

Key

9/16/25

Exam 1 Review Packet

Identify each substance as a compound, an element, a homogeneous or heterogeneous mixture.

Filtered tea

homogeneous mixture

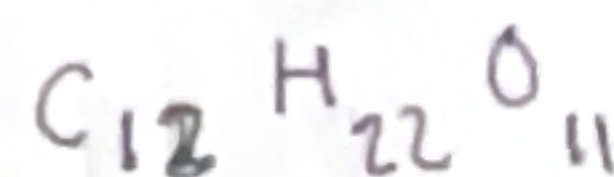
Selenium

element

Soil

heterogeneous mixture

Table sugar (sucrose)



compound

Salad dressing

heterogeneous mixture

Aluminum oxide

Compound

Convert the following:

2 sig figs
0.042 km to m

$$0.042 \text{ km} \cdot \frac{1000 \text{ m}}{1 \text{ km}} = \boxed{42 \text{ m}}$$

2 sig figs
7.3 L to mL

$$7.3 \text{ L} \cdot \frac{1000 \text{ mL}}{1 \text{ L}} = \boxed{7300 \text{ mL}}$$

or
 7.3×10^3

The Eiffel tower in Paris, France contains 8200 tons of puddled iron in its makeup. How many grams (g) of iron is that equal to? 1 ton = 2000 lb.; 453.6 g = 1 lb.

$$8200 \text{ tons Fe} \cdot \frac{2000 \text{ lb}}{1 \text{ ton}} \cdot \frac{453.6 \text{ g}}{1 \text{ lb}} = \boxed{7.4 \times 10^9 \text{ g Fe}}$$

A patient requires 2.5 g of medication. The medication is available as a 20 mg/mL solution. How many milliliters of the solution should be administered?

$$2.5 \text{ g} \cdot \frac{1000 \text{ mg}}{1 \text{ g}} = \frac{2500 \text{ mg}}{20 \text{ mg/mL}} = \boxed{125 \text{ mL}}$$



What volume of gold (density 19.3 g/ml) is needed to obtain 9.4 g of gold? - mass Au

$$V = \frac{m}{D} = \frac{9.4 \text{ g Au}}{19.3 \text{ g/mL}} = \boxed{0.49 \text{ mL}}$$

Determine the number of protons, neutrons, and electrons in the following elements:

Anion - gained electrons

N^{3-}

$P = \boxed{7}$ (atomic number)

$N = 14 - 7 = \boxed{7}$

$E = 7 + 3 = \boxed{10}$

Protons
+
neutrons
atomic weight

Cation - lost electrons

Ca^{2+}

$P = \boxed{20}$ (atomic number)

$N = 40 - 20 = \boxed{20}$

$E = 20 - 2 = \boxed{18}$

Classify the following compounds as ionic, molecular (covalent), or acidic and then name.

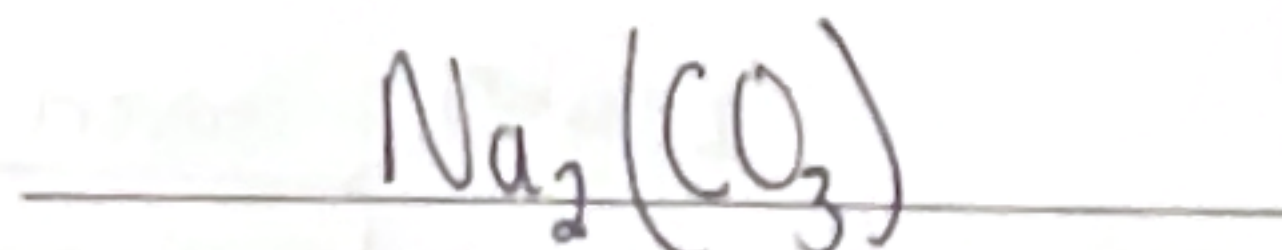
	Type of Bond
A. CrPO_4 metal polyatomic ion	<u>Ionic</u>
B. SO_2 2 non-metals prefix	<u>Molecular (covalent)</u>
C. HBr(aq) means acid	<u>acidic</u>

Name
<u>Chromium (III) phosphate</u>
<u>Sulfur dioxide</u>
<u>hydrobromic acid</u>

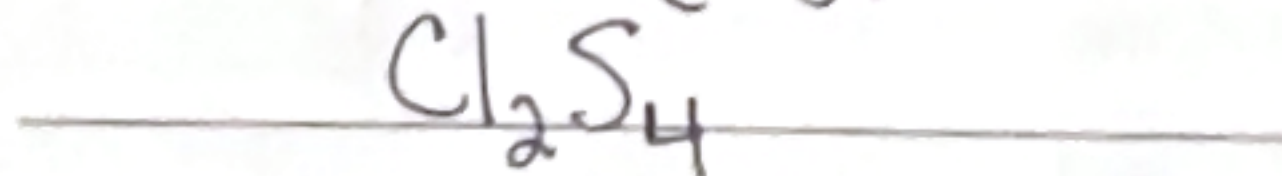
hydro stem -ic acid

Write the correct formula for the following compounds.

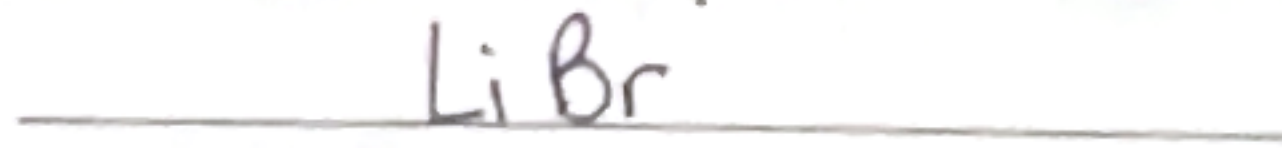
Ionic → A. Sodium Carbonate



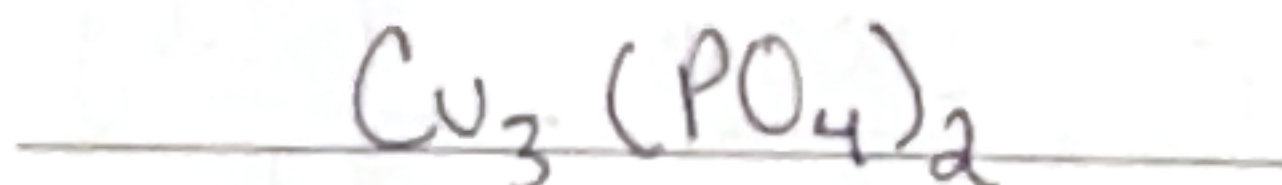
Covalent → B. Dichlorine tetrasulfide



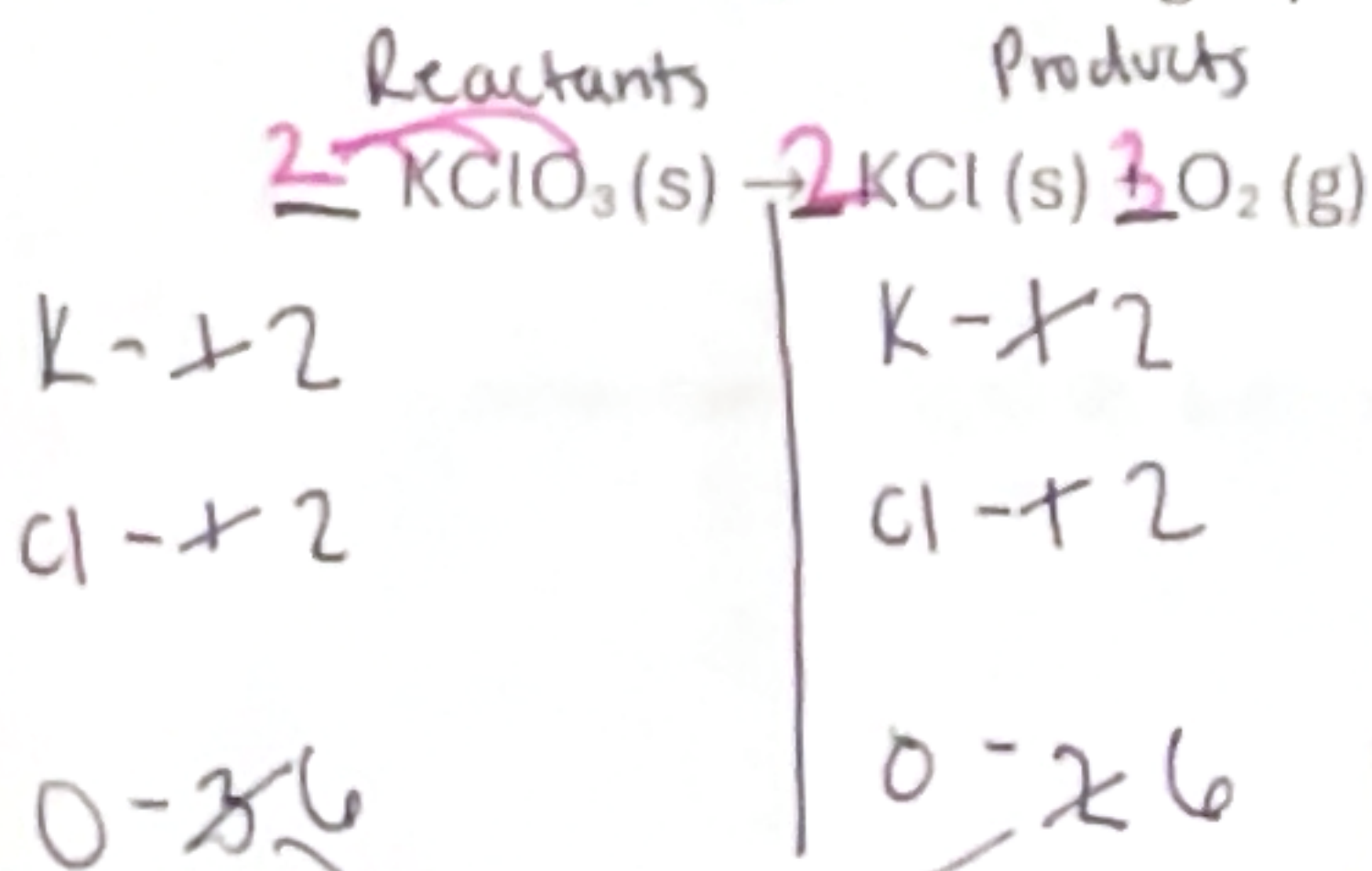
Ionic → C. Lithium bromide



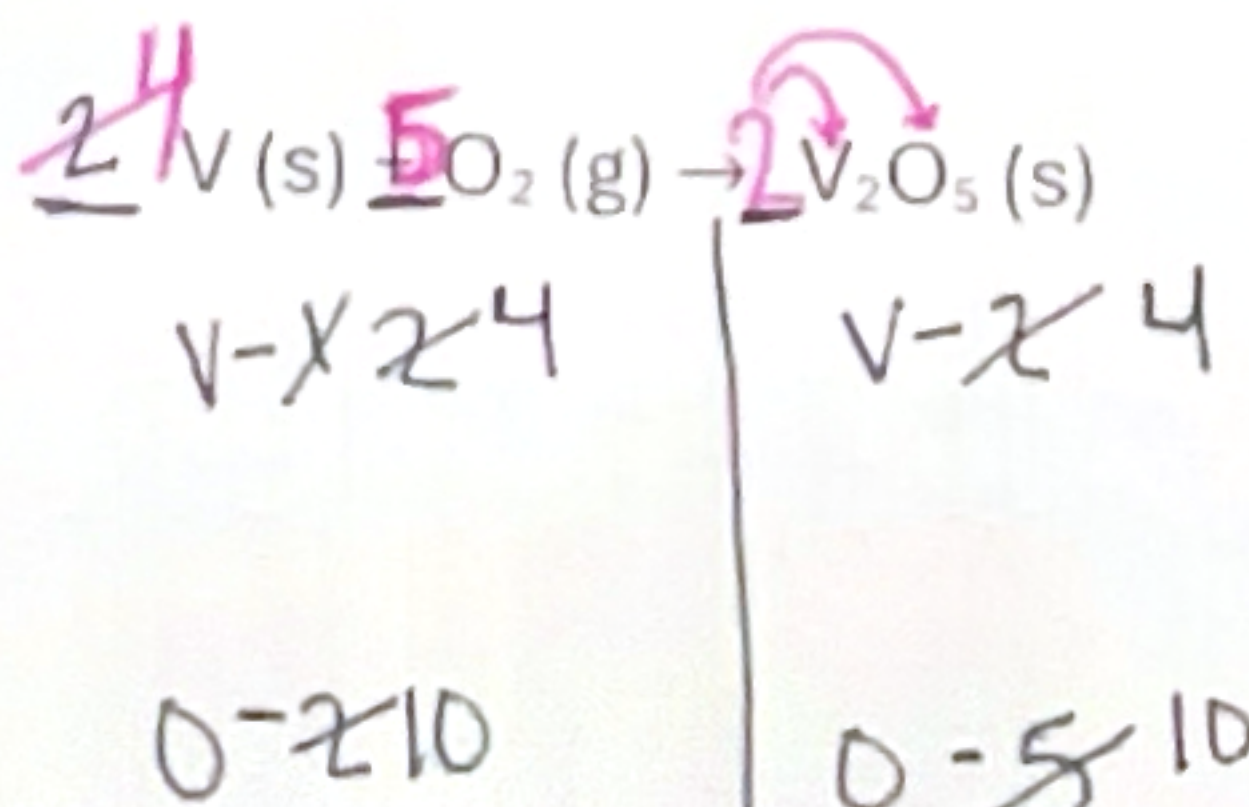
Ionic → D. Copper (II) phosphate



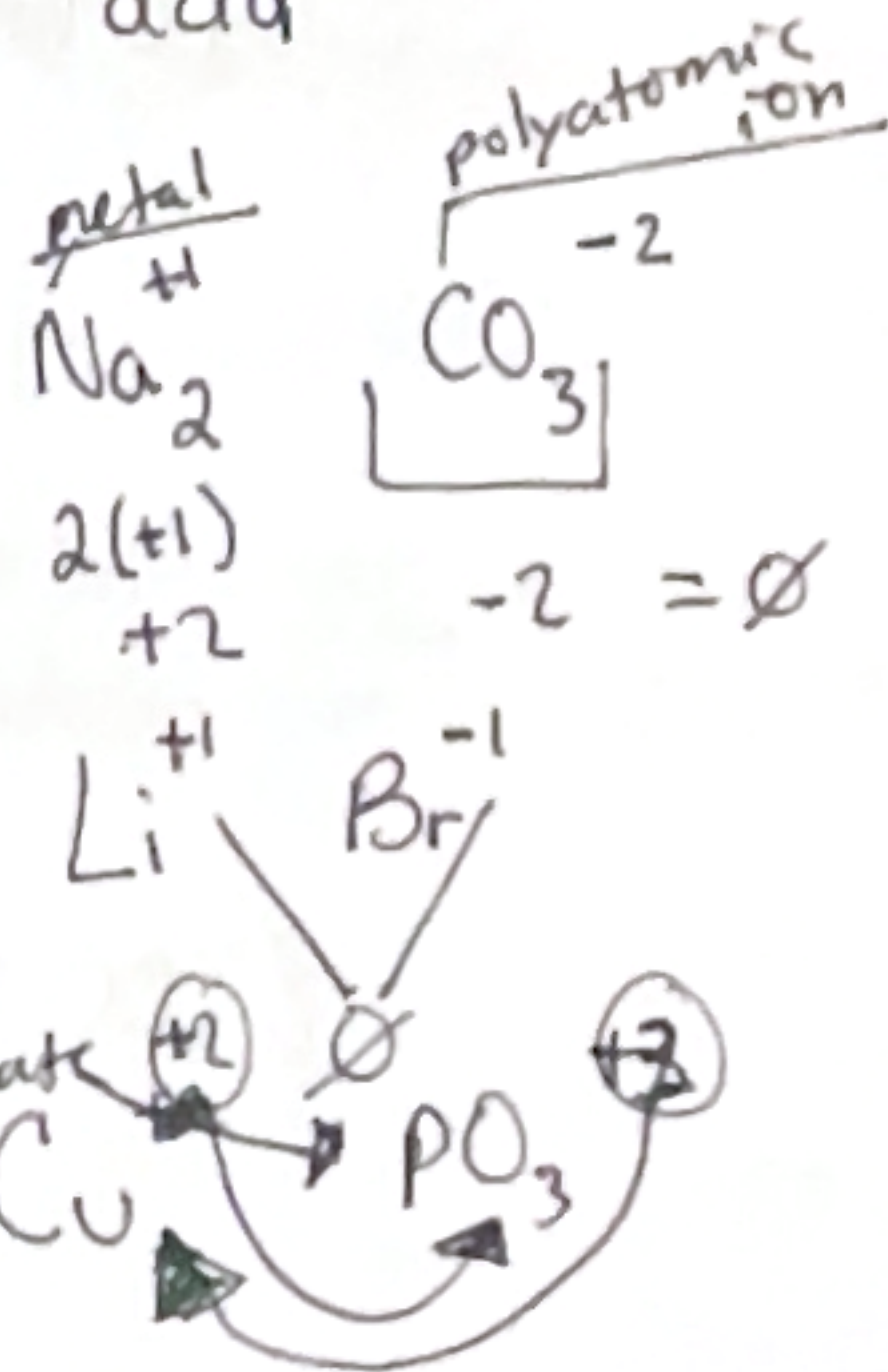
Balance the following equations:



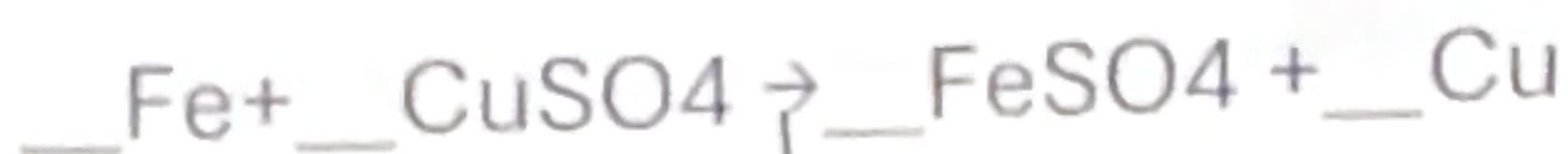
find ~~least~~ smallest common factor = 6



Smallest common factor = 10



Balance the following equation and use it to answer the following two questions:



Fe-1
Cu-1
S-1
O-4

Fe-1
Cu-1
S-1
O-4

Already balanced ✓

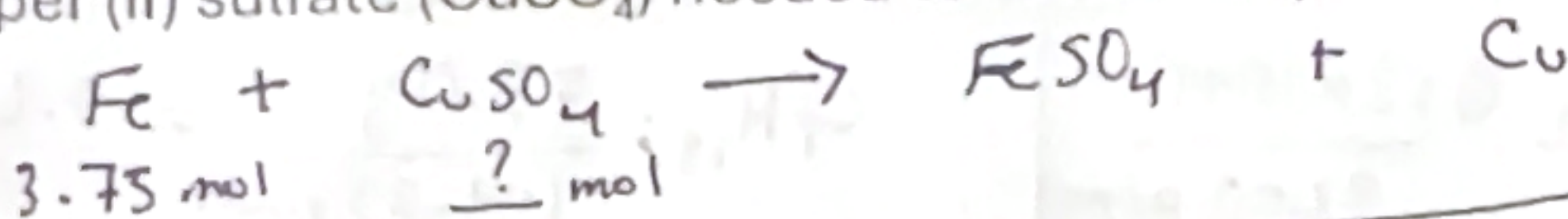
Calculate the grams of copper (Cu) produced if 0.500 grams of iron (Fe) react completely.

$$0.500 \text{ g Fe} \cdot \frac{1 \text{ mol Fe}}{55.845 \text{ g Fe}} \cdot \frac{1 \text{ mol Cu}}{1 \text{ mol Fe}} \cdot \frac{63.55 \text{ g Cu}}{1 \text{ mol Cu}} = 0.569 \text{ g Cu}$$

3 sig figs

↑ could skip this step since it's a 1:1 ratio. SAVE TIME! :

Calculate the moles of copper (II) sulfate (CuSO_4) needed to react completely with 3.75 moles of iron (Fe).



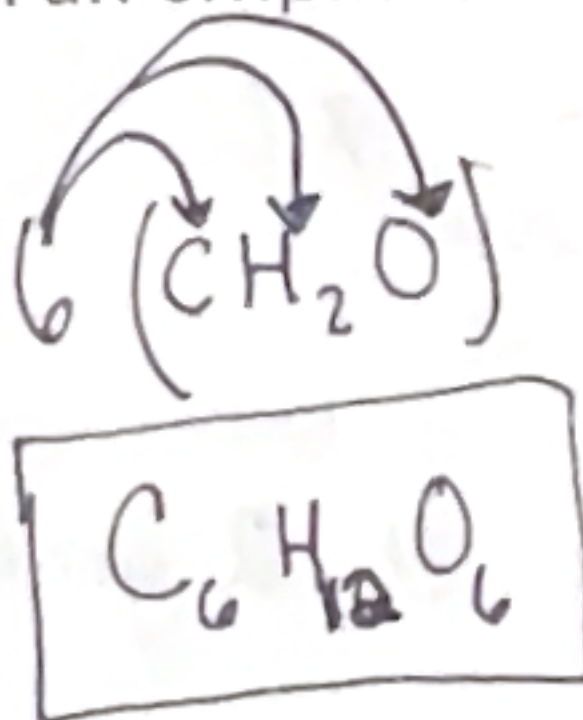
$$3.75 \text{ mol Fe} : 1 \text{ mol CuSO}_4 \rightarrow 3.75 \text{ mol CuSO}_4$$

Again this is due to the 1:1 mole ratio from the balanced equation.

GFM
EFM

Determine the molecular formula of a compound with an empirical formula of CH_2O and a molar mass (molecular mass) of 180.16 g/mol.

$$\frac{180.16 \text{ g/mol}}{30.026 \text{ g}} \approx 6$$



$$\begin{array}{l} \text{C: } 1 \times 12.011 \\ \text{H: } 2 \times 1.008 \\ \text{O: } 1 \times 15.999 \end{array} \left. \vphantom{\begin{array}{l} \text{C: } 1 \times 12.011 \\ \text{H: } 2 \times 1.008 \\ \text{O: } 1 \times 15.999 \end{array}} \right\} \text{Add}$$

$$\underline{\hspace{2cm}} 30.026 \text{ g}$$

Empirical
Formula
Rules

1. % → g
2. g → mol
3. divide by smallest # of moles

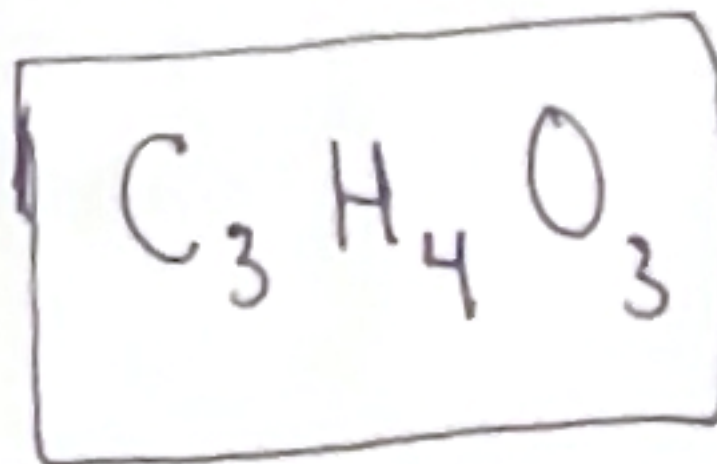
4. make adjustments if there's fractions

Ascorbic acid contains 40.92% C, 4.58% H, and 54.50% O by mass. What is the empirical formula of ascorbic acid?

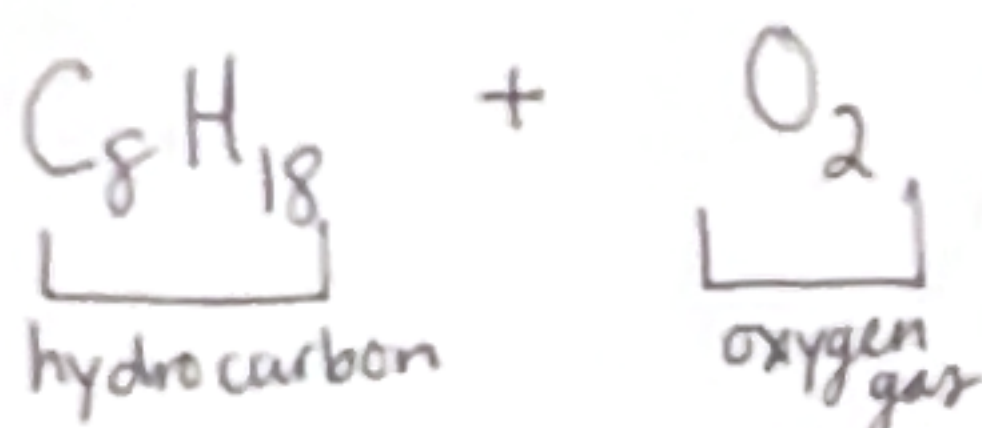
$$\text{C} - 40.92 \text{ g} \cdot \frac{1 \text{ mol}}{12.01 \text{ g}} = 3.407 \text{ mol} \div 3.406 = 1 \quad \times 3 = 3$$

$$\text{H} - 4.58 \text{ g} \cdot \frac{1 \text{ mol}}{1.008 \text{ g}} = 4.54 \text{ mol} \div 3.406 \approx 1.33 \times 3 = 4$$

$$\text{O} - 54.50 \text{ g} \cdot \frac{1 \text{ mol}}{15.999 \text{ g}} = 3.406 \text{ mol} \div 3.406 = 1 \quad \times 3 = 3$$



★ When you see a hydrocarbon + O_2 it'll be a combustion reaction



Complete combustion

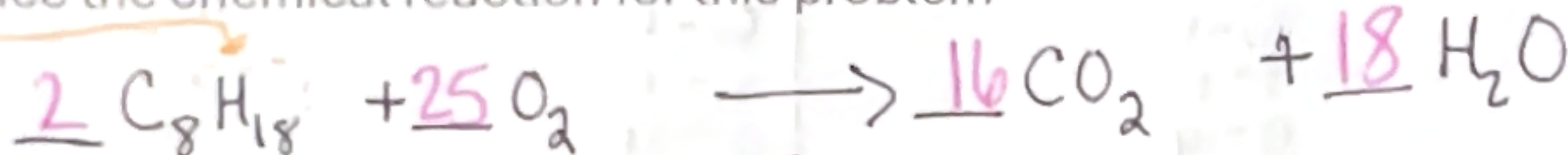
When 73.0 grams of octane (C_8H_{18}) is burned in the presence of 68.0 grams of oxygen,

26.2 grams of water is produced.

actual yield

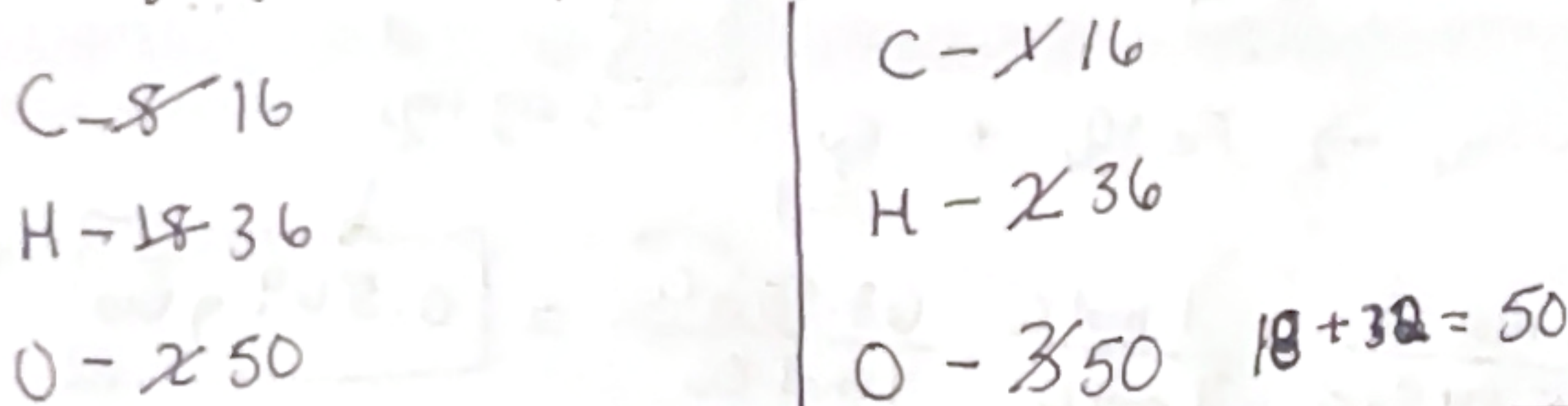
$$18 \div 2 = 9$$

A. Balance the chemical reaction for this problem



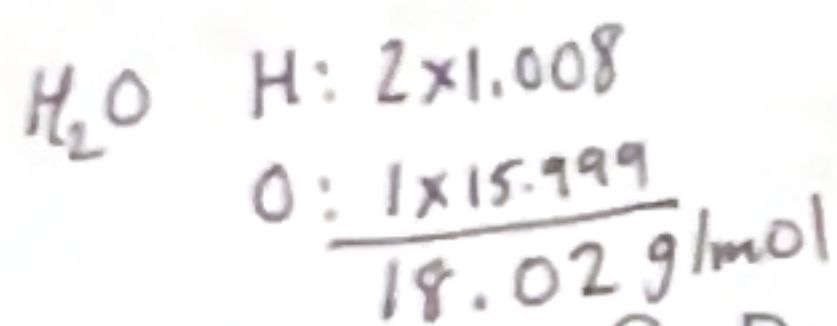
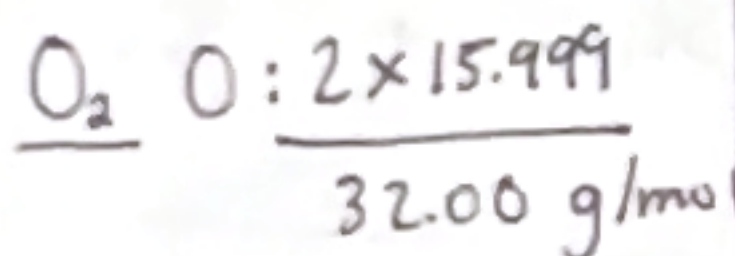
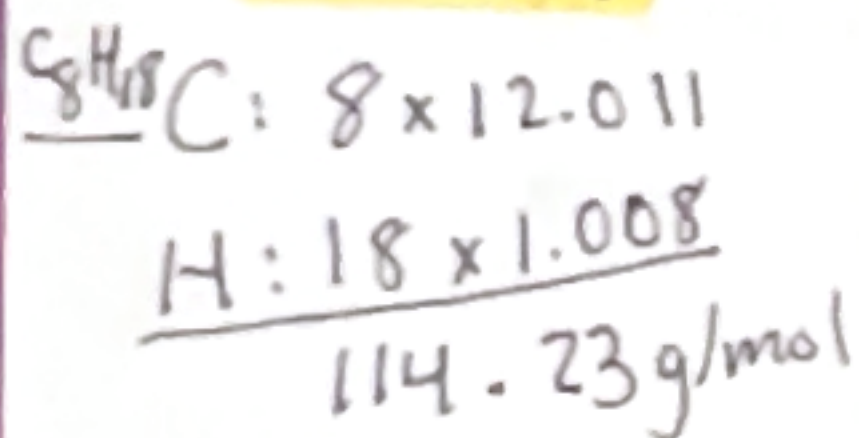
✓ Balanced

★ If when you divide the value of hydrogens from the hydrocarbon by 2 and it's an odd # the coefficient for hydrocarbon will be 2.

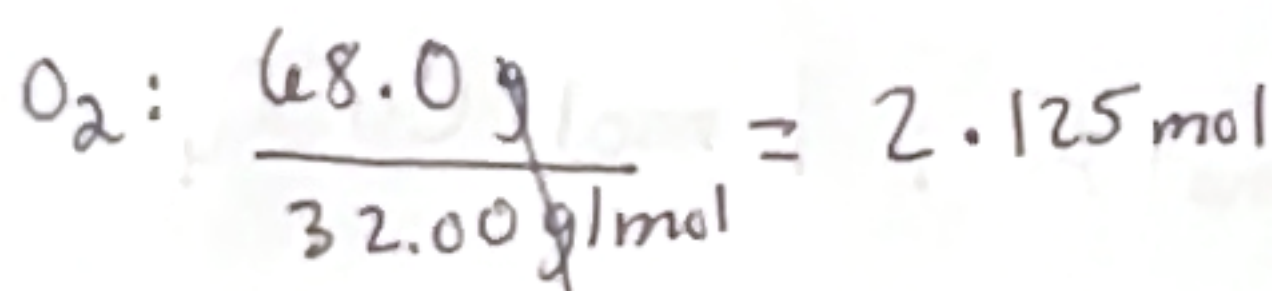
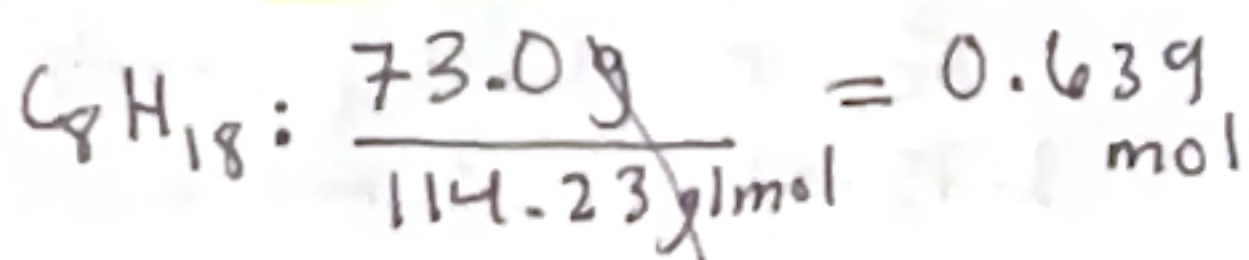


B. Determine the limiting reactant and the theoretical yield in grams of water.

1. Find molar mass of reactants + product



2. Convert mass of reactants to moles



3. Determine limiting reactant mole ratio of O_2 to C_8H_{18}

$$\text{is } \frac{25}{2} = 12.5$$

Available mole ratio of O_2 to C_8H_{18}

$$\text{is } \frac{2.125 \text{ mol}}{0.639 \text{ mol}} = 3.33$$

Since the available ratio is less than required ratio of 12.5, oxygen is limiting reactant.

Formula: $\frac{\text{Actual yield}}{\text{Theoretical yield}} \times 100$

Actual yield of water is 26.2 grams

$$\frac{26.2 \text{ g}}{27.57 \text{ g}} \times 100 = 95.0\%$$

Theoretical Yield

$$2.125 \text{ mol O}_2 \cdot \frac{18 \text{ mol H}_2\text{O}}{25 \text{ mol O}_2} = 1.53 \text{ mol H}_2\text{O}$$

$$1.53 \text{ mol H}_2\text{O} \cdot \frac{18.02 \text{ g/mol}}{1 \text{ mol}} = 27.57 \text{ g H}_2\text{O}$$

27.57 g H₂O