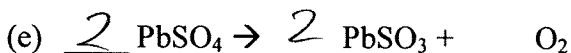
Type of reaction: double displacement



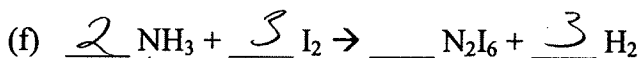
Type of reaction: single displacement



Type of reaction: combustion



Type of reaction: decomposition



Type of reaction: single displacement



Type of reaction: synthesis

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$$\textcircled{1} \quad 85(.722) + 87(.278) = \underline{85.56 \text{ u}}$$

$$\textcircled{2} \quad 234(.0001) + 235(0.0071) + 238(.9928) = \underline{237.98 \text{ u}}$$

$$\textcircled{3} \quad 46(.08) + 47(.078) + 48(.734) + 49(.055) + 50(.053) = \underline{47.92 \text{ u}}$$

$$\textcircled{4} \quad 62.9298(.6909) + x(.3091) = 63.546$$

$$43.4782 + x(.3091) = 63.546$$

$$x = \underline{64.9233 \text{ u}}$$

$$\textcircled{5} \quad x(.7870) + 24.98584(.1013) + 25.98259(.117) = 24.3050$$

$$x = \underline{23.8043 \text{ u}}$$

$$\textcircled{9} \quad \begin{array}{l} 1 \text{ mol} = 63.5 + 79.9 = 143.4 \text{ g} \\ .5 \text{ ml} \quad \quad \quad = x \end{array}$$

$$\underline{71.7 \text{ g}}$$

$$\textcircled{10} \quad \begin{array}{l} 1 \text{ mol} = 6.02 \times 10^{23} \text{ molecules} \\ .655 \quad \quad \quad = x \end{array}$$

$$\underline{3.94 \times 10^{23} \text{ molecules}}$$

$$\textcircled{11} \quad \begin{array}{l} 1 \text{ mol} = 6.02 \times 10^{23} \text{ molecules} \\ x \quad \quad \quad 2.35 \times 10^{24} \end{array}$$

$$\underline{3.9 \text{ mol}}$$

$$\textcircled{12} \quad \begin{array}{l} 1 \text{ mol} = 6.02 \times 10^{23} \text{ molecules} \\ x \quad \quad \quad 5.06 \times 10^{22} \end{array}$$

$$x = 0.084 \text{ mol}$$

$$\begin{array}{l} 1 \text{ mol} = 60.1 \text{ g} \\ .084 \quad \quad \quad x \end{array}$$

$$\underline{5.05 \text{ g}}$$

$$\textcircled{13} \quad \begin{array}{l} 1 \text{ mol} = 16.04 \text{ g} \\ x \quad \quad \quad = 21.6 \end{array}$$

$$\begin{array}{l} 1 \text{ mol} = 6.02 \times 10^{23} \text{ molecules} \\ 1.35 \quad \quad \quad x \end{array}$$

$$x = 1.35 \text{ mol}$$

$$\underline{8.13 \times 10^{23} \text{ molecules}}$$

(14) find V at STP

$$\frac{V_1 P_1}{T_1} = \frac{V_2 P_2}{T_2}$$

$$\frac{V_1 (1 \text{ atm})}{273 \text{ K}} = \frac{(120 \text{ L})(2.3 \text{ atm})}{340 \text{ K}}$$

$$V_1 = 221.6 \text{ L}$$

$$1 \text{ mol} = 22.4 \text{ L}$$

$$\times \quad 221.6 \text{ L}$$

$$x = 9.89 \text{ mol}$$

(15) find volume at STP

$$1 \text{ mol} = 22.4 \text{ L}$$

$$45 \quad \times$$

$$x = 1008 \text{ L}$$

$$\frac{V_1 P_1}{T_1} = \frac{V_2 P_2}{T_2}$$

$$\frac{(1008 \text{ L})(1 \text{ atm})}{(273 \text{ K})} = \frac{(50 \text{ L}) P_2}{(473 \text{ K})}$$

$$P = 34.93 \text{ atm}$$

(16) find volume at STP

$$1 \text{ mol} = 22.4 \text{ L}$$

$$2 \quad \times$$

$$x = 44.8 \text{ L}$$

$$\frac{(44.8 \text{ L})(1 \text{ atm})}{273 \text{ K}} = \frac{(1 \text{ L}) P_2}{1673 \text{ K}}$$

$$P = \underline{274.54 \text{ atm}}$$

(17) find volume at STP

$$\frac{V_1 P_1}{T_1} = \frac{V_2 P_2}{T_2}$$

$$\frac{V_1 (1 \text{ atm})}{273 \text{ K}} = \frac{(30 \text{ L})(700 \text{ atm})}{300 \text{ K}}$$

$$V = 5460 \text{ L}$$

$$1 \text{ mol} = 22.4 \text{ L}$$

$$x \quad 5460 \text{ L}$$

$$x = \underline{243.75 \text{ mol}}$$

(18) at STP

$$1 \text{ mol} = 22.4 \text{ L}$$

$$3 \quad \times$$

$$x = 67.2 \text{ L}$$

find T

$$\frac{V_1 P_1}{T_1} = \frac{V_2 P_2}{T_2}$$

$$\frac{(67.2 \text{ L})(1 \text{ atm})}{273 \text{ K}} = \frac{(100 \text{ L})(1 \text{ atm})}{T}$$

$$T = \underline{406.3 \text{ K}}$$