Chimie 30S
Révision – Corrigé

La matière

1. $Q = m\Delta T c$

$Q = (50\,g)(40°C)(4,18\,J/g\cdot°C)$

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

2. de $-15°C$ à $0°C$: $Q = m\Delta T c$
$= (1200\,g)(15°C)(2,06\,J/g\cdot°C) = 37\,080\,J$

à $0°C$: $Q = m\Delta H_f = (1200\,g)(334\,J/g) = 400\,800\,J$

de $0°C$ à $30°C$: $Q = m\Delta T c$
$= (1200\,g)(30°C)(4,18\,J/g\cdot°C) = 150\,480\,J$

$\boxed{588\,360\,J}$

3. de $90°C$ à $100°C$: $Q = m\Delta T c$
$= (210\,g)(10°C)(4,18\,J/g\cdot°C) = 8778\,J$

à $100°C$: $Q = m\Delta H_v$
$= (210\,g)(2260\,J/g) = 474\,600\,J$

$\boxed{483\,378\,J}$

Les réactions chimiques

1. $2,66\times10^{30}\text{ atomes}\left(\frac{1\,mol}{6,02\times10^{23}\text{ atomes}}\right) = \boxed{4,42\times10^{6}\,mol}$

2. $3,68\,mol\left(\frac{6,02\times10^{23}\text{ molécules}}{1\,mol}\right) = \boxed{2,22\times10^{24}\text{ molécules}}$

3. $7,50\,mol\ H_2SO_4\left(\frac{4\,O}{1\,H_2SO_4}\right)\left(\frac{6,02\times10^{23}\text{ atomes}}{1\,mol}\right) = \boxed{1,81\times10^{25}\text{ atomes O}}$

4. $8,12\times10^{22}\text{ at. H}\left(\frac{1\,C_3H_8}{8\,H}\right)\left(\frac{1\,mol}{6,02\times10^{23}}\right) = \boxed{1,69\times10^{-2}\,mol\ C_3H_8}$

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

6. $CuSO_4$ Cu : 63,546 g/mol
S : 32,066 g/mol
O : 4 × 15,9994 g/mol
$\boxed{159,6096\ g/mol}$

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

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

9. $200\,g\left(\frac{1\,mol}{44,09652\,g}\right)\left(\frac{6,02\times10^{23}\ molécules}{1\,mol}\right)\left(\frac{11\ atomes}{1\ molécule}\right) = \boxed{3,00\times10^{25}\ atomes}$

10. $4,5\times10^{25}\ at.\ Cl\left(\frac{1\,mol}{6,02\times10^{23}\,at}\right) = 74,750830056\ mol\ Cl$

Donc, il y a 74,75 mol KCl

$74,750830056\ mol\ KCl\left(\frac{74,551\,g}{1\,mol}\right) = \boxed{5572,75\,g}$

11. $2Li + 2H_2O \rightarrow 2LiOH + 1H_2$

Rapport 2 : 2
1 : 1
$\boxed{4,8\ mol\ H_2O}$

12. $2,75\ mol\ H_2O : x\ mol\ H_2$
$2\ mol\ H_2O : 1\ mol\ H_2$
$x = \boxed{1,38\ mol\ H_2}$

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

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

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

↳ besoin de $12,9664\,mol\ H_2O$

$300_g\ H_2O\left(\frac{1\,mol}{18,015288_g}\right) = 16,65253052\,mol\ H_2O$

↳ > $12,9664\,mol$

∴ Réactif limitant Li
Réactif en excès H_2O

$16,65253052\,mol - 12,96643135\,mol = 3,68609916\,9\,mol$ en excès

$3,68\ldots\left(\frac{18,015288_g}{1\,mol}\right) = \boxed{66,41_g\ H_2O \text{ en excès}}$

H_2 : $\frac{12,96643135\,mol}{2} = 6,483215675\,mol\ H_2$

$6,48\ldots mol\left(\frac{2,015888_g}{1\,mol}\right) = \boxed{13,07_g\ H_2}$

15. a. $2Ca + 1O_2 \longrightarrow 2CaO$ synthèse

b. $1Pb(NO_3)_2 + 1CuSO_4 \longrightarrow 1PbSO_4 + 1Cu(NO_3)_2$ dépl. double

c. $Zn + Na_2SO_4 \longrightarrow ZnSO_4 + Na$ dépl. simple

d. $1C_5H_{12} + 8O_2 \longrightarrow 5CO_2 + 6H_2O$ combustion

e. $1ZnCl_2 \longrightarrow 1Zn + 1Cl_2$ décomposition

16. a. $2(H_2 + 0,5O_2 \longrightarrow H_2O + 242KJ)$

$2H_2 + O_2 \longrightarrow 2H_2 + 484\,KJ$ 484KJ relâchés

b. $C_3H_8 \longrightarrow 3C + 4H_2$ $\Delta H = 104KJ$

$3C + 3O_2 \longrightarrow 3CO_2$ $\Delta H = -2754,5\,KJ$

$4CO + 4H_2 \longrightarrow 4H_2O + 4C$ $\Delta H = -520\,KJ$

$4CO_2 \longrightarrow 4CO + 2O_2$ $\Delta H = 1132KJ$

$C_3H_8 + 5O_2 \longrightarrow 3CO_2 + 4H_2O$ $\Delta H = -2038,5\,KJ$

Les solutions

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

$90 + 0,3m_s = m_s$

$90 = 0,7m_s$

$m_s = 128,57142857g$

$128,57142857g\ NaCl\left(\frac{1mol}{58,44247g}\right) = \boxed{2,20mol}$

2. $130mL - 85,5mL = 44,5mL\ KMnO_4$

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

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

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

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

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

5. $\frac{24}{33\,900\,000} \times 10^6 = \boxed{0,71\ ppm}$

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

7. $n = \frac{0,54mol}{L} \cdot 0,040L = \boxed{0,022\ mol}$

8. $C_1V_1 = C_2V_2$

$(17,5M)V_1 = (2,5M)(200mL)$

$V_1 = 28,57mL\ HCl$

$200mL - 28,57mL = \boxed{171,43mL\ H_2O}$

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

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

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

10. $0,40 = \frac{m}{450g}$ $\quad 180g\left(\frac{1mol}{98,0748g}\right) = 1,835246272mol$

$m = 180g$

H_2O: $450g - 180g = 270g$
↳ 270mL

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

11. $\frac{5,3mol}{L}\left(\frac{159,6096g}{1mol}\right) = \frac{845,930885g}{L}\left(\frac{1L}{1000g}\right) = 0,8459 = \boxed{84,59\%}$

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

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

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

13. $\frac{0,60g}{L}\left(\frac{1mol}{39,9971g}\right) = 0,015001084M$

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°
   Charles : P
   Dalton : pression totale, volume
4. $V_1 = 85dm^3$
   $P_1 = 104kPa$
   $P_2 = 21kPa$

   $P_1V_1 = P_2V_2$
   $104kPa \cdot 85dm^3 = 21kPa \cdot V_2$
   $V_2 = \boxed{420,95\ dm^3}$

5. $V_1 = 15\,dm^3$
$V_2 = 40\,dm^3$
$T_2 = 313\,K$

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

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

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

6. $P_T = 103\,kPa$

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

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

7. $V_1 = 22\,dm^3$
$T_1 = 25°C = 298\,K$
$T_2 = 90°C = 363\,K$

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

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

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

8. $n = 0,5\,mol$
$T = 25°C = 298\,K$
$P = 101\,kPa$

$PV = nRT$

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

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

9. $V_1 = 2000\,cm^3 = 2000\,mL = 2\,L$
$P_1 = 103\,kPa$
$T_1 = 25°C = 298\,K$
$P_2 = 99\,kPa$
$T_2 = 273\,K$

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

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

$V_2 = \boxed{1,91\,L}$

10. $P = 89,8\,kPa$
$V = 1,81\,L$
$T = 25°C = 298\,K$

$PV = nRT$

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

$n = 0,065603744\,mol$

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

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

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

12. $T_1 = 12°C = 285K$
$V_1 = 100L$
$T_2 = -273°C = 0K$

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

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

$V_2 = \boxed{0L}$

C'est une valeur théorique.

13. $V_1 = 30cm^3 = 30mL = 0,030L$
$T_1 = 290K$
$P_1 = 73kPa$
$T_2 = 273K$
$P_2 = 101,3kPa$

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

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

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

16. $V_1 = 32,4L$
$P_1 = 97kPa$
$T_1 = 23°C = 296K$
$P_2 = 81,7kPa$
$T_2 = 19°C = 292K$
$V_2 = 32,4L$

① $PV = nRT$
$97kPa \cdot 32,4L = n \cdot 8,314 \cdot 296K$
$n_1 = 1,277070913 mol$

② $PV = nRT$
$81,7kPa \cdot 32,4L = n \cdot 8,314 \cdot 292K$
$n_2 = 1,090370756 mol$

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

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

$0,011634 59 mol\ Cl_2$

$n = 0,011634 59 mol$
$P = 101,3kPa$
$T = 273K$

$PV = nRT$
$101,3kPa \cdot V = (0,0116...)(8,314)(273K)$
$V = \boxed{0,26L}$

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

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

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

18. $2ZnS_{(s)} + 3O_{2(g)} \rightarrow 2ZnO_{(s)} + 2SO_{2(g)}$

à TPN:
$T = 273K$
$P = 101,3KPa$
$V = 185L$

$PV = nRT$
$101,3KPa \cdot 185L = n \cdot 8,314 \cdot 273K$
$n = 8,25673805 mol\ O_2$

$8,25673805 mol \left(\frac{2}{3}\right) = 5,50449203 mol\ ZnO$

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

19. $2C_3H_6 + 9O_2 \rightarrow 6CO_2 + 6H_2O$

O_2/CO_2: $9:6$ $\quad \frac{x}{6} = \frac{5,6}{9}$
$5,6L : x$ $\quad x = \boxed{3,73L\ de\ CO_2}$

O_2/H_2O: $9:6$ $\quad x = \boxed{3,73L\ de\ H_2O}$
$5,6L : x$

20. $54g \left(\frac{1mol}{159,6922g}\right) = 0,33815051 7 mol\ Fe_2O_3$

<u>CO</u>: $3 \times 0,33815051 7 mol = 1,01445155 1 mol\ CO \left(\frac{28,0104g}{1mol}\right) = \boxed{28,42g}$

$PV = nRT$
$98,5KPa \cdot V = 1,01445 \cdot 8,314 \cdot 290K$
$V = \boxed{0,04L}$

<u>Fe</u>: $2 \times 0,33815051 7 mol = 0,67630103 4 mol \left(\frac{55,847g}{1mol}\right) = \boxed{37,77g}$

<u>CO_2</u>: $3 \times 0,33815051 7 mol = 1,01445155 1 mol\ CO_2 \left(\frac{44,0098g}{1mol}\right) = \boxed{44,65g}$

$PV = nRT$
$98,5\ KPa \cdot V = 1,01445 mol \cdot 8,314 \cdot 290K$

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