

# Chimie 30S

## Révision - Corrigé

### La matière

1.  $Q = m \Delta T c$

$$Q = (50g)(40^\circ C)(4,18 \frac{J}{g \cdot ^\circ C})$$

$$\boxed{Q = 8360 J}$$

2. de  $-15^\circ C$  à  $0^\circ C$  :  $Q = m \Delta T c$   
 $= (1200g)(15^\circ C)(2,06 \frac{J}{g \cdot ^\circ C}) = 37080 J$

à  $0^\circ C$  :  $Q = m \Delta H_f = (1200g)(334 \frac{J}{g}) = 400800 J$

de  $0^\circ C$  à  $30^\circ C$  :  $Q = m \Delta T c$   
 $= (1200g)(30^\circ C)(4,18 \frac{J}{g \cdot ^\circ C}) = 150480 J$

$$\boxed{588360 J}$$

3. de  $90^\circ C$  à  $100^\circ C$  :  $Q = m \Delta T c$   
 $= (210g)(10^\circ C)(4,18 \frac{J}{g \cdot ^\circ C}) = 8778 J$

à  $100^\circ C$  :  $Q = m \Delta H_v$   
 $= (210g)(2260 \frac{J}{g}) = 474600 J$

$$\boxed{483378 J}$$

### Les réactions chimiques

1.  $2,66 \times 10^{30}$  atomes  $\left( \frac{1 \text{ mol}}{6,02 \times 10^{23} \text{ atomes}} \right) = \boxed{4,42 \times 10^6 \text{ mol}}$

2.  $3,68 \text{ mol} \left( \frac{6,02 \times 10^{23} \text{ moléc.}}{1 \text{ mol}} \right) = \boxed{2,22 \times 10^{24} \text{ moléc.}}$

3.  $7,50 \text{ mol } H_2SO_4 \left( \frac{40}{1 H_2SO_4} \right) \left( \frac{6,02 \times 10^{23} \text{ atomes}}{1 \text{ mol}} \right) = \boxed{1,81 \times 10^{25} \text{ atomes O}}$

4.  $8,12 \times 10^{22} \text{ at. H} \left( \frac{1 C_3H_8}{8 H} \right) \left( \frac{1 \text{ mol}}{6,02 \times 10^{23}} \right) = \boxed{1,69 \times 10^{-2} \text{ mol } C_3H_8}$

$$5. \boxed{238,029 \text{ g/mol}}$$

$$6. \text{CuSO}_4 \quad \begin{array}{l} \text{Cu: } 63,546 \text{ g/mol} \\ \text{S: } 32,066 \text{ g/mol} \\ \text{O: } 4 \times 15,9994 \text{ g/mol} \end{array}$$

$$\boxed{159,6096 \text{ g/mol}}$$

$$7. 145 \text{ g} \left( \frac{1 \text{ mol}}{278,1054 \text{ g}} \right) = \boxed{0,52 \text{ mol}}$$

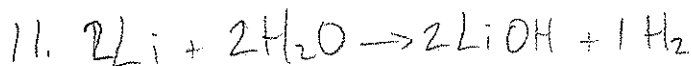
$$8. 2,38 \text{ mol} \left( \frac{100,0872 \text{ g}}{1 \text{ mol}} \right) = \boxed{238,21 \text{ g}}$$

$$9. 200 \text{ g} \left( \frac{1 \text{ mol}}{44,09632 \text{ g}} \right) \left( \frac{6,02 \times 10^{23} \text{ molecules}}{1 \text{ mol}} \right) \left( \frac{11 \text{ atoms}}{1 \text{ molecule}} \right) = \boxed{3,00 \times 10^{25} \text{ atoms}}$$

$$10. 45 \times 10^{25} \text{ at. Cl} \left( \frac{1 \text{ mol}}{6,02 \times 10^{23} \text{ at.}} \right) = 74,75083056 \text{ mol Cl}$$

Donc, il y a 74,75 mol KCl

$$74,75083056 \text{ mol KCl} \left( \frac{74,551 \text{ g}}{1 \text{ mol}} \right) = \boxed{5572,75 \text{ g}}$$



$$\begin{array}{l} \text{Rapport } 2:2 \\ \quad \quad 1:1 \end{array} \quad \boxed{4,8 \text{ mol H}_2\text{O}}$$

$$12. \begin{array}{l} 2,75 \text{ mol H}_2\text{O} : x \text{ mol } 1/2 \\ 2 \text{ mol H}_2\text{O} : 1 \text{ mol H}_2 \end{array}$$

$$x = \boxed{1,38 \text{ mol H}_2}$$

$$13. 45,60 \text{ g Li} \left( \frac{1 \text{ mol}}{6,941 \text{ g}} \right) = 6,569658551 \text{ mol Li} = 6,569658551 \text{ mol LiOH}$$

$$6,569658551 \text{ mol LiOH} \left( \frac{23,94834 \text{ g}}{1 \text{ mol}} \right) = \boxed{157,33 \text{ g}}$$

$$14. \quad 90g \text{ Li} \left( \frac{1 \text{ mol}}{6,941g} \right) = 12,96643135 \text{ mol Li}$$

↳ besoin de 12,9664 mol H<sub>2</sub>O

$$300g \text{ H}_2\text{O} \left( \frac{1 \text{ mol}}{18,01528g} \right) = 16,65253052 \text{ mol H}_2\text{O}$$

↳ > 12,9664 mol

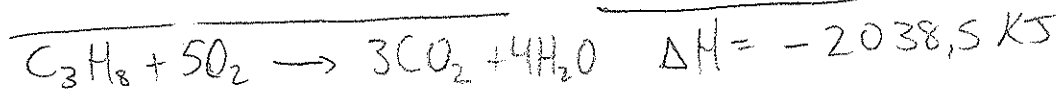
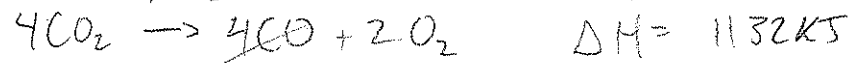
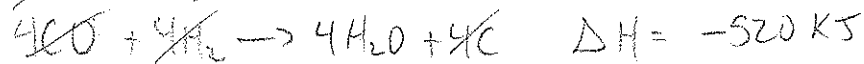
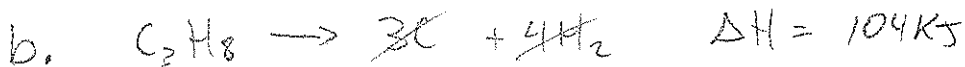
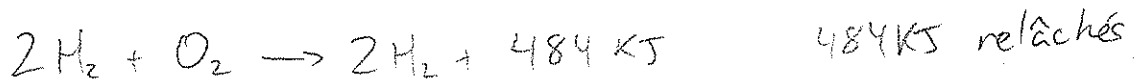
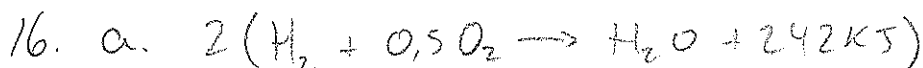
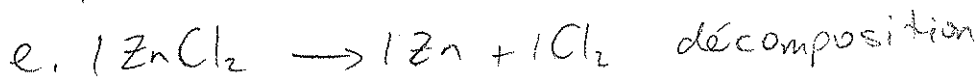
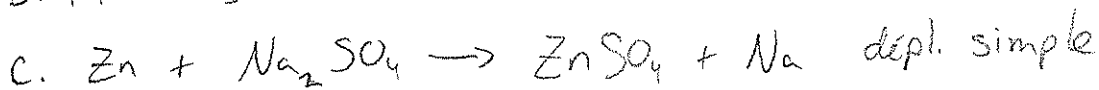
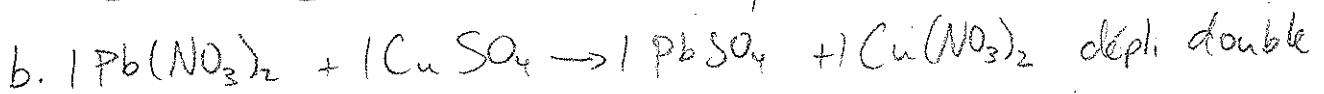
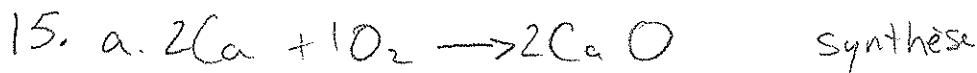
∴ Réactif limitant Li Réactif en excès H <sub>2</sub> O
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$$16,65253052 \text{ mol} - 12,96643135 \text{ mol} = 3,686099169 \text{ mol en excès}$$

$$3,68... \left( \frac{18,01528g}{1 \text{ mol}} \right) = \boxed{66,41g \text{ H}_2\text{O en excès}}$$

$$\text{H}_2 : \frac{12,96643135 \text{ mol}}{2} = 6,483215675 \text{ mol H}_2$$

$$6,48... \text{ mol} \left( \frac{2,01588g}{1 \text{ mol}} \right) = \boxed{13,07g \text{ H}_2}$$



## Les solutions

$$1. 0,30 = \frac{m_s}{300 + m_s}$$

$$90 + 0,3m_s = m_s$$

$$90 = 0,7m_s$$

$$m_s = 128,5714286g$$

$$128,5714286g \text{ NaCl} \left( \frac{1 \text{ mol}}{58,44247g} \right) = \boxed{2,20 \text{ mol}}$$

$$2. 130 \text{ mL} - 85,5 \text{ mL} = 44,5 \text{ mL KMnO}_4$$

$$\% \frac{V}{V} = \frac{44,5}{130} = \boxed{34,23\%}$$

$$3. 35g \left( \frac{1 \text{ mol}}{39,99711g} \right) = 0,875063223 \text{ mol}$$

$$C = \frac{0,875063223 \text{ mol}}{0,1 \text{ L}} = \boxed{8,75 \text{ M}}$$

$$4. 22,45g \left( \frac{1 \text{ mol}}{159,6096g} \right) = 0,1406557 \text{ mol}$$

$$C = \frac{0,1406557 \text{ mol}}{0,225 \text{ L}} = \boxed{0,63 \text{ M}}$$

$$5. \frac{24}{33900000} \times 10^6 = \boxed{0,71 \text{ ppm}}$$

$$6. 0,65 \frac{g}{L} \left( \frac{1 \text{ mol}}{98,07948g} \right) = \boxed{6,75 \text{ M}} \rightarrow \text{Il est à noter que le pourcentage aurait dû dire } 6,5\% \text{ et non } 65\%.$$

$$7. n = 0,54 \frac{\text{mol}}{L} \cdot 0,0405 \text{ L} = \boxed{0,022 \text{ mol}}$$

$$8. C_1 V_1 = C_2 V_2$$

$$(17,5 \text{ M}) V_1 = (2,5 \text{ M})(200 \text{ mL})$$

$$V_1 = 28,57 \text{ mL HCl}$$

$$200 \text{ mL} - 28,57 \text{ mL} = \boxed{171,43 \text{ mL H}_2\text{O}}$$

$$9. n = 0,75 \frac{\text{mol}}{L} \cdot 0,3 \text{ L} = 0,225 \text{ mol}$$

$$0,225 \text{ mol} \left( \frac{100,0872g}{1 \text{ mol}} \right) = 22,52g$$

Ajouter  $\boxed{22,52g}$  à 300 mL d'eau

$$10. \quad 0,40 = \frac{m}{450g} \quad 180g \left( \frac{1 \text{ mol}}{98,07948g} \right) = 1,835246272 \text{ mol}$$

$$m = 180g$$

$$H_2O: 450g - 180g = 270g \rightarrow 270 \text{ mL}$$

$$C = \frac{1,835246272 \text{ mol}}{0,270 \text{ L}} = \boxed{6,80 \text{ M}}$$

$$11. \quad 5,3 \frac{\text{mol}}{\text{L}} \left( \frac{159,6096g}{1 \text{ mol}} \right) = 845,93088g \left( \frac{1 \text{ L}}{1000g} \right) = 0,8459 = \boxed{84,59\%}$$

$$12. \quad 0,40 \text{ mg} \left( \frac{1g}{1000 \text{ mg}} \right) = 0,0004g$$

$$\frac{0,0004g}{2000g} \times 10^9 = \boxed{200 \text{ ppb}}$$

$$2 \text{ L} \left( \frac{1000g}{1 \text{ L}} \right) = 2000g$$

$$13. \quad 0,60 \frac{g}{L} \left( \frac{1 \text{ mol}}{39,99711g} \right) = 0,015001084 \text{ M}$$

La question n'a pas de sens. On ne peut pas augmenter la concentration à 1,5M.

### Les gaz

1. La pression diminue lorsqu'on augmente le volume.  
La pression augmente lorsqu'on diminue le volume.

2. Le volume augmente lorsqu'on augmente la température.  
Le volume diminue lorsqu'on diminue la température.

3. Boyle-Mariotte:  $T^\circ$

Charles:  $P$

Dalton: pression totale, volume

$$4. \quad V_1 = 85 \text{ dm}^3$$

$$P_1 = 104 \text{ kPa}$$

$$P_2 = 21 \text{ kPa}$$

$$P_1 V_1 = P_2 V_2$$

$$104 \text{ kPa} \cdot 85 \text{ dm}^3 = 21 \text{ kPa} \cdot V_2$$

$$V_2 = \boxed{420,95 \text{ dm}^3}$$

$$5. \quad V_1 = 15 \text{ dm}^3$$

$$V_2 = 40 \text{ dm}^3$$

$$T_2 = 313 \text{ K}$$

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$\frac{15 \text{ dm}^3}{T_1} = \frac{40 \text{ dm}^3}{313 \text{ K}}$$

$$T_1 = \boxed{117,38 \text{ K}}$$

$$6. \quad P_T = 103 \text{ kPa}$$

$$N_2: \quad 0,78 \cdot 103 \text{ kPa} = \boxed{80,34 \text{ kPa}}$$

$$O_2: \quad 0,20 \cdot 103 \text{ kPa} = \boxed{20,6 \text{ kPa}}$$

$$7. \quad V_1 = 22 \text{ dm}^3$$

$$T_1 = 25^\circ\text{C} = 298 \text{ K}$$

$$T_2 = 90^\circ\text{C} = 363 \text{ K}$$

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$\frac{22 \text{ dm}^3}{298 \text{ K}} = \frac{V_2}{363 \text{ K}}$$

$$V_2 = \boxed{26,80 \text{ dm}^3}$$

$$8. \quad n = 0,5 \text{ mol}$$

$$T_1 = 25^\circ\text{C} = 298 \text{ K}$$

$$P = 101 \text{ kPa}$$

$$PV = nRT$$

$$101 \text{ kPa} \cdot V = 0,5 \text{ mol} \cdot 8,314 \cdot 298 \text{ K}$$

$$V = \boxed{12,27 \text{ L}}$$

$$9. \quad V_1 = 2000 \text{ cm}^3 = 2000 \text{ mL} = 2 \text{ L}$$

$$P_1 = 103 \text{ kPa}$$

$$T_1 = 25^\circ\text{C} = 298 \text{ K}$$

$$P_2 = 99 \text{ kPa}$$

$$T_2 = 273 \text{ K}$$

$$\frac{V_1 P_1}{T_1} = \frac{V_2 P_2}{T_2}$$

$$\frac{2 \text{ L} \cdot 103 \text{ kPa}}{298 \text{ K}} = \frac{V_2 \cdot 99 \text{ kPa}}{273 \text{ K}}$$

$$V_2 = \boxed{11,91 \text{ L}}$$

$$10. \quad P = 89,8 \text{ kPa}$$

$$V = 1,81 \text{ L}$$

$$T = 25^\circ\text{C} = 298 \text{ K}$$

$$PV = nRT$$

$$89,8 \text{ kPa} \cdot 1,81 \text{ L} = n \cdot 8,314 \cdot 298 \text{ K}$$

$$n = 0,065603744 \text{ mol}$$

$$\text{Masse molaire} = \frac{2,1 \text{ g}}{0,065603744 \text{ mol}} = 32,01 \text{ g/mol}$$

Il s'agit probablement de l'oxygène gazeux ( $O_2$ ).

11. La pression diminuera de moitié.  
La température doublera.

12.  $T_1 = 12^\circ\text{C} = 285\text{K}$

$V_1 = 100\text{L}$

$T_2 = -273^\circ\text{C} = 0\text{K}$

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$\frac{100\text{L}}{285\text{K}} = \frac{V_2}{0}$$

$V_2 = \boxed{0\text{L}}$

C'est une valeur théorique.

13.  $V_1 = 30\text{cm}^3 = 30\text{mL} = 0,030\text{L}$

$T_1 = 290\text{K}$

$P_1 = 73\text{kPa}$

$T_2 = 273\text{K}$

$P_2 = 101,3\text{kPa}$

$$\frac{V_1 P_1}{T_1} = \frac{V_2 P_2}{T_2}$$

$$\frac{30\text{mL} \cdot 73\text{kPa}}{290\text{K}} = \frac{V_2 \cdot 101,3\text{kPa}}{273\text{K}}$$

$V_2 = \boxed{20,35\text{mL}}$

16.  $V_1 = 32,4\text{L}$

$P_1 = 97\text{kPa}$

$T_1 = 23^\circ\text{C} = 296\text{K}$

$P_2 = 81,7\text{kPa}$

$T_2 = 19^\circ\text{C} = 292\text{K}$

$V_2 = 32,4\text{L}$

①  $PV = nRT$

$$97\text{kPa} \cdot 32,4\text{L} = n \cdot 8,314 \cdot 296\text{K}$$

$$n_1 = 1,277070913\text{mol}$$

②  $PV = nRT$

$$81,7\text{kPa} \cdot 32,4\text{L} = n \cdot 8,314 \cdot 292\text{K}$$

$$n_2 = 1,090370756\text{mol}$$

$n_1 - n_2 = \boxed{0,19\text{mol}}$

17.  $2,51\text{g} \left( \frac{1\text{mol}}{107,868\text{g}} \right) = 0,023269181\text{mol Ag}$

$0,01163459\text{mol Cl}_2$

$n = 0,01163459\text{mol}$

$P = 101,3\text{kPa}$

$T = 273\text{K}$

$PV = nRT$

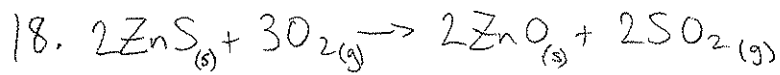
$$101,3\text{kPa} \cdot V = (0,01163459) (8,314) (273\text{K})$$

$V = \boxed{0,26\text{L}}$

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$\frac{101,3\text{kPa} \cdot 0,26\text{L}}{273\text{K}} = \frac{99,2\text{kPa} \cdot V_2}{297\text{K}}$$

$V_2 = \boxed{0,29\text{L}}$



à TPN:

$$T = 273\text{K}$$

$$P = 101,3\text{kPa}$$

$$V = 185\text{L}$$

$$PV = nRT$$

$$101,3\text{kPa} \cdot 185\text{L} = n \cdot 8,314 \cdot 273\text{K}$$

$$n = 8,25673805\text{ mol O}_2$$

$$8,25673805\text{ mol} \left(\frac{2}{3}\right) = 5,504492033\text{ mol ZnO}$$

$$5,50449203\text{ mol} \left(\frac{81,3894\text{g}}{1\text{mol}}\right) = \boxed{448,01\text{g ZnO}}$$



$$\text{O}_2/\text{CO}_2: \quad 9:6$$

$$5,6\text{L}: x$$

$$\frac{x}{6} = \frac{5,6}{9}$$

$$x = \boxed{3,73\text{L de CO}_2}$$

$$\text{O}_2/\text{H}_2\text{O}: \quad 9:6$$

$$5,6\text{L}: x$$

$$x = \boxed{3,73\text{L de H}_2\text{O}}$$

$$20. 54\text{g} \left(\frac{1\text{mol}}{159,6922\text{g}}\right) = 0,338150517\text{ mol Fe}_2\text{O}_3$$

$$\underline{\text{CO}}: 3 \times 0,338150517\text{ mol} = 1,014451551\text{ mol CO} \left(\frac{28,0104\text{g}}{1\text{mol}}\right) = \boxed{28,42\text{g}}$$

$$PV = nRT$$

$$98,5\text{kPa} \cdot V = 1,01445 \cdot 8,314 \cdot 290\text{K}$$

$$V = \boxed{0,04\text{L}}$$

$$\underline{\text{Fe}}: 2 \times 0,338150517\text{ mol} = 0,676301034\text{ mol} \left(\frac{55,847\text{g}}{1\text{mol}}\right) = \boxed{37,77\text{g}}$$

$$\underline{\text{CO}_2}: 3 \times 0,338150517\text{ mol} = 1,014451551\text{ mol CO}_2 \left(\frac{44,0098\text{g}}{1\text{mol}}\right) = \boxed{44,65\text{g}}$$

$$PV = nRT$$

$$98,5\text{ kPa} \cdot V = 1,01445\text{ mol} \cdot 8,314 \cdot 290\text{K}$$

$$V = \boxed{0,04\text{L}}$$