

STOICHIOMETRY

Acetylene gas (C_2H_2) undergoes combustion to produce 75.0 L carbon dioxide and water vapor at STP. Determine $[\text{A, C} = 12.0, \text{O} = 16.0, \text{H} = 1.0]$

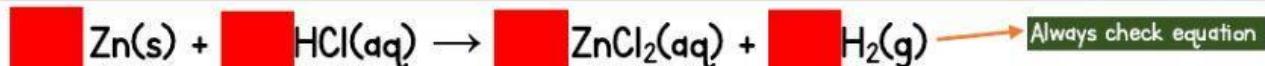
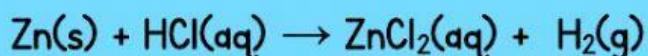
- How many liters of C_2H_2 are required to produce the CO_2 ?
- What mass of H_2O is produced?

Equation	<p>Make sure the equation is balanced.</p> $\boxed{\text{C}_2\text{H}_2} + \boxed{\text{O}_2} \rightarrow \boxed{\text{CO}_2} + \boxed{\text{H}_2\text{O}}$
Convert to mole	<p>Given 75.0 L CO_2 (convert vol(L) to mole)</p> $n_{\text{CO}_2} = \frac{\text{volume CO}_2}{\text{molar volume}}$ $= \frac{\boxed{\text{L}}}{\boxed{\text{L}}} = \boxed{\text{mol CO}_2}$ <p style="text-align: right;">At STP, molar volume of gas = 22.4 L At 4 decimal places Value given in the question</p>
Compare	<p>Write the stoichiometry.</p> <p>From equation, (theoretically)</p> $\boxed{\text{mol C}_2\text{H}_2} \equiv \boxed{\text{mol O}_2} \equiv \boxed{\text{mol CO}_2} \equiv \boxed{\text{mol H}_2\text{O}}$ <p>a) compared only CO_2 and C_2H_2</p> $\boxed{\text{mol CO}_2} \equiv \boxed{\text{mol C}_2\text{H}_2}$ <p>so, (given in the question)</p> $\boxed{\text{mol CO}_2} = \frac{\boxed{\text{X}}}{\boxed{\text{X}}} = \boxed{\text{mol C}_2\text{H}_2}$ <p>b) compared only CO_2 and H_2O</p> $\boxed{\text{mol CO}_2} \equiv \boxed{\text{mol H}_2\text{O}}$ <p>so, (given in the question)</p> $\boxed{\text{mol CO}_2} = \frac{\boxed{\text{X}}}{\boxed{\text{X}}} = \boxed{\text{mol H}_2\text{O}}$
Convert to mass/volume	<p>convert to volume.</p> $V_{\text{C}_2\text{H}_2} = n_{\text{C}_2\text{H}_2} \times \text{molar volume(stp)}$ $= \boxed{\text{X}} \times \boxed{\text{L}}$ $= \boxed{\text{L}} \text{ L} *$ <p>convert to mass.</p> $\text{mass H}_2\text{O} = n_{\text{H}_2\text{O}} \times M_r \text{ H}_2\text{O}$ $= \boxed{\text{X}} \times \boxed{\text{g}}$ $= \boxed{\text{g}} *$

PRACTICE 2

How many grams of ZnCl_2 can be obtained using 5.0 grams of zinc metal?

[A_r Zn = 65.35, Cl = 35.5, H = 1.0]



Given $\boxed{\text{zinc metal}}$,

$$\begin{aligned} n_{\text{Zn}} &= \frac{\text{mass}}{\text{Mr}} \\ &= \frac{\boxed{\text{}}}{\boxed{\text{}}} = \boxed{\text{}} \text{ mol} \end{aligned}$$

overall stoichiometry,

$$\boxed{\text{}} \text{ mol Zn} \equiv \boxed{\text{}} \text{ mol HCl} \equiv \boxed{\text{}} \text{ mol ZnCl}_2 \equiv \boxed{\text{}} \text{ mol H}_2$$

From equation, $\boxed{\text{}} \text{ mol Zn} \equiv \boxed{\text{}} \text{ mol ZnCl}_2$

$$\begin{aligned} \text{thus, } \boxed{\text{}} \text{ mol Zn} &= \frac{\boxed{\text{}} \times \boxed{\text{}}}{\boxed{\text{}}} \\ &= \boxed{\text{}} \text{ mol ZnCl}_2 \end{aligned}$$

$$\begin{aligned} \text{mass ZnCl}_2 &= \boxed{\text{}} \times \boxed{\text{}} \\ &= \boxed{\text{}} \text{ g} \end{aligned}$$

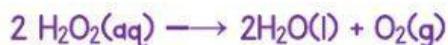
$$M_r \text{ ZnCl}_2 = \boxed{\text{}} \text{ g/mol}$$

EXERCISE :

SOLVE THIS QUESTION IN A TEST PAD.



I. Hydrogen peroxide, H_2O_2 , decomposes to produce water and oxygen as in the following equation:



What would be the volume of O_2 released from the decomposition of 250 mL of 20 M H_2O_2 at STP ?

5.6 L

2. Assume that 5.60 L of hydrogen gas at STP reacts with copper (II) oxide according to the following balanced equation. $[\text{Ar}_{\text{Cu}} = 63.5]$



a) How many moles of H_2 react? 0.25 mol

b) How many grams of copper are produced? 15.875g

3. Assume that 13.5 g of solid aluminum react with HCl according to the following balanced equation at STP. $[\text{Ar}_{\text{Al}} = 27.0, \text{Cl} = 35.5, \text{H} = 1.0]$



a) How many moles of Al react? 0.5 mol

b) How many gram of HCl reacted? 54.75g

c) How many liters of H_2 are produced? 16.8g

4. The complete combustion of copper(I) sulphide is according to the following equation: $[\text{Ar}_{\text{Cu}} = 63.5, \text{S} = 32.0, \text{O} = 16.0]$



If the mass of Cu_2S in the mixture is 14.0 g, calculate

a) the number of molecules of oxygen gas reacted. 7.9955×10^{22} molecules

b) the mass of SO_2 gas produced. 5.64g

c) the volume of SO_2 gas at STP. 1.97 L



BY MADAM ZIL