

Key - Review for Mous Test

- (1) a) $\text{Al}(\text{OH})_3$ - has 3 H's
 b) H_2CaO_4 - has 2 H's
 c) $(\text{NH}_4)_2\text{HPO}_4$ - has 9 H's
 d) $\text{C}_4\text{H}_{10}\text{O}$ - has 10 H's

(2) 1.00 moles of any substance has 6.02×10^{23} particles.
 Therefore, 1.00 mol H_2O_2 , 1.00 mol C_2H_6 , and 1.00 mol CO
 all have the same number of molecules, 6.02×10^{23} .

(3) a) H_3PO_4

$$\begin{array}{r} \text{H } 3 \times 1.01\text{g} = 3.03\text{g} \\ \text{P } 1 \times 30.97\text{g} = 30.97\text{g} \\ \text{O } 4 \times 16.00\text{g} = 64.00\text{g} \\ \hline 98.00\text{g} \end{array}$$

c) $\text{C}_4\text{H}_9\text{O}$

$$\begin{array}{r} \text{C } 4 \times 12.01\text{g} = 48.04\text{g} \\ \text{H } 9 \times 1.01\text{g} = 9.09\text{g} \\ \text{O } 1 \times 16.00\text{g} = 16.00\text{g} \\ \hline 73.13\text{g} \end{array}$$

b) Na_2O_3

$$\begin{array}{r} \text{N } 2 \times 14.01\text{g} = 28.02\text{g} \\ \text{O } 3 \times 16.00\text{g} = 48.00\text{g} \\ \hline 76.02\text{g} \end{array}$$

d) $(\text{NH}_4)_2\text{SO}_4$

$$\begin{array}{r} \text{N } 2 \times 14.01\text{g} = 28.02\text{g} \\ \text{H } 8 \times 1.01\text{g} = 8.08\text{g} \\ \text{S } 1 \times 32.07\text{g} = 32.07\text{g} \\ \text{O } 4 \times 16.00\text{g} = 64.00\text{g} \\ \hline 132.17\text{g} \end{array}$$

(4) a) $\frac{15.5\text{g SiO}_2}{60.09\text{g}} \times 1\text{mol} = 0.258\text{mol SiO}_2$

SiO_2 - Molar Mass

$$\begin{array}{r} \text{Si } 1 \times 28.09\text{g} = 28.09\text{g} \\ \text{O } 2 \times 16.00\text{g} = 32.00\text{g} \\ \hline 60.09\text{g} \end{array}$$

b) $\frac{0.0688\text{g AgCl}}{143.32\text{g}} \times 1\text{mol} = 0.000480\text{mol AgCl}$

AgCl - MM

$$\begin{array}{r} \text{Ag } 1 \times 107.87\text{g} = 107.87\text{g} \\ \text{Cl } 1 \times 35.45\text{g} = 35.45\text{g} \\ \hline 143.32\text{g} \end{array}$$

(5) $\frac{0.780\text{mol Ca}(\text{CN})_2}{72.12\text{g}} \times 1\text{mol} = 56.3\text{g Ca}(\text{CN})_2$

$\text{Ca}(\text{CN})_2$ - MM

$$\begin{array}{r} \text{Ca } 1 \times 40.08\text{g} = 40.08\text{g} \\ \text{C } 2 \times 12.01\text{g} = 24.02\text{g} \\ \text{N } 2 \times 14.01\text{g} = 28.02\text{g} \\ \hline 72.12\text{g} \end{array}$$

(5) b) $\frac{7.00 \text{ mol H}_2\text{O}_2}{1 \text{ mol}} \left| \frac{34.02 \text{ g}}{1 \text{ mol}} \right. = 238 \text{ g H}_2\text{O}_2$

H₂O₂ - MM

H 2 × 1.01 g = 2.02 g

O 2 × 16.00 g = 32.00 g
 34.02 g

(6) a) $\frac{7.6 \text{ mol Ar}}{1 \text{ mol}} \left| \frac{22.4 \text{ L}}{1 \text{ mol}} \right. = 170 \text{ L Ar}$

b) $\frac{0.44 \text{ mol CaH}_2}{1 \text{ mol}} \left| \frac{22.4 \text{ L}}{1 \text{ mol}} \right. = 9.9 \text{ L CaH}_2$

(7) a) $\frac{14.4 \text{ L F}_2}{22.4 \text{ L}} \left| \frac{1 \text{ mol}}{22.4 \text{ L}} \right. = 0.643 \text{ mol F}_2$

b) $\frac{3.21 \times 10^2 \text{ L CO}_2}{22.4 \text{ L}} \left| \frac{1 \text{ mol}}{22.4 \text{ L}} \right. = 14.3 \text{ mol CO}_2$

(8) a) $\frac{3.00 \text{ mol Sn}}{1 \text{ mol}} \left| \frac{6.02 \times 10^{23} \text{ atoms}}{1 \text{ mol}} \right. = 1.81 \times 10^{24} \text{ atoms Sn}$

b) $\frac{0.400 \text{ mol KCl}}{1 \text{ mol}} \left| \frac{6.02 \times 10^{23} \text{ f.u.}}{1 \text{ mol}} \right. = 2.41 \times 10^{23} \text{ f.u. KCl}$

(9) a) $\frac{4.80 \times 10^{20} \text{ f.u. NaI}}{6.02 \times 10^{23} \text{ f.u.}} \left| \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ f.u.}} \right. = 0.000797 \text{ mol NaI}$
 or
 $7.97 \times 10^{-4} \text{ mol NaI}$

b) $\frac{7.50 \times 10^{24} \text{ molecules SO}_2}{6.02 \times 10^{23} \text{ molecules}} \left| \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ molecules}} \right. = 12.5 \text{ mol SO}_2$

(10) a) $\frac{835 \text{ g SO}_3}{80.07 \text{ g}} \left| \frac{1 \text{ mol}}{80.07 \text{ g}} \right. \left| \frac{22.4 \text{ L}}{1 \text{ mol}} \right. = 234 \text{ L SO}_3$

SO₃ - MM

S 1 × 32.07 g = 32.07 g

O 3 × 16.00 g = 48.00 g
 80.07 g

$$(10) b) \frac{1 \text{ molecule } C_9H_8O_4}{6.02 \times 10^{23} \text{ molecules}} \times \frac{180.17 \text{ g}}{1 \text{ mol}} = 3 \times 10^{-22} \text{ g } C_9H_8O_4$$

$C_9H_8O_4$ - MM

$$C \ 9 \times 12.01 \text{ g} = 108.09 \text{ g}$$

$$H \ 8 \times 1.01 \text{ g} = 8.08 \text{ g}$$

$$O \ 4 \times 16.00 \text{ g} = + 64.00 \text{ g}$$

$$\hline 180.17 \text{ g}$$

$$c) \frac{146 \Delta O_3}{22.4 \text{ L}} \times \frac{1 \text{ mol}}{1 \text{ mol}} \times 6.02 \times 10^{23} \text{ molecules} = 3.92 \times 10^{24} \text{ molecules } O_3$$

(11) a) H_2S

MM

$$H \ 2 \times 1.01 \text{ g} = 2.02 \text{ g}$$

$$S \ 1 \times 32.07 \text{ g} = 32.07 \text{ g}$$

$$\hline 34.09 \text{ g}$$

$$\% H = \frac{2.02 \text{ g}}{34.09 \text{ g}} \times 100 = 5.93\%$$

$$\% S = \frac{32.07 \text{ g}}{34.09 \text{ g}} \times 100 = 94.1\%$$

b) $Mg(ClO_4)_2$

$$Mg \ 1 \times 24.31 \text{ g} = 24.31 \text{ g}$$

$$Cl \ 2 \times 35.45 \text{ g} = 70.90 \text{ g}$$

$$O \ 8 \times 16.00 \text{ g} = 128.00 \text{ g}$$

$$\hline 223.21 \text{ g}$$

$$\% Mg = \frac{24.31 \text{ g}}{223.21 \text{ g}} \times 100 = 10.89\%$$

$$\% Cl = \frac{70.90 \text{ g}}{223.21 \text{ g}} \times 100 = 31.76\%$$

$$\% O = \frac{128.00 \text{ g}}{223.21 \text{ g}} \times 100 = 57.345\%$$

(12) a) S_2Cl_2 MF EF = SCl

b) $C_6H_{10}O_4$ MF EF = $C_3H_5O_2$

c) Na_2SO_3 EF

d) $C_5H_{10}O_5$ MF EF = CH_2O

e) $C_{17}H_{19}NO_3$ EF

f) $(NH_4)_2CO_3$ EF

(13) a) 79.8% C

$$\frac{79.8 \text{ g C}}{12.01 \text{ g/mol}} = 6.6445 \text{ mol C}$$

$$\frac{6.6445 \text{ mol C}}{6.6445 \text{ mol}} = 1 \text{ C}$$

20.2% H

$$\frac{20.2 \text{ g H}}{1.01 \text{ g/mol}} = 20.0 \text{ mol H}$$

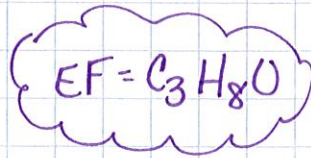
$$\frac{20.0 \text{ mol H}}{6.6445 \text{ mol}} = 3 \text{ H}$$

$$EF = CH_3$$

$$(13) \text{ b) } \begin{array}{l} 62.1\% \text{ C} \\ \underline{62.1 \text{ g C}} \\ 12.01 \text{ g/mol} \end{array}$$

$$\begin{array}{l} 13.8\% \text{ H} \\ \underline{13.8 \text{ g H}} \\ 1.01 \text{ g/mol} \end{array}$$

$$\begin{array}{l} 24.1\% \text{ N} \\ \underline{24.1 \text{ g N}} \\ 14.01 \text{ g/mol} \end{array}$$



$$= \frac{5.1707 \text{ mol C}}{1.7202 \text{ mol}}$$

$$= \frac{13.6634 \text{ mol H}}{1.7202 \text{ mol}}$$

$$= \frac{1.7202 \text{ mol N}}{1.7202 \text{ mol}}$$

$$= 3 \text{ C}$$

$$= 8 \text{ H}$$

$$= 1 \text{ N}$$

$$(14) \text{ a) } \text{EF} = \text{CH}_2\text{O}$$

$$\text{MM} = \text{C } 1 \times 12 \text{ g} = 12 \text{ g}$$

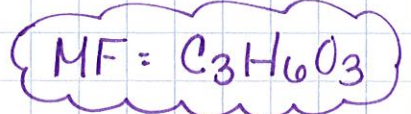
$$\text{H } 2 \times 1 \text{ g} = 2 \text{ g}$$

$$\text{O } 1 \times 16 \text{ g} = 16 \text{ g}$$

$$\hline 30 \text{ g}$$

$$\frac{90 \text{ g}}{30 \text{ g}} = 3$$

$$\text{MF} = 3 \times \text{EF}$$



$$\text{b) } \text{EF} = \text{HgCl}$$

$$\text{MM} = \text{Hg } 1 \times 201 \text{ g} = 201 \text{ g}$$

$$\text{Cl } 1 \times 35.5 \text{ g} = 35.5 \text{ g}$$

$$\hline 236.5 \text{ g}$$

$$\frac{472.2 \text{ g}}{236.5 \text{ g}} = 2$$

$$\text{MF} = 2 \times \text{EF}$$



$$(15) \text{ } 58.8\% \text{ C}$$

$$\begin{array}{l} \underline{58.8 \text{ g C}} \\ 12.01 \text{ g/mol} \end{array}$$

$$9.8\% \text{ H}$$

$$\begin{array}{l} \underline{9.8 \text{ g H}} \\ 1.01 \text{ g/mol} \end{array}$$

$$31.4\% \text{ O}$$

$$\begin{array}{l} \underline{31.4 \text{ g O}} \\ 16.00 \text{ g/mol} \end{array}$$

$$\text{EF} = \text{C}_5\text{H}_{10}\text{O}_2$$

MM

$$\text{C } 5 \times 12 \text{ g} = 60 \text{ g}$$

$$\text{H } 10 \times 1 \text{ g} = 10 \text{ g}$$

$$\text{O } 2 \times 16 \text{ g} = 32 \text{ g}$$

$$\hline 102 \text{ g}$$

$$= \frac{4.8959 \text{ mol C}}{1.9625 \text{ mol}}$$

$$= \frac{9.7030 \text{ mol H}}{1.9625 \text{ mol}}$$

$$= \frac{1.9625 \text{ mol O}}{1.9625 \text{ mol}}$$

$$= (2.5 \text{ C})_2$$

$$= (5 \text{ H})_2$$

$$= (1 \text{ O})_2$$

$$\frac{102 \text{ g}}{102 \text{ g}} = 1$$

$$\text{MF} = 1 \times \text{EF} = \text{C}_5\text{H}_{10}\text{O}_2$$

(16) 81.78% C	6.1133% H	12.1056% O
$\frac{81.78 \text{ g C}}{12.01 \text{ g/mol}}$	$\frac{6.1133 \text{ g H}}{1.01 \text{ g/mol}}$	$\frac{12.1056 \text{ g O}}{16.00 \text{ g/mol}}$
$= 6.8093 \text{ mol C}$	$= 6.0528 \text{ mol H}$	$= .7566 \text{ mol O}$
$\frac{6.8093 \text{ mol C}}{.7566 \text{ mol}}$	$\frac{6.0528 \text{ mol H}}{.7566 \text{ mol}}$	$\frac{.7566 \text{ mol O}}{.7566 \text{ mol}}$
$= 9 \text{ C}$	$= 8 \text{ H}$	$= 1 \text{ O}$

EF = C₉H₈O

MM C 9 × 12g = 108g
 H 8 × 1g = 8g
 O 1 × 16g = +16g
 132g

$$\frac{132 \text{ g}}{132 \text{ g}} = 1$$

MF = 1 × EF

MF = C₉H₈O

- (17) a) dichlorine heptoxide Cl₂O₇
 b) sodium phosphate Na⁺ PO₄³⁻ ⇒ Na₃PO₄
 c) lithium hypochlorite Li⁺ ClO⁻ ⇒ LiClO
 d) tin (IV) dichromate Sn⁴⁺ Cr₂O₇²⁻ ⇒ Sn₂(Cr₂O₇)₄ ⇒ Sn(Cr₂O₇)₂
 e) hydrosulfuric acid H⁺ S²⁻ ⇒ H₂S
 f) nitric acid H⁺ NO₃⁻ ⇒ HNO₃
 g) sulfurous acid H⁺ SO₃²⁻ ⇒ H₂SO₃

