Chapter 1, 2, 3 Practice Quiz KEY
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Quiz Chapter 1,2,3 Practice KEY

1. $M(Cr) = 52$ $\quad \frac{M(Cr)}{2M(O)} \approx \frac{1.62}{1.00}$
   $M(O) = 16$

   Answer: B CrO_2

2. $D = \frac{m}{V} = \frac{(250 - 30.0)\,g}{110\,cm^3} = 2.00\ \frac{g}{cm^3}$

   ↑ 3 sig figs!

   Answer: D

3. Let the total be 100g:

   $18.0g\ C \cdot \frac{1\ mol\ C}{12.01\ g\ C} = 1.5\ mol\ C$

   $2.5g\ H \cdot \frac{1\ mol\ H}{1.01\ gH} = 2.5\ mol\ H$

   $63.5g\ I \cdot \frac{1\ mol\ I}{126.9\ g\ I} = 0.5\ mol\ I$

   $16.0g\ O \cdot \frac{1\ mol\ O}{16.00\ g\ O} = 1\ mol\ O$

   Divide by the least value of moles to get the molar ratio of elements:

   $\frac{1.5}{0.5} \approx 3 \quad \frac{2.5}{0.5} = 5 \quad \frac{0.5}{0.5} = 1 \quad \frac{1}{0.5} = 2$

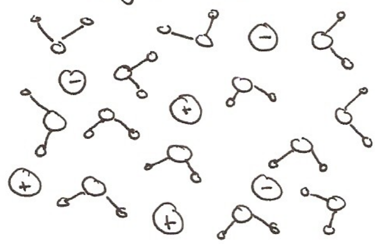
   empirical: $C_3H_5IO_2$

   This has molar mass of: $3 \cdot 12 + 5 \cdot 1 + 1 \cdot 63.5 + 2 \cdot 16 = 200\frac{g}{mol}$

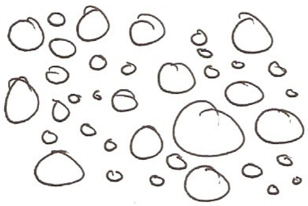
   Thus, if the compound has a molar mass of $400\frac{g}{mol}$, the molecular formula is twice the empirical:

   molecular: $C_6H_{10}I_2O_4$

4. Homogenous: salt dissolved in water

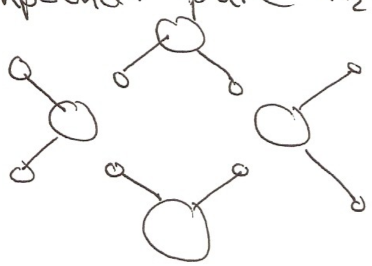


Heterogenous: Lucky charms, gravel.



Element: Pure gold

Compound: pure H_2O



5. Filtration, the process shows particles being separated by size through a porous material, letting smaller particles pass but not letting larger particles to do so. The diagram is also labelled with "feed" and "filtrate," terms for the initial and final mixtures in filtration.

6. We want to find

$$\text{mass \% Mg in MgO} = \frac{\text{mass of Mg}}{\text{mass of MgO}} \cdot 100$$

&

$$\text{mass \% O in MgO} = \frac{\text{mass of O}}{\text{mass of MgO}} \cdot 100$$

$$\text{mass \% Mg in MgO} = \frac{0.1867 g}{0.2893 g} \cdot 100 = \boxed{64.54\%}$$

$$\text{mass \% O in MgO} = \frac{0.1013 g}{0.2893 g} \cdot 100 = \boxed{35.02\%}$$

7. Liquid-liquid extraction is a process that uses a separating funnel to separate two liquids by density. It is often used when specific substances are dissolved in one of the two liquids.
In the quick ache relief lab, we wanted to separate aspirine and acetaminophen, which were dissolved in two liquids with different densities.

8. a.

compound X: $1 \text{ mol } X \cdot \frac{88.1 g X}{1 \text{ mol } X} \cdot \frac{64.8 g Q}{100 g X} = 57.1 g Q$

compound Y: $1 \text{ mol } Y \cdot \frac{104. g Y}{1 \text{ mol } Y} \cdot \frac{73.0 g Q}{100 g Y} = 75.9 g Q$

compound Z: $1 \text{ mol } Z \cdot \frac{64.0 g Z}{1 \text{ mol } Z} \cdot \frac{59.3 g Z}{100 g Z} = 38.0 g Q$

b. The greatest common factor of 57, 76, and 38 is 19, so the most probable weight is $\boxed{19 g}$

8c. We use the oxides to find the initial masses and moles of C and H in compound Z:

$$1.37\ g\ CO_2 \cdot \frac{1\ mol\ CO_2}{44\ g\ CO_2} \cdot \frac{1\ mol\ C}{1\ mol\ CO_2} = 0.031\ mol\ C$$

$$0.031\ mol\ C \cdot \frac{12\ g\ C}{1\ mol\ C} = 0.374\ g\ C$$

$$0.281\ g\ H_2O \cdot \frac{1\ mol\ H_2O}{18\ g\ H_2O} \cdot \frac{2\ mol\ H}{1\ mol\ H_2O} = 0.031\ mol\ H$$

$$0.031\ mol\ H \cdot \frac{1\ g\ H}{1\ mol\ H} = 0.031\ g\ H$$

This means the initial mass of element Q in compound Z is:

$$1.00\ g - 0.374\ g - 0.031\ g = 0.595\ g\ Q$$

Using the answer from part b, we have

$$0.595\ g\ Q \cdot \frac{1\ mol\ Q}{19\ g\ Q} = 0.031\ mol\ Q$$

The empirical formula, since mol(C) = mol(H) = mol(Q), is:

CHQ

The molecular mass of CHQ is 12 + 1 + 19 = 32 g. We are given the molecular weight of compound Z as 64g, so the molecular formula is $\frac{64}{32} = 2$ times the empirical:

$$\boxed{C_2H_2Q_2}$$

9. The reaction is:

$$Au_2S_3 + 3H_2 \longrightarrow 2Au + 3H_2S$$

By stoichiometery:

$$0.05 \text{ mol } Au_2S_3 \cdot \frac{2 \text{ mol Au}}{1 \text{ mol } Au_2S_3} \cdot \frac{196.97 \text{ g Au}}{1 \text{ mol Au}} = 19.7 \text{ g Au}$$

Answer: **B**

10. The decomposition reaction is:

$$CaCO_3 \longrightarrow CaO + CO_2$$

Using stoichiometry:

$$0.38 \text{ g } CO_2 \cdot \frac{1 \text{ mol } CO_2}{44 \text{ g } CO_2} \cdot \frac{1 \text{ mol } CaCO_3}{1 \text{ mol } CO_2} \cdot \frac{100 \text{ g } CaCO_3}{1 \text{ mol } CaCO_3} = 0.863 \text{ g } CaCO_3$$

The percent of $CaCO_3$ by mass is:

$$\frac{\text{g } CaCO_3}{\text{g limestone}} \cdot 100 = \frac{0.863 \text{ g}}{1.0 \text{ g}} \cdot 100 = 86.3\%$$

Answer: **D**

11. The reaction is:

$$C_nH_m + O_2 \longrightarrow nCO_2 + \frac{m}{2} H_2O$$

Using stoichiometry:

$$0.9102 \text{ g } H_2O \cdot \frac{1 \text{ mol } H_2O}{18 \text{ g } H_2O} \cdot \frac{2 \text{ mol H}}{1 \text{ mol } H_2O} = 0.101 \text{ mol H}$$

$$2.668 \text{ g } CO_2 \cdot \frac{1 \text{ mol } CO_2}{44 \text{ g } CO_2} \cdot \frac{1 \text{ mol C}}{1 \text{ mol } CO_2} = 0.061 \text{ mol C}$$

we find the empirical formula by dividing both by the lesser:

$$\frac{0.101}{0.061} \approx \frac{5}{3} \qquad \frac{0.061}{0.061} = 1$$

The ratio of H to C is $\frac{5}{3} : 1 = 5:3$, so the empirical formula is

C_3H_5

This has a molecular weight of 41 g, and we are given ~~the~~ cyclohexane's molecular weight to be 82 g, so we multiply the empirical formula by a factor of $\frac{82}{41} = 2$ to get the molecular formula:

$\boxed{C_6H_{10}}$