1) a) 2,500g KNO_3 — 101,1g – 1mol

MM = 101,1g/mol — 2,500g – x

x = 0,0247 mol KNO_3

$KNO_3 \longrightarrow K^+ + NO_3^-$

0,0247mol 0,0247 0,0247 mol

$\therefore [K^+] = [NO_3^-] = \frac{0,0247 mol}{0,1L} = 0,247 mol/L$

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b) 120mg Na_2SO_4 — 142g – 1mol

MM = 142g/mol — 0,120g – x

$x = 8,45.10^{-4}$ mol

$Na_2SO_4 \longrightarrow 2Na^+ + SO_4^{2-}$

$8,45.10^{-4}$ mol $16,90.10^{-4}$ $8,45.10^{-4}$ mol

$[Na^+] = \frac{16,90.10^{-4} mol}{0,050L} = 0,038 mol/L$ $[SO_4^{2-}] = \frac{8,45.10^{-4} mol}{0,050L} = 0,0169 \frac{mol}{L}$

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c) 1,250g K_2CO_3 — 138,2g – 1mol

MM = 138,2g/mol — 1,250g – x

$x = 9,04.10^{-3}$ mol

$K_2CO_3 \longrightarrow 2K^+ + CO_3^{2-}$

$9,04.10^{-3}$ mol $18,08.10^{-3}$ $9,04.10^{-3}$ mol

$[K^+] = \frac{18,08.10^{-3} mol}{0,5L} = 0,036 mol/L$ $[CO_3^{2-}] = \frac{9,04.10^{-3} mol}{0,5L} = 0,01808 mol/L$

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2) a) $HCl + NaOH \longrightarrow NaCl + H_2O$ — nenhum reagente em excesso

início $1,5.10^{-3}$ $1,5.10^{-3}$ mol – –

final – – $1,5.10^{-3}$ mol

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b) $HAc + NaOH \longrightarrow NaAc + H_2O$ — nenhum reagente em excesso

início $1,5.10^{-3}$ $1,5.10^{-3}$ mol – –

final – – $1,5.10^{-3}$ mol

c) $HCl + NH_4OH \rightarrow NH_4Cl + H_2O$

i	$1,5.10^{-3}$	$1,5.10^{-3}$ mol	—	nenhum reagente em excesso
f	—	—	$1,5.10^{-3}$ mol	

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d) $HCl + Na_2CO_3 \rightarrow NaHCO_3 + NaCl$

i	$1,5.10^{-3}$	$1,0.10^{-3}$ mol	—	nenhum reagente em excesso;
f	$0,5.10^{-3}$ mol	—	$1,0.10^{-3}$ mol	

$HCl + NaHCO_3 \rightarrow H_2CO_3 + NaCl$

i	$0,5.10^{-3}$	$1,0.10^{-3}$ mol	—	produtos da reação: $NaHCO_3$ e H_2CO_3
f	—	$0,5.10^{-3}$ mol	$0,5.10^{-3}$ mol	

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e) $H_3PO_4 + NaOH \rightarrow NaH_2PO_4 + H_2O$

i	$1,0.10^{-3}$	$1,5.10^{-3}$ mol	—	nenhum reagente em excesso;
f	—	$0,5.10^{-3}$	$1,0.10^{-3}$ mol	

$NaH_2PO_4 + NaOH \rightarrow Na_2HPO_4 + H_2O$

i	$1,0.10^{-3}$	$0,5.10^{-3}$ mol	—	produtos da reação: NaH_2PO_4 e Na_2HPO_4
f	$0,5.10^{-3}$	—	$0,5.10^{-3}$ mol	

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3) a) 10 ml HAc 0,1 mol/L + 6 ml NaOH 0,05 mol/L

HAc: 0,1 mol — 1000 ml
x — 10 ml
$x = 1.10^{-3}$ mol HAc

NaOH: 0,05 mol — 1000 ml
x — 6 ml
$x = 0,3.10^{-3}$ mol NaOH

$HAc + NaOH \rightarrow NaAc + H_2O$

i	1.10^{-3}	$0,3.10^{-3}$	—	
f	$0,7.10^{-3}$ mol	—	$0,3.10^{-3}$ mol	
	↓			
	excesso			

$[HAc] = \frac{0,7.10^{-3}\ mol}{(10+6).10^{-3}\ L} = 0,04375\ mol/L$

$[NaAc] = \frac{0,3.10^{-3}\ mol}{(10+6).10^{-3}\ L} = 0,01875\ mol/L$

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b) 10 ml HCl 0,2 mol/L = 2.10^{-3} mol HCl + 10 ml Na_2CO_3 0,1 M = 1.10^{-3} mol

$HCl + Na_2CO_3 \rightarrow NaHCO_3 + NaCl$

i	2.10^{-3}	1.10^{-3} mol	—	
f	1.10^{-3} mol	—	1.10^{-3} mol	

$HCl + NaHCO_3 \rightarrow H_2CO_3 + NaCl$

i	1.10^{-3}	1.10^{-3} mol	—	
f	—	—	1.10^{-3} mol	

$[H_2CO_3] = \frac{1.10^{-3}\ mol}{(10+10).10^{-3}\ L} = 0,05\ mol/L$

c) 10 mL HCl 0,2 mol/L = 2.10^{-3} mol + 10 mL Na_2CO_3 0,15 mol/L = $1,5.10^{-3}$ mol

$HCl + Na_2CO_3 \rightarrow NaHCO_3 + NaCl$

I	2.10^{-3}	$1,5.10^{-3}$ mol	—	
F	$0,5.10^{-3}$	—	$1,5.10^{-3}$ mol	

$HCl + NaHCO_3 \rightarrow H_2CO_3 + NaCl$

I	$0,5.10^{-3}$	$1,5.10^{-3}$	—	
F	—	$1,0.10^{-3}$ mol	$0,5.10^{-3}$ mol	

$[NaHCO_3] = \frac{1.10^{-3}\ mol}{(10+10).10^{-3}\ L} = 0,05$ mol/L

$[H_2CO_3] = \frac{0,5.10^{-3}\ mol}{(10+10).10^{-3}\ L} = 0,025$ mol/L

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d) 10 mL NaCl 0,1 mol/L = 1.10^{-3} mol + 5 mL $AgNO_3$ 0,3 mol/L = $1,5.10^{-3}$ mol

$NaCl + AgNO_3 \rightarrow AgCl_{(s)} + NaNO_3$

I	1.10^{-3}	$1,5.10^{-3}$ mol	—	—
F	—	$0,5.10^{-3}$ mol	1.10^{-3} mol	1.10^{-3} mol

$[AgNO_3] = \frac{0,5.10^{-3}\ mol}{(10+5).10^{-3}\ L} = 0,033$ mol/L

$[NaNO_3] = \frac{1.10^{-3}\ mol}{(10+5).10^{-3}\ L} = 0,067$ mol/L

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4) 3,2 g $CuSO_4$ (MM = 160 g/mol) = 0,02 mol

100 mL NH_3 1,0 mol/L = 0,1 mol

$CuSO_4 \rightarrow Cu^{2+} + SO_4^{2-}$

0,02 0,02 0,02 mol

$Cu^{2+} + 4\,NH_3 \rightarrow [Cu(NH_3)_4]^{2+}$

I	0,02	0,1 mol	—
F	—	0,02 mol	0,02 mol

$[Cu(NH_3)_4^{2+}] = \frac{0,02\ mol}{0,1\ L} = 0,2$ mol/L errado! a concentração final aqui ficará 0,1 mol/L

errado! o correto é 0,2L (100mL de NH3 + 100mL da solução de CuSO4)

5) a) $NiCl_2$ 12,5% (m/m) = 12,5 g — 100 g solução

$d = 1,149\ g/mL$

1,149 g — 1 mL
100 g — V ∴ V = 87,03 mL

∴ 12,5 g/100 g = 12,5 g/87,03 mL = 143,6 g/L

MM = 129,61 g — 1 mol
143,6 g — x ∴ x = 1,108 mol

∴ 12,5% (m/m) = 12,5 g/100 g = 12,5 g/87,03 mL = 143,6 g/L = 1,108 mol/L

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b) $NiCl_2 \rightarrow Ni^{2+} + 2Cl^-$

1,108 mol/L 1,108 2.1,108 mol/L ∴ $[Cl^-] = 2,216\ mol/L$

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c) 143,6 g

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d) 25 mL NaCl 0,050 mol/L = $1,25.10^{-3}$ mol

$AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$

1 mol — 1 mol
x — $1,25.10^{-3}$

$x = 1,25.10^{-3}$ mol

$AgNO_3$: 0,1000 mol — 1000 mL
$1,25.10^{-3}$ mol — V

∴ V = 12,50 mL