Risultati della prova in itinere di Chimica Generale – 28 Gennaio 2011 **A**

Esercizio 1

$\Delta H° = \Delta H°_1 + \Delta H°_2 - 2(\Delta H°_3 + \Delta H°_4)$ = -494 kJ/mole

$\Delta H° = \Delta U° + P\Delta V = \Delta U° + \Delta nRT$ $\Delta n = -1$ $\Delta U°$ = 491 kJ/mole

Esercizio 2

$18\ NaBiO_3 + 38\ H_2SO_4 + 4\ FeS \leftrightarrows 9\ Bi_2(SO_4)_3 + 2\ Fe_2(SO_4)_3 + 9\ Na_2SO_4 + 38\ H_2O$
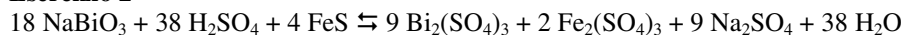
nFeS=5,000/87,91= 0,05688   N.R.FeS=0,05688/4=**0,01422**

nNaBiO$_3$= $(2,000 \cdot 10^{24}/6,022 \cdot 10^{23})/3$ = 1,107 mol   N.R.NaBiO$_3$=1,107/18=0,06150

nH$_2$SO$_4$= $5,000 \cdot 10^{2} \cdot 1,150 \cdot 0,2138/98,08$ = 1,253 mol N.R.H$_2$SO$_4$=1,253/38=0,03298

nNaBiO$_{3avanzate}$=1,107- 0,01422$\cdot$18 = 0,85104 mol

nH$_2$SO$_{4avanzate}$=1,253 - 0,01422$\cdot$38 = 0,71264 mol

m**NaBiO$_{3avanzato}$** = 0,85104$\cdot$279,968 = **238,3** g

m**H$_2$SO$_{4avanzato}$** = 0,71264$\cdot$98,08 = **69,90** g

Esercizio 3.

P$\cdot$M.M.=d$\cdot$R$\cdot$T , M.M.= (d$\cdot$R$\cdot$T)/P=$(2,4590\cdot0,0821\cdot423)/(900/760)$=72,11g/mol

$C_xH_y + x+y/4\ O_2 \rightarrow x\ CO2 + y/2\ H_2O$
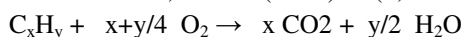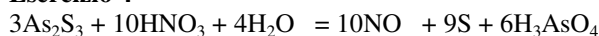
$$\begin{cases} 12{,}01x+1{,}008y=72{,}11 \\ x+\dfrac{y}{4}=8 \end{cases} \begin{cases} 12{,}01x+1{,}008y=72{,}11 \\ 4x+y=32 \end{cases}$$

$$\begin{cases} 12{,}01x+1{,}008y=72{,}11 \\ -4{,}032x-1{,}008y=-32{,}256 \end{cases} \begin{cases} 7{,}978x=39{,}854 \\ x+\dfrac{y}{4}=8 \end{cases}$$

$$\begin{cases} x=5{,}00 \\ y=12 \end{cases}$$

C$_5$H$_{12}$

Esercizio 4

$3As_2S_3 + 10HNO_3 + 4H_2O = 10NO + 9S + 6H_3AsO_4$

n(S) = 0.0183 pari a 0.587g

Esercizio 5

n(NaCl) = 0.1711

M = 1.71 moli/L

m = 1.77 moli/Kg

X(NaCl) = 0.0331

Mfinale = 0.977 moli/L

Esercizio 6

$\Delta t(eb) = Keb \times m \times \nu$ $\pi = M \times R \times T \times \nu$ = 47.7 atm

Teb = 100.96

Esercizio 7.

n=2, l=1, m=0 ___2p___   n=3, l=3, m=2 ___NO___   n=2, l=-1, m=0 ___NO___   n=6, l=4, m=-4 ____6f___

Esercizio 1

$\Delta H° = \Delta H°_1 + \Delta H°_2 - (2\Delta H°_3 + \Delta H°_4) = -937$ kJ/mole

$\Delta H° = \Delta U° + P\Delta V = \Delta U° + \Delta nRT \quad \Delta n = -2 \quad \Delta U° = -932$ kJ/mole

Esercizio 2

$18\ NaBiO_3 + 38\ H_2SO_4 + 4\ FeS \leftrightarrows 9\ Bi_2(SO_4)_3 + 2\ Fe_2(SO_4)_3 + 9\ Na_2SO_4 + 38\ H_2O$
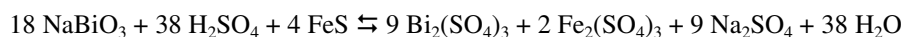
nFeS=11,600/87,91= 0,1320   N.R.FeS=0,1320/4=0,03299

nNaBiO$_3$= $(1,500 \cdot 10^{24}/6,022 \cdot 10^{23})/3$ = 0,8303 mol   N.R.NaBiO$_3$=0,8303/18=0,04613

nH$_2$SO$_4$= $2,500 \cdot 10^2 \cdot 1,150 \cdot 0,2138/98,08$ = 0,6267 mol   N.R.H$_2$SO$_4$=0,6267/38=**0,01649**

nNaBiO$_{3avanzate}$=0,8303- 0,01649·18 = 0,53348 mol

nFeS$_{avanzate}$=0,1320 - 0,01649·4 = 0,06604 mol

m**NaBiO$_{3avanzato}$** = 0,53348·279,968 = **149,4** g

m**FeS$_{avanzato}$** = 0,06604·87,91 = **5,806** g

Esercizio 3.

$P \cdot M.M.=d \cdot R \cdot T$, M.M.= $(d \cdot R \cdot T)/P=(3,8940 \cdot 0,0821 \cdot 423)/(900/760)=114,196$ g/mol

$C_xH_y + \quad x+y/4\ O_2 \to \quad x\ CO2 + \ y/2\ H_2O$
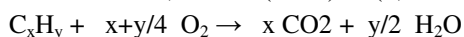
$$\begin{cases} 12{,}01x+1{,}008y=114{,}196 \\ x+\dfrac{y}{4}= 12{,}5 \end{cases} \quad \begin{cases} 12{,}01x+1{,}008y=114{,}196 \\ 4x+y=50 \end{cases}$$

$$\begin{cases} 12{,}01x+1{,}008y=114{,}196 \\ -4{,}032x-1{,}008y=-50{,}4 \end{cases} \quad \begin{cases} 7{,}978x=63{,}796 \\ x+\dfrac{y}{4}= 12{,}5 \end{cases}$$

$$\begin{cases} x=8{,}00 \\ y=18 \end{cases}$$

C$_8$H$_{18}$

Esercizio 4

$3MnCl_2 + 2KMnO_4 + 2H_2O = 5MnO_2 + 4HCl + 2KCl$

n(MnCl$_2$) = 0.00936 pari a 1.178g

Esercizio 5

n(H$_2$SO$_4$) = 0.4000 pari a 39.22g

%(m/m) = 5.43%

M = 0.571 moli/L   N = 1.142 eq/L

%(p/V) = 5.60%

Esercizio 6

$\pi = M \times R \times T \times \nu \qquad \Delta t(eb) = Keb \times m \times \nu = 0.96$

Teb = 100.96°C

Esercizio 7.

n=0, l=0, m=0 ___NO___   n=3, l=2, m=-2 ___3d_____   n=2, l=0, m=0 ___2s____   n=6, l=3, m=-4 ____NO___

Esercizio 1

$\Delta H° = \Delta H°_1 + \Delta H°_2 - 2(\Delta H°_3 + \Delta H°_4) = -202$ kJ/mole

$\Delta H° = \Delta U° + P\Delta V = \Delta U° + \Delta nRT \quad \Delta n = -1/2 \quad \Delta U° = -200$ kJ/mole

Esercizio 2

$18\ NaBiO_3 + 38\ H_2SO_4 + 4\ FeS \leftrightarrows 9\ Bi_2(SO_4)_3 + 2\ Fe_2(SO_4)_3 + 9\ Na_2SO_4 + 38\ H_2O$
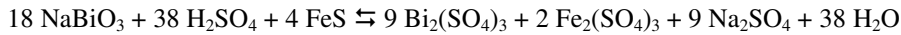
nFeS=12,000/87,91= 0,1365 $\qquad\qquad$ N.R.FeS=0,1365/4=0,03413

nNaBiO$_3$= $(4,000 \cdot 10^{23}/6,022 \cdot 10^{23})/3$ = 0,2214 mol $\quad$ N.R.NaBiO$_3$=0,2214/18=**0,01230**

nH$_2$SO$_4$= $5,000 \cdot 10^{2} \cdot 1,150 \cdot 0,2138/98,08$ = 1,2534 mol $\qquad$ N.R.H$_2$SO$_4$=1,2534/38=0,03298

nH$_2$SO$_{4 avanzate}$=1,2534 - 0,01230$\cdot$38 = 0,7860 mol

nFeS$_{avanzate}$=0,1365 - 0,01230$\cdot$4 = 0,0873 mol

m**H$_2$SO$_4$**$_{avanzato}$ = 0,7860$\cdot$98,08 = **77,09** g

$\qquad$ m**FeS**$_{avanzato}$ = 0,0873$\cdot$87,91 = **7,675** g

Esercizio 3

P$\cdot$M.M.=d$\cdot$R$\cdot$T , M.M.= (d$\cdot$R$\cdot$T)/P=(3,4170$\cdot$0,0821$\cdot$423)/(900/760)=100,20 g/mol

C_xH_y + $x+y/4$ $O_2 \rightarrow$ $x\ CO2$ + $y/2\ H_2O$
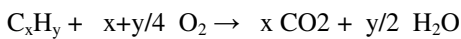
$$\begin{cases} 12,01x+1,008y=100,20 \\ x+\dfrac{y}{4} = 11 \end{cases} \begin{cases} 12,01x+1,008y=100,20 \\ 4x+y=44 \end{cases}$$

$$\begin{cases} 12,01x+1,008y=100,20 \\ -4,032x-1,008y=-44,352 \end{cases} \begin{cases} 7,978x=55,848 \\ x+\dfrac{y}{4} = 11 \end{cases}$$

$$\begin{cases} x=7,00 \\ y=16 \end{cases}$$

$\qquad$ **C$_7$H$_{16}$**

Esercizio 4

$Cr_2O_3 + 2NaNO_3 + 2NaOH = 2Na_2CrO_4 + 2NO + H_2O$
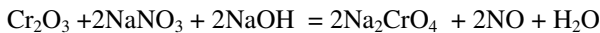
NaOH 3.200g $\quad$ resa teorica n(Na$_2$CrO$_4$) = 0.0800 $\quad$ resa 97% 12.57g

Esercizio 5

n(H$_2$SO$_4$) = 0.184

M = 2.30 moli/L

%(p/V) = 22.5%

X(H$_2$SO$_4$) = 0.0388

Mfinale = 1.31 moli/L

Esercizio 6

$\pi = M \times R \times T \times \nu \qquad M = m \qquad \Delta t(cr) = Kcr \times m \times \nu = 3.64$

Tcong = -3.64°C

Esercizio 7.

n=1, l=1, m=0 ___NO___ n=2, l=1, m=2 ____NO____ n=2, l=1, m=1 ___2p___ n=7, l=3, m=-2 ___7f___

Esercizio 1

$\Delta H° = \Delta H°_1 + \Delta H°_2 - 2 (\Delta H°_3 + \Delta H°_4) = -686$ kJ/mole

$\Delta H° = \Delta U° + P\Delta V = \Delta U° + \Delta nRT \quad \Delta n = -5/2 \quad \Delta U° = -679$ kJ/mole

Esercizio 2

$18 \, NaBiO_3 + 38 \, H_2SO_4 + 4 \, FeS \leftrightarrows 9 \, Bi_2(SO_4)_3 + 2 \, Fe_2(SO_4)_3 + 9 \, Na_2SO_4 + 38 \, H_2O$
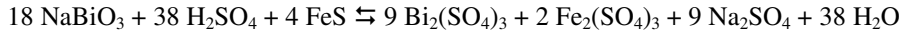
nFeS=11,600/87,91= 0,1320 ⟶ N.R.FeS=0,1320/4=0,03299

nNaBiO$_3$= $(2,500 \cdot 10^{24}/6,022 \cdot 10^{23})/3$ = 1,3838 mol ⟶ N.R.NaBiO$_3$=1,3838/18=0,07688

nH$_2$SO$_4$= $2,000 \cdot 10^{2} \cdot 1,150 \cdot 0,2138/98,08$ = 0,5014 mol ⟶ N.R.H$_2$SO$_4$=0,5014/38=**0,01319**

nNaBiO$_{3\text{avanzate}}$=1,3838- 0,01319·18 = 1,14638 mol

nFeS$_{\text{avanzate}}$=0,1320 - 0,01319·4 = 0,07924 mol

m**NaBiO$_3$**$_{\text{avanzato}}$ = 1,14638·279,968 = **320,9** g

m**FeS**$_{\text{avanzato}}$ = 0,07924·87,91 = **6,966** g

Esercizio 3.

P·M.M.=d·R·T , M.M.= (d·R·T)/P=(2,9394·0,0821·423)/(900/760)=86,20 g/mol

$C_xH_y + \quad x+y/4 \; O_2 \to \quad x \, CO2 + \; y/2 \; H_2O$
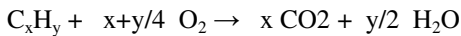
$$\begin{cases} 12{,}01x+1{,}008y=86{,}20 \\ x+\dfrac{y}{4} = 9{,}5 \end{cases} \begin{cases} 12{,}01x+1{,}008y=86{,}20 \\ 4x+y=38 \end{cases}$$

$$\begin{cases} 12{,}01x+1{,}008y=86{,}20 \\ -4{,}032x-1{,}008y=-38{,}304 \end{cases} \begin{cases} 7{,}978x=47{,}896 \\ x+\dfrac{y}{4} = 9{,}5 \end{cases}$$

$$\begin{cases} x=6{,}00 \\ y=14 \end{cases}$$

C$_6$H$_{14}$

Esercizio 4

$3As_2S_3 + 10HNO_3 + 4H_2O = 10 \, NO + 9S + 6 \, H_3AsO_4$
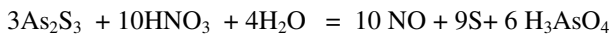
n(S) = 0.03658 teoriche   pari a 0.986g con resa 84%

Esercizio 5

n(NaCl) = 0.205

M = 2.20 moli/L

m = 2.33 moli/Kg

X(NaCl) = 0.0403

m(finale) = 1.52 moli/Kg

Esercizio 6

$\Delta t(eb) = Keb \times m \times \nu = 1.05$

Teb = 101.05°C

Esercizio 7.

n=3, l=1, m=0 ___3p___   n=1, l=1, m=1 ___NO____   n=3, l=0, m=1 ___NO___   n=6, l=3, m=-3 ___6f___