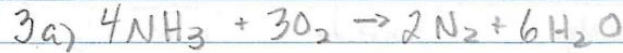


### 3.8 Stoechiométrie



b)  $1,60 \text{ mol NH}_3 \times \frac{3 \text{ mol O}_2}{4 \text{ mol NH}_3} = 1,20 \text{ mol O}_2$

c)  $1,60 \text{ mol NH}_3 \times \frac{2 \text{ mol N}_2}{4 \text{ mol NH}_3} = 0,8 \text{ mol N}_2$

et

$1,60 \text{ mol NH}_3 \times \frac{6 \text{ mol H}_2\text{O}}{4 \text{ mol NH}_3} = 2,4 \text{ mol H}_2\text{O}$

4a)  $0,750 \text{ mol NH}_3 \times \frac{3 \text{ mol O}_2}{4 \text{ mol NH}_3} = 0,5625 \text{ mol O}_2$

b)  $0,750 \text{ mol NH}_3 \times \frac{2 \text{ mol N}_2}{4 \text{ mol NH}_3} = 0,375 \text{ mol N}_2$

et

$0,750 \text{ mol NH}_3 \times \frac{6 \text{ mol H}_2\text{O}}{4 \text{ mol NH}_3} = 1,125 \text{ mol H}_2\text{O}$

5.  $2,50 \text{ mol NH}_3 \times \frac{6 \text{ mol H}_2\text{O}}{4 \text{ mol NH}_3} = 3,75 \text{ mol H}_2\text{O}$

6.  $0,750 \text{ mol O}_2 \times \frac{2 \text{ mol H}_2\text{S}}{3 \text{ mol O}_2} = 0,500 \text{ mol H}_2\text{S}$

7.  $1,80 \text{ mol KClO}_3 \times \frac{3 \text{ mol O}_2}{2 \text{ mol KClO}_3} = 2,70 \text{ mol O}_2$

8.  $4,50 \text{ g H}_2\text{O} \times \frac{1 \text{ mol H}_2\text{O}}{18,0 \text{ g H}_2\text{O}} \times \frac{1 \text{ mol O}_2}{2 \text{ mol H}_2\text{O}} \times \frac{32,0 \text{ g O}_2}{1 \text{ mol O}_2} = 4,00 \text{ g O}_2$

$\text{H}_2: 4,50 \text{ g H}_2\text{O} \times \frac{1 \text{ mol H}_2\text{O}}{18,0 \text{ g H}_2\text{O}} \times \frac{2 \text{ mol H}_2}{2 \text{ mol H}_2\text{O}} \times \frac{2 \text{ g H}_2}{1 \text{ mol H}_2} = 0,500 \text{ g H}_2$

$$9. \quad 8 \text{ g O}_2 \times \frac{1 \text{ mol O}_2}{32,0 \text{ g O}_2} \times \frac{2 \text{ mol Al}_2\text{O}_3}{3 \text{ mol O}_2} \times \frac{102 \text{ g Al}_2\text{O}_3}{1 \text{ mol Al}_2\text{O}_3} = 17 \text{ g Al}_2\text{O}_3$$

$$10. \quad \text{H}_2\text{O}: 2,30 \text{ g NO}_2 \times \frac{1 \text{ mol NO}_2}{46 \text{ g NO}_2} \times \frac{1 \text{ mol H}_2\text{O}}{3 \text{ mol NO}_2} \times \frac{18 \text{ g H}_2\text{O}}{1 \text{ mol H}_2\text{O}} = 0,30 \text{ g}$$

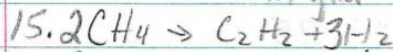
$$\text{HNO}_3: 2,30 \text{ g NO}_2 \times \frac{1 \text{ mol NO}_2}{46 \text{ g NO}_2} \times \frac{2 \text{ mol HNO}_3}{3 \text{ mol NO}_2} \times \frac{63,0 \text{ g HNO}_3}{1 \text{ mol HNO}_3} = 2,10 \text{ g}$$

$$11. \quad 25,2 \text{ g HNO}_3 \times \frac{1 \text{ mol HNO}_3}{63,0 \text{ g HNO}_3} \times \frac{4 \text{ mol Sn(NO}_3)_2}{10 \text{ mol HNO}_3} \times \frac{242,7 \text{ g Sn(NO}_3)_2}{1 \text{ mol Sn(NO}_3)_2} = 38,8 \text{ g}$$

$$12. \quad 14,2 \text{ g Cl}_2 \times \frac{1 \text{ mol Cl}_2}{71,0 \text{ g Cl}_2} \times \frac{4 \text{ mol HCl}}{2 \text{ mol Cl}_2} \times \frac{36,5 \text{ g HCl}}{1 \text{ mol HCl}} = 14,6 \text{ g}$$

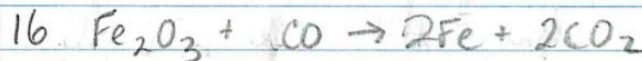
$$13. \quad 60,0 \text{ g NaOH} \times \frac{1 \text{ mol NaOH}}{40,0 \text{ g NaOH}} \times \frac{1 \text{ mol H}_3\text{PO}_4}{3 \text{ mol NaOH}} \times \frac{98,0 \text{ g H}_3\text{PO}_4}{1 \text{ mol H}_3\text{PO}_4} = 49,0 \text{ g}$$

$$14. \quad 18,3 \text{ g HCl} \times \frac{1 \text{ mol HCl}}{36,5 \text{ g HCl}} \times \frac{1 \text{ mol H}_2}{2 \text{ mol HCl}} \times \frac{2 \text{ g H}_2}{1 \text{ mol H}_2} = 0,501 \text{ g}$$



$$1. \quad \text{C}_2\text{H}_2: 8,0 \text{ g CH}_4 \times \frac{1 \text{ mol CH}_4}{16,0 \text{ g CH}_4} \times \frac{1 \text{ mol C}_2\text{H}_2}{2 \text{ mol CH}_4} \times \frac{22,4 \text{ L}}{1 \text{ mol C}_2\text{H}_2} = 5,6 \text{ L}$$

$$\text{H}_2: 8,0 \text{ g CH}_4 \times \frac{1 \text{ mol CH}_4}{16,0 \text{ g CH}_4} \times \frac{3 \text{ mol H}_2}{2 \text{ mol CH}_4} \times \frac{22,4 \text{ L H}_2}{1 \text{ mol H}_2} = 16,8 \text{ L}$$



pas capable d'équilibrer

Est-ce juste moi ?

$$17. 34,0 \text{ L O}_2 \times \frac{1 \text{ mol O}_2}{22,4 \text{ L}} \times \frac{2 \text{ mol NO}_2}{1 \text{ mol O}_2} \times \frac{22,4 \text{ L}}{1 \text{ mol NO}_2} = 68 \text{ L}$$

$$18. 125 \text{ L} \times \frac{1 \text{ mol}}{22,4 \text{ L}} \times \frac{420 \text{ kJ}}{1 \text{ mol}} = 2,34 \times 10^3 \text{ kJ}$$

### 3.9 Réactifs limitants

1. a)  $\text{H}_2: 2 \div 2 = 1$  limitant  
 $\text{O}_2: 2 \div 1 = 2$  excès

b)  $\text{H}_2: 10 \div 2 = 5$  excès  
 $\text{O}_2: 4 \div 1 = 4$  limitant

c)  $\text{H}_2: 50 \div 2 = 25$  excès  
 $\text{O}_2: 20 \div 1 = 20$  limitant

d)  $\text{H}_2: 100 \div 2 = 50$  limitant  
 $\text{O}_2: 75 \div 1 = 75$  excès

e)  $\text{H}_2: 100 \div 2 = 50$  excès  
 $\text{O}_2: 25 \div 1 = 25$  limitant



2. a)  $H_2: 0,500 \div 2 = 0,250 \text{ mol}$  limitant  
 $O_2: 0,750 \div 1 = 0,750 \text{ mol}$  excès

$H_2O \text{ formé} : 2(0,250) = \boxed{0,500 \text{ mol}}$

b)  $H_2: 0,800 \div 2 = 0,400 \text{ mol}$  limitant  
 $O_2: 0,750 \div 1 = 0,750 \text{ mol}$  excès

$H_2O \text{ formé} : 2(0,400) = \boxed{0,800 \text{ mol}}$

c)  $H_2: 5,00 \text{ g} \times \frac{1 \text{ mol}}{2,02 \text{ g}} = 2,50 \text{ mol}$   $2,50 \div 2 = 1,25 \text{ mol}$   
↑  
limitant

$O_2: 56,0 \text{ g} \times \frac{1 \text{ mol}}{32,0 \text{ mol}} = 1,75 \text{ mol}$   $O_2: 1,75 \div 1 = 1,75 \text{ mol}$   
↑  
excès

$H_2O \text{ produit} : 2(1,25) = 2,50 \text{ mol} \times \frac{18,0 \text{ g}}{1 \text{ mol}} = \boxed{45 \text{ g}}$

d)  $H_2: 2,00 \text{ L} \times \frac{1 \text{ mol}}{22,4 \text{ L}} = 0,0893 \text{ mol}$   $0,0893 \text{ mol} \div 2 = 0,04465 \text{ mol}$   
↑  
limitant

$O_2: 2 \text{ L} \times \frac{1 \text{ mol}}{22,4 \text{ L}} = 0,0893 \text{ mol}$   $0,0893 \text{ mol} \div 1 = 0,0893 \text{ mol}$   
↑  
excès

$H_2O \text{ produit} : 2(0,04465) = 0,0893 \text{ mol} \times \frac{22,4 \text{ L}}{1 \text{ mol}} = \boxed{2,00 \text{ L}}$

e)  $H_2: 7,0 \text{ L} \times \frac{1 \text{ mol}}{22,4 \text{ L}} = 0,3125 \text{ mol}$   $0,3125 \div 2 = 0,15625 \text{ mol}$   
↑  
excès

$O_2: 3 \text{ L} \times \frac{1 \text{ mol}}{22,4 \text{ L}} = 0,1339 \text{ mol}$   $0,1339 \text{ mol} \div 1 = 0,1339 \text{ mol}$   
↑  
limitant

$H_2O \text{ produit} : 2(0,1339) = 0,2678 \text{ mol} \times \frac{22,4 \text{ L}}{1 \text{ mol}} = \boxed{6,00 \text{ L}}$

$$3. \text{H}_2: 0,161 \text{ g} \times \frac{1 \text{ mol}}{2,02 \text{ g}} = 0,0797 \text{ mol} \div 1 = 0,0797 \text{ mol}$$

↑  
excès

$$\text{N}_2: 5,62 \text{ g} \times \frac{1 \text{ mol}}{28 \text{ g}} = 0,200 \text{ mol} \div 3 = 0,0667 \text{ mol}$$

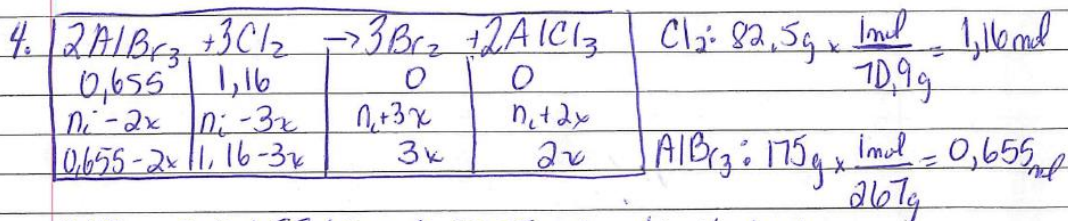
↑  
limitant (x)

	$\text{H}_2$	$3\text{N}_2$	$2\text{HN}_3$
initial	0,0797	0,200	0
inter.	$n_i - x$	$n_i - 3x$	$n_i + 2x$
final	$0,0797 - x$	$0,200 - 3x$	$2x$

$$\text{masse NH}_3 \text{ produit } 2(0,0667) = 1,334 \text{ mol} \times \frac{43 \text{ g}}{1 \text{ mol}} = \boxed{57,3 \text{ g}}$$

masse du réactif en excès ( $\text{H}_2$ )

$$0,0797 - 0,0667 = 0,0130 \text{ mol} \times \frac{2,02 \text{ g}}{1 \text{ mol}} = \boxed{0,026 \text{ g}}$$



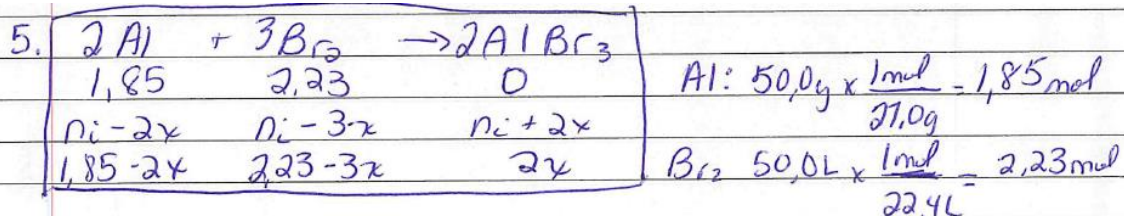
$$\text{AlBr}_3: 0,655 \div 2 = 0,3275 \text{ mol} \quad \text{limitant (x)}$$

$$\text{Cl}_2: 1,16 \div 3 = 0,387 \text{ mol} \quad \text{excès}$$

$$\text{AlCl}_3 \text{ produit } 2(0,3275) = 0,655 \text{ mol} \times \frac{133 \text{ g}}{1 \text{ mol}} = \boxed{87,1 \text{ g}}$$

masse du réactif en excès ( $\text{Cl}_2$ )

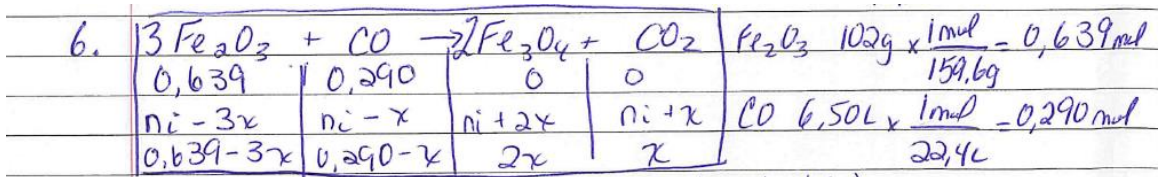
$$1,16 - 3(0,3275) = 0,1775 \text{ mol} \times \frac{70,9 \text{ g}}{1 \text{ mol}} = \boxed{12,6 \text{ g}}$$



$$\text{Al}: 1,85 \div 2 = 0,925 \text{ mol} \quad \text{excès}$$

$$\text{Br}_2: 2,23 \div 3 = 0,743 \text{ mol} \quad \text{limitant (x)}$$

$$\text{masse du AlBr}_3 \quad 2(0,743) = 1,49 \text{ mol} \times \frac{267 \text{ g}}{1 \text{ mol}} = \boxed{398 \text{ g}}$$



$\text{Fe}_2\text{O}_3$   $0,639 \div 3 = 0,213\text{mol}$  limitant(x)

$\text{CO}$   $0,290 \div 1 = 0,290\text{mol}$  excès

volume  $\text{CO}_2$  produit  $0,213\text{mol} \times \frac{22,4\text{L}}{1\text{mol}} = \boxed{4,77\text{L}}$