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 87Rb 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 = $107.9 + 14 + 3(16) = 170g$

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

   (c) $CoCl_2$ cobalt chloride Mass = 130g

   (d) $Sn(CO_3)_2$ 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 $(NH_4)_3PO_4$ Mass = 149g

(c) vanadium (V) cyanide $V(CN)_5$ Mass = 181 g

(d) platinum (IV) hydroxide $Pt(OH)_4$ Mass = 263 g

Balancing Equations and Type of Reaction

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

(a) $3\ NaBr + \_\_\_\ H_3PO_4 \rightarrow \_\_\_\ Na_3PO_4 + 3\ HBr$

Type of reaction: double displacement

(b) $3\ Ca(OH)_2 + \_\_\_\ Al_2(SO_4)_3 \rightarrow 3\ CaSO_4 + 2\ Al(OH)_3$

Type of reaction: double displacement

(c) $3\ Mg + \_\_\_\ Fe_2O_3 \rightarrow 2\ Fe + 3\ MgO$

Type of reaction: single displacement

(d) $\_\_\_\ C_2H_4 + 3\ O_2 \rightarrow 2\ CO_2 + 2\ H_2O$

Type of reaction: combustion

(e) $2\ PbSO_4 \rightarrow 2\ PbSO_3 + \_\_\_\ O_2$

Type of reaction: decomposition

(f) $2\ NH_3 + 3\ I_2 \rightarrow \_\_\_\ N_2I_6 + 3\ H_2$

Type of reaction: single displacement

(g) $\_\_\_\ H_2O + \_\_\_\ SO_3 \rightarrow \_\_\_\ H_2SO_4$

Type of reaction: synthesis

Chemical Reactions Part #1 Review

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

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

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

(4) $62.9298(.6909) + x(.3091) = 63.546$

$43.4782 + x(.3091) = 63.546$

$\underline{x = 64.9233\ u}$

(5) $x(.7870) + 24.98584(.1013) + 25.98259(.117) = 24.3050$

$\underline{x = 23.8043\ u}$

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(9) $1\ mol = 63.5 + 79.9 = 143.4\ g$

$.5\ mol = x$

$\underline{71.7\ g}$

(10) $1\ mol = 6.02 \times 10^{23}\ molecules$

$.655 = x$

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

(11) $1\ mol = 6.02 \times 10^{23}\ molecules$

$x \qquad 2.35 \times 10^{24}$

$\underline{3.9\ mol}$

(12) $1\ mol = 6.02 \times 10^{23}\ molecules$

$x \qquad 5.06 \times 10^{22}$

$x = 0.084\ mol$

$1\ mol = 60.1\ g$

$.084 \qquad x$

$\underline{5.05\ g}$

(13) $1\ mol = 16.04\ g$

$x = 21.6$

$x = 1.35\ mol$

$1\ mol = 6.02 \times 10^{23}\ molecules$

$1.35 \qquad x$

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

(14) find V at STP

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

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

$$V_1 = 221.6\ L$$

1 mol = 22.4 L

x = 221.6 L

$$x = 9.89\ mol$$

(15) find volume at STP

1 mol = 22.4 L

45 x

$$x = 1008\ L$$

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

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

$$P = 34.93\ atm$$

(16) Find volume at STP

$1\ mol = 22.4\ L$

$2 \quad x$

$x = 44.8\ L$

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

$$P = 274.54\ atm$$

(17) Find volume at STP

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

$$\frac{V_1(1\ atm)}{273\ K} = \frac{(30\ L)(200\ atm)}{300\ K}$$

$$V = 5460\ L$$

$1\ mol = 22.4\ L$

$x \quad 5460\ L$

$$x = 243.75\ mol$$

(18) at STP

$1\ mol = 22.4\ L$

$3 \quad x$

$x = 67.2\ L$

Find T

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

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

$$T = 406.3\ K$$