Onderrigtoets 2. / *Class Test 2.*	Modulekode. / *Module Code.* NCHE 111		Duur. / *Duration.* 45 minute. / *45 minutes.*	
Maksimum punte. / *Maximum marks.* 34 punte. / *34 marks.*	Datum. / *Date.* 5 April 2019		Roostergroep 2 *Roster Group 2*	
	Punt /34 *Mark* /34		Persentasie. *Percentage.*	%

MEMORANDUM (Leereenheid 3 en 4.1 to 4.3)

√ = ½ punt. / *mark.*

√ = 1 punt. / *mark.*

Vraag 1. / *Question 1.*

Skryf 'n volledig gebalanseerde chemiese reaksievergelyking **sowel as** 'n netto ioniese vergelyking vir die reaksie hieronder neer. Wys al die fisiese toestande van die reagense sowel as die produkte. / *Write down a full balanced chemical reaction equation **as well as** a net ionic equation for the reaction below. Show all the physical states of the reagents and the products.*

Waterige kaliumchloried word by waterige silwernitraat gevoeg om 'n silwerchloried presipitaat en waterige kaliumnitraat te vorm. / *Aqueous potassium chloride is added to aqueous silver nitrate to form a silver chloride precipitate plus aqueous potassium nitrate.*

Gebalanseerde reaksievergelyking: / *Balanced reaction equation:* **[2]**

$KCl\ (aq) + AgNO_3\ (aq) \rightarrow AgCl\ (s) + KNO_3\ (aq)$ √√

Everything must be correct to get the marks. The physical states must be shown. 2 Marks or zero.

Netto ioniese vergelyking: / *Net ionic equation:* **[2]**

$Cl^-\ (aq) + Ag^+\ (aq) \rightarrow AgCl\ (s)$ √√

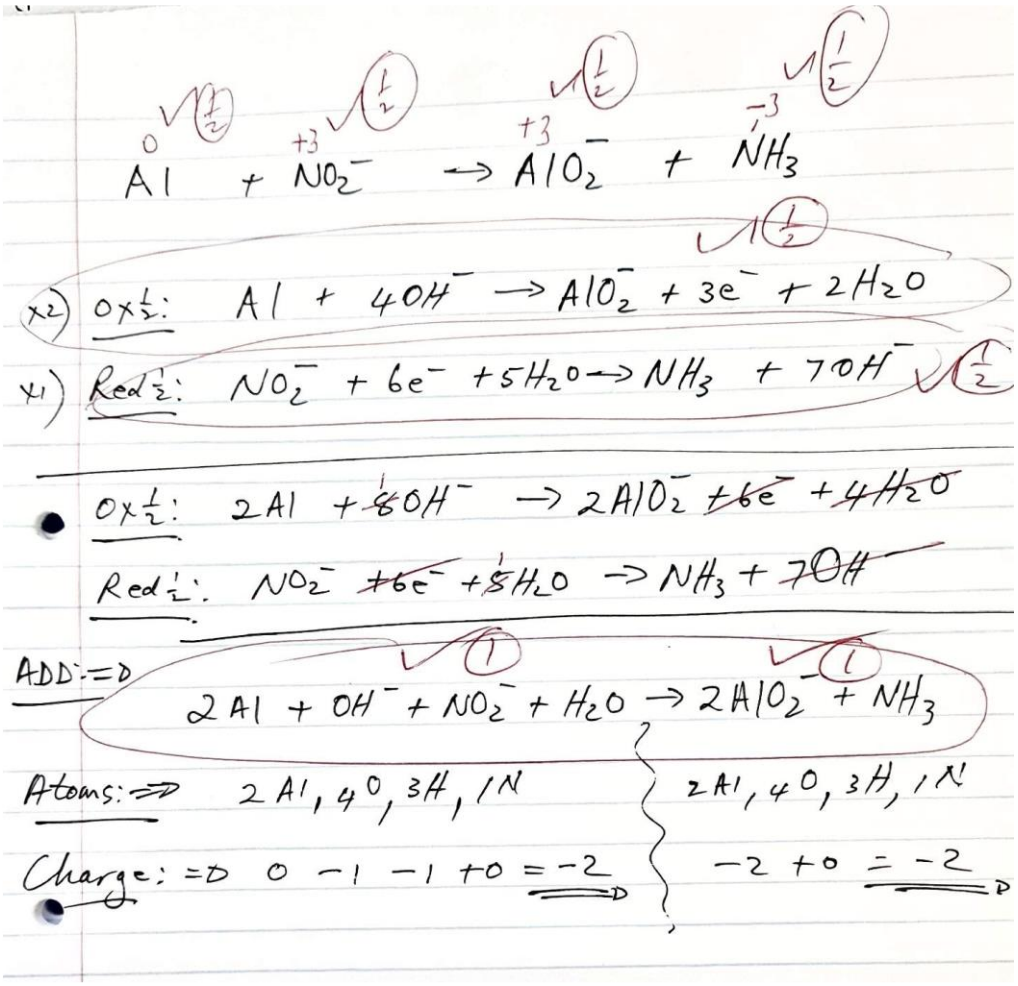
Everything must be correct to get the marks. The physical states must be shown. 2 Marks or zero.

Vraag 2. / *Question 2.*

Balanseer die volgende redoksreaksie in 'n alkaliese medium. / *Balance the follow redox reaction in an alkaline medium.* **[5]**

$$Al\ (s) + NO_2^-\ (aq) \rightarrow AlO_2^-\ (aq) + NH_3\ (aq)$$

No marks are given for the mass and charge balance. A student does not have to show all the steps. If the final equation is correctly balanced and there are a method that was followed you can give the student the full 5 marks. The physical states of the reagents and products does not have to be shown. If the final reaction is not correctly balanced, then you can look for marks in the steps.



OR

Treat as if acid solution

$$\overset{0}{Al} + \overset{+3}{NO_2^-} \rightarrow \overset{+3}{AlO_2^-} + \overset{-3}{NH_3}$$

x2) Ox ½: $Al + 2H_2O + 4OH^- \rightarrow AlO_2^- + 3e^- + 4H^+ + 4OH^-$

x1) Red ½: $NO_2^- + 6e^- + 7H^+ \rightarrow NH_3 + 2H_2O + 7OH^-$

Ox ½: $2Al + 4H_2O + 8OH^- \rightarrow 2AlO_2^- + 6e^- + 8H^+ + 8OH^-$

$+ 8H_2O$

Red ½: $NO_2^- + 6e^- + 7H^+ + 7OH^- \rightarrow NH_3 + 2H_2O + 7OH^-$

$7H_2O$

ADD: $\Rightarrow 2Al + H_2O + OH^- + NO_2^- \rightarrow 2AlO_2^- + NH_3$

Atoms: $\Rightarrow$ 2 Al, 3 H, 4 O, 1 N | 2 Al, 3 H, 4 O, 1 N

Charge: $\Rightarrow 0 + 0 - 1 - 1 = -2$ | $-2 + 0 = -2$

Vraag 3. / *Question 3.*

Jy voeg 18.1 g NH_3 by 90.4 g CuO en laat dit toe om volgens die volgende reeds gebalanseerde reaksievergelyking te reageer. Watter reagens is **a)** die beperkende reagens en **b)** hoeveel gram N_2 gas sal vorm en **c)** wat is die persentasie opbrengs indien slegs 9.64 g N_2 gas gevorm het? / *You add 18.1 g of NH_3 to 90.4 g of CuO and leave it to react according to the following already balanced reaction equation. Which reagent is **a)** the limiting reagent and **b)** how many grams of N_2 gas will form and **c)** what is the percentage yield if only 9.64 g of N_2 gas has formed?*

Gegee: / *Given:*

M_{NH3} = 17.03 g.mol^{-1}; M_{CuO} = 79.4 g.mol^{-1}; M_{N2} = 28 g.mol^{-1}; M_{Cu} = 63.4 g.mol^{-1}; M_{H2O} = 18.02 g.mol^{-1}

$$2NH_3\,(g) + 3CuO\,(s) \rightarrow N_2\,(g) + 3Cu\,(s) + 3H_2O\,(g)$$

a) Beperkende reagens. / *Limiting reagent.* **[4]**

For ALL calculations allow for a small deviation on the answers because of different ways of rounding of the answers.

a) $n_{NH_3} = \frac{18.1\ g}{17.03\ g.mol^{-1}} = 1.06\ mol$ ✓(1)

$n_{CuO} = \frac{90.4\ g}{79.4\ g.mol^{-1}} = 1.14\ mol$ ✓(1)

Ratio: $NH_3 : CuO$

$2 : 3$

∴ $n_{(CuO)\ needed} = \frac{3(n_{NH_3})}{2} = \frac{3(1.06)}{2}$

$= 1.59\ mol$ ✓(1) CuO needed

You only have 1.14 mol CuO, therefore the CuO is limiting reagent

✓(1)

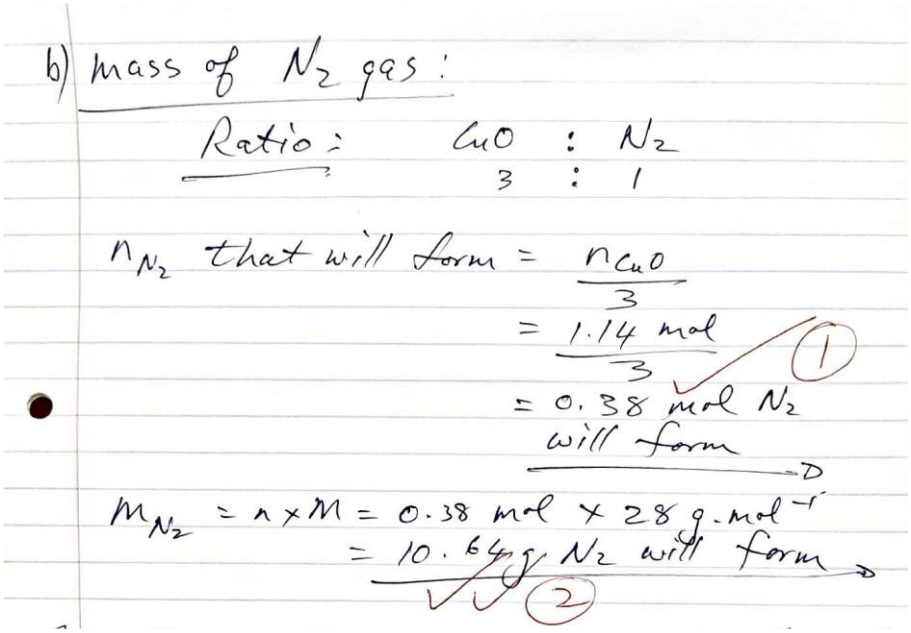
OR

∴ $n_{NH_3\ needed} = \frac{2(n_{CuO})}{3} = \frac{2(1.14)}{3}$

$= 0.76\ mol\ NH_3$ needed

You have 1.06 mol of NH_3, therefore CuO is the limiting reagent

b) Massa N_2 gas. / *Mass N_2 gas.* **[3]**

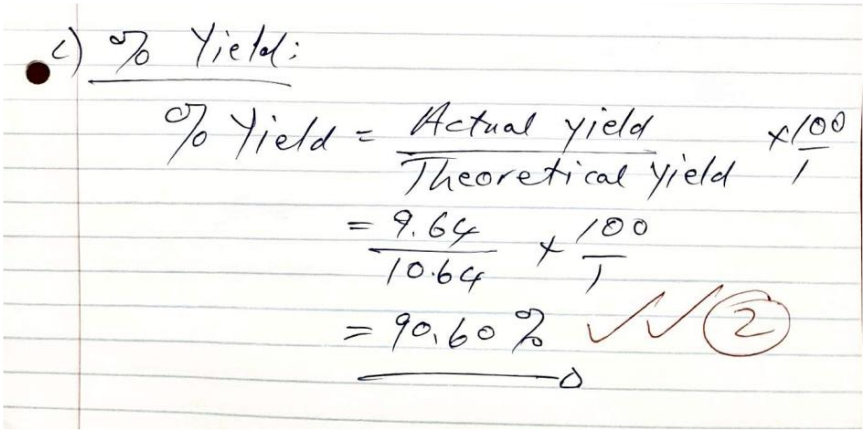

b) Mass of N_2 gas:

Ratio: CuO : N_2
3 : 1

n_{N_2} that will form = $\frac{n_{CuO}}{3}$
= $\frac{1.14 \text{ mol}}{3}$ ✓ (1)
= 0.38 mol N_2 will form →

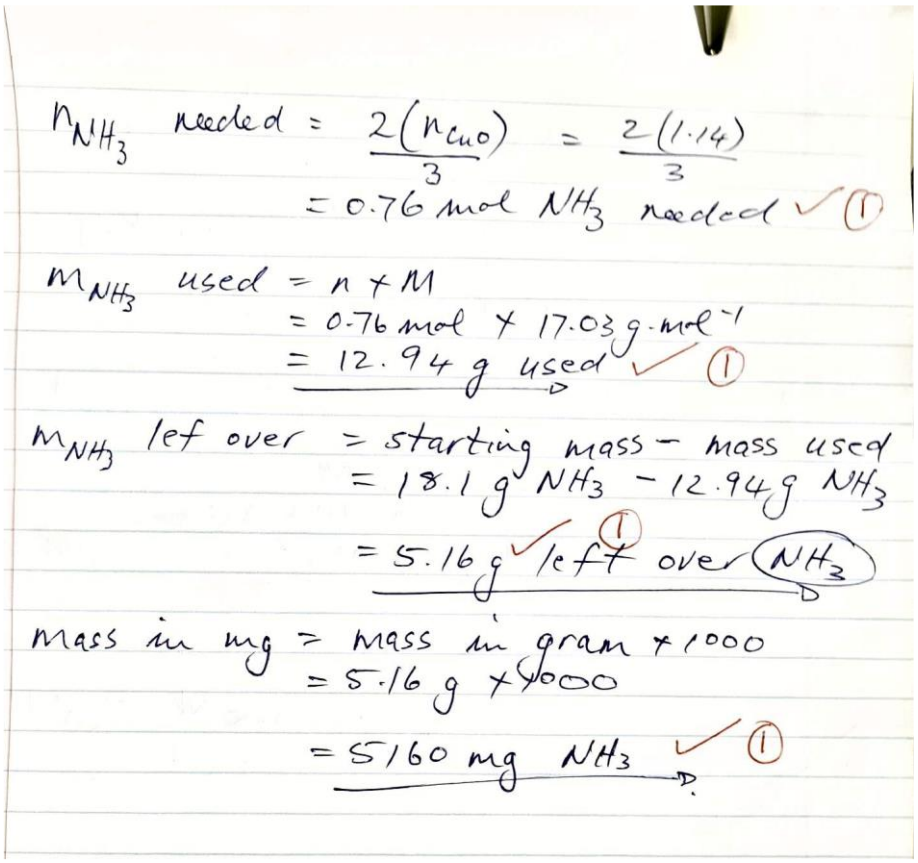
$m_{N_2} = n \times M = 0.38 \text{ mol} \times 28 \text{ g.mol}^{-1}$
= 10.64 g N_2 will form → ✓✓ (2)

c) Persentasie opbrengs. / *Percentage yield.* **[2]**


c) % Yield:

% Yield = $\frac{\text{Actual yield}}{\text{Theoretical yield}} \times \frac{100}{1}$
= $\frac{9.64}{10.64} \times \frac{100}{1}$
= 90.60 % ✓✓ (2) →

d) Bereken die massa (in gram en in milligram) van die oormaat reagens wat oorbly nadat die reaksie voltooi is.
Calculate the mass (in gram and in milligram) of the excess reagent that is left over after the reaction is complete. **[4]**



Vraag 4. / *Question 4.*

Maak gebruik van die oplosbaarheidstabel en bepaal watter van die volgende ioniese verbindings wateroplosbaar is en watter nie wateroplosbaar is nie. Indien jy bepaal dat 'n spesifieke verbinding wateroplosbaar is, dui dan ook die ione aan wat in oplossing sal vorm.

Use the solubility table to determine which of the following ionic compounds are water soluble and which is not water soluble. If you determine that a specific compound is water soluble, then also indicate the ions that will form in solution. **[3]**

4.1 Al_2O_3 **Insoluble. (No ions)** ✓

4.2 Natriumfosfaat. / *Sodium phosphate.* Na_3PO_4 **soluble ($3Na^+$ and PO_4^{3-} ions)** ✓

4.3 PbF_2 **Onoplosbaar / Insoluble.** ✓

Vraag 5. / *Question 5.*

Bereken die oksidasiegetal van die aangeduide element in elk van die volgende verbindings of ione. / *Calculate the oxidation number for the indicated element in each of the following compounds or ions.* **[2]**

5.1 $Ca(MnO_4)_2$ Mn = ? **Ca + 2Mn + 8O = 0; +2 + 2Mn – 16 = 0; 2Mn = +16 – 2; Mn = +14/2 = +7 (Mn = +7)** ✓

5.2 PO_4^{3-} P = ? **P + 4O = -3; P – 8 = -3; P = -3 + 8 = +5 (P = +5)** ✓

A calculation does not have to be shown for this question.

Vraag 6. / *Question 6.*

Sink reageer met suurstof om sink(II)oksied te lewer. / *Zinc reacts with oxygen to form zinc(II) oxide.*

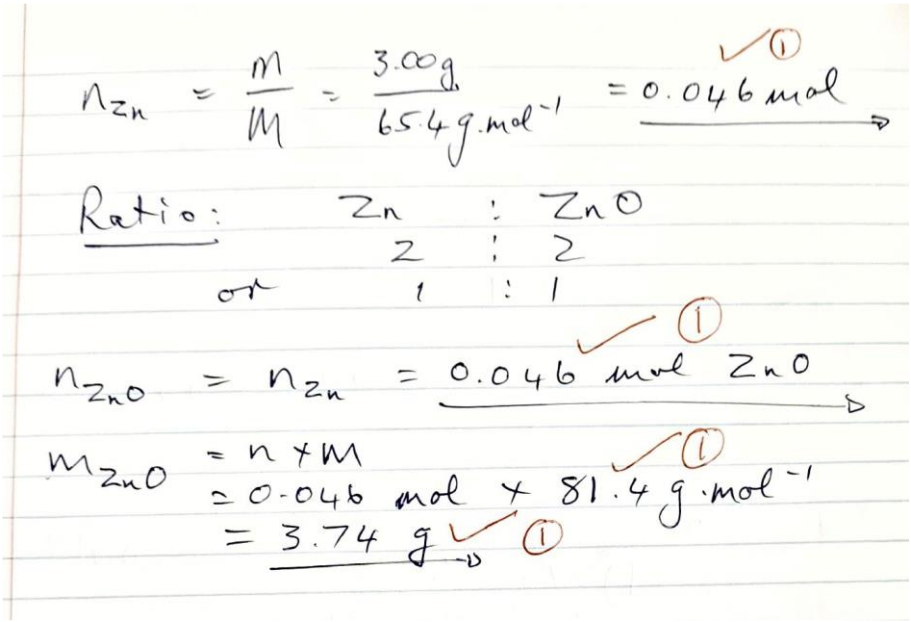
6.1 Skryf 'n volledige gebalanseerde reaksievergelyking met al die fisiese toestande van die reagense en produkte vir die reaksie neer. / *Write down a complete balanced reaction equation with all the physical states of the reagents and products for the reaction.* **[2]**

$2Zn\ (s) + O_2\ (g) \rightarrow 2ZnO\ (s)$ ✓ ✓

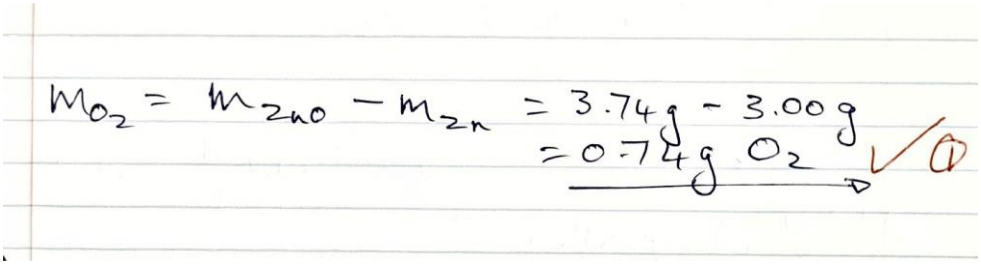
Everything must be correct to get the marks. The physical states must be shown. 2 Marks or zero.

6.2 Indien 3.00 g suiwer sink volledig met suurstof reageer, bereken die massa sink(II)oksied wat sal vorm.
If 3.00 g of pure zinc reacts completely with oxygen, calculate the mass of zinc(II) oxide that will form. **[4]**

For ALL calculations allow for a small deviation on the answers because of different ways of rounding of the answers.



6.3 Bereken die massa suurstof wat nodig is vir die reaksie. / *Calculate the mass of oxygen that is required for the reaction.* **[1]**



JY MAG HIERDIE BLADSY AFSKEUR!

YOU MAY TEAR OF THIS PAGE!

PERIODIC TABLE OF THE ELEMENTS
PERIODIEKE INDELING VAN DIE ELEMENTE

IA (1)													IIIA (13)	IVA (14)	VA (15)	VIA (16)	VIIA (17)	0 (18)
1 **H** 1,01	IIA (2)																	2 **He** 4,00
3 **Li** 6,94	4 **Be** 9,01												5 **B** 10,8	6 **C** 12,0	7 **N** 14,0	8 **O** 16,0	9 **F** 19,0	10 **Ne** 20,2
11 **Na** 23,0	12 **Mg** 24,3	IIIB (3)		IVB (4)	VB (5)	VIB (6)	VIIB (7)	(8)	VIII (9)	(10)	IB (11)	IIB (12)	13 **Al** 27,0	14 **Si** 28,1	15 **P** 31,0	16 **S** 32,1	17 **Cl** 35,45	18 **Ar** 39,9
19 **K** 39,1	20 **Ca** 40,1	21 **Sc** 45,0		22 **Ti** 47,9	23 **V** 50,9	24 **Cr** 52,0	25 **Mn** 54,9	26 **Fe** 55,9	27 **Co** 58,9	28 **Ni** 58,7	29 **Cu** 63,4	30 **Zn** 65,4	31 **Ga** 69,7	32 **Ge** 72,6	33 **As** 74,9	34 **Se** 79,0	35 **Br** 79,9	36 **Kr** 83,8
37 **Rb** 85,5	38 **Sr** 87,6	39 **Y** 88,9		40 **Zr** 91,2	41 **Nb** 92,9	42 **Mo** 95,9	43 **Tc** (98)	44 **Ru** 101,1	45 **Rh** 102,9	46 **Pd** 106,4	47 **Ag** 107,9	48 **Cd** 112,4	49 **In** 114,8	50 **Sn** 118,7	51 **Sb** 121,6	52 **Te** 127,6	53 **I** 127,9	54 **Xe** 131,3
55 **Cs** 132,9	56 **Ba** 137,3	57 **La** 138,9	*	72 **Hf** 178,5	73 **Ta** 180,9	74 **W** 183,9	75 **Re** 186,2	76 **Os** 190,2	77 **Ir** 192,2	78 **Pt** 195,1	79 **Au** 197,0	80 **Hg** 200,6	81 **Tl** 204,4	82 **Pb** 207,2	83 **Bi** 209,0	84 **Po** (209)	85 **At** (210)	86 **Rn** (222)
87 **Fr** (223)	88 **Ra** 226,0	89 **Ac** 227,0	#	104 **Rf** (261)	105 **Db** (262)	106 **Sg** (263)	107 **Bh** (262)	108 **Hs** (265)	109 **Mt** (266)									

atomic number / atoomgetal
symbol / simbool
atomic mass / atoommassa

lanthanides* / lantaniede	58 **Ce** 140,1	59 **Pr** 140,9	60 **Nd** 144,2	61 **Pm** (145)	62 **Sm** 150,4	63 **Eu** 152,0	64 **Gd** 157,3	65 **Tb** 158,9	66 **Dy** 162,5	67 **Ho** 164,9	68 **Er** 167,3	69 **Tm** 168,9	70 **Yb** 173,0	71 **Lu** 175,0
actinides# / aktiniede	90 **Th** 232,0	91 **Pa** 231,0	92 **U** 238,0	93 **Np** 237,0	94 **Pu** (244)	95 **Am** (234)	96 **Cm** (247)	97 **Bk** (247)	98 **Cf** (251)	99 **Es** (252)	100 **Fm** (257)	101 **Md** (258)	102 **No** (258)	103 **Lr** (260)

TABEL 1: Oplosbaarheidstabel.
TABLE 1: Solubility Table.

Soluble compounds		**Exceptions**
Almost all salts of Na^+, K^+ and NH_4^+		
All salts of Cl^-, Br^- and I^-	⇔	Halides of Ag^+, Hg_2^{2+} and Pb^{2+}
Compounds containing F^-	⇔	Fluorides of Mg^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+} and Pb^{2+}
Salts of nitrate, NO_3^-; chlorate, ClO_3^-; perchlorate, ClO_4^-; acetate, CH_3COO^-		$KClO_4$
Salts of sulphate, SO_4^{2-}	⇔	Sulphates of Sr^{2+}, Ba^{2+} and Pb^{2+}

Insoluble compounds		**Exceptions**
All salts of carbonate, CO_3^{2-}; phosphate, PO_4^{3-} oxalate, $C_2O_4^{2-}$; chromate, CrO_4^{2-}; sulphide, S^{2-} Most metal hydroxides OH^- and oxides, O^{2-}	⇔	Salts of NH_4^+ and alkali metal cations