2. $CuCl_3$

$a = 1 \quad b = 3$

$Y: Cl \; -1 \; (7A)$

$$+X = \frac{|3 \cdot -1|}{1}$$

$$Cu = \frac{3}{1} = +3$$

3. $Fe(NO_3)_2$

$a = 1 \quad b = 2$

$Y: NO_3 \; -1$

$$Fe = \frac{|2 \cdot -1|}{1}$$

$Fe = +2$

$X_a Y_b$

$$+X = \frac{|b \cdot -Y|}{a}$$

1A: +1		5A: -3	
2A: +2		6A: -2	
3A: +3		7A: -1	
4A: +4		8A: 0	

Double Replacement Reaction

$$AB + CD \longrightarrow AD + CB$$

A and C

Metals

Trans. (Find charge)

Rep. (Look up charge)

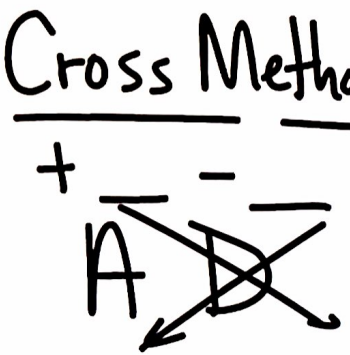
B and D

Nonmetals

Binary (single)

Polyatomic (chart)

Cross Method



$$\underline{2}\ \underset{\substack{A\\+1\\(1A)}}{Na_3}\underset{\substack{B\\-3\\(5A)}}{N} + \underline{\quad}\ \underset{\substack{C\\+3\\(3A)}}{Al_2}\underset{\substack{D\\-2\\(6A)}}{S_3} \longrightarrow$$

1. ID Charges
2. Write form Products
3. Use X
4. Balance

AD

+1 −2

Na S

Na_2S

$$\underline{3}\ Na_2S + \underline{2}\ Al\ N$$

A D

CB

CB

+3 −3

Al N

Al_3N_3 AlN

$\_\_ V_2(S_2O_3)_3 + \underline{3}\ Ca(NO_3)_2 \longrightarrow$

A: V, B: S_2O_3, C: Ca, D: NO_3

$+\ \underline{3}$ trans. -2; C: $+2$ (2A); D: -1

1. charges
2. Form
3. Cross
4. Balance

$$V_2(S_2O_3)_3$$

$$V = \frac{|3 \cdot -2|}{2} = \frac{6}{2} = +3$$

$\underline{2}\ V(NO_3)_3 + \underline{3}\ CaS_2O_3$

A D, C B

$+3$, -1: $V(NO_3) \rightarrow V(NO_3)_3$

$+2$, -2: $Ca(S_2O_3) \rightarrow Ca_2(S_2O_3)_2 \rightarrow CaS_2O_3$

Reduce

Find transition metal charges

$X_a Y_b$

a and b = subscripts

X = metal (+X charge)

Y = nonmetal (-Y charge)

$X_a(YO_2)_b$

YO_2 = polyatomic (−)

$$+X = \frac{|b \cdot -Y|}{a}$$

trans. metal charge

$AB + CD \rightarrow AD + CB$ (A and C swap)

9. $\_\_ AlCl_3 + 3\ LiBrO_3 \rightarrow$

$AlCl_3$: A B, +3 −1 — $LiBrO_3$: C D, +1 −1

$\_\_ Al(BrO_3)_3 + 3\ LiCl$

$Al(BrO_3)_3$: A D, +3 −1 — $LiCl$: C B, +1 −1

$Al(BrO_3)_3$

$LiCl$

① Determine Charges

② Write Form

③ Cross Metho

④ Balance

13. $\_\_ Al(BrO_3)_3 + \_\_ MnCl_3 \longrightarrow$

A B C D

+3 −1 +3 −1

① Determine Charges

② Write Form

③ Cross Metho

④ Balance

+ −1

$MnCl_3$

$Mn = \frac{|3 \cdot -1|}{1} = +3$

$\_\_ AlCl_3 + \_\_ Mn(BrO_3)_3$

A D C B

+3 −1 +3 −1

$AlCl_3$ $Mn(BrO_3)_3$

Neutralization Reaction

Acid + Base ⟶ Salt (Ionic) + Water (H_2O, HOH)

HCl + $NaOH$ ⟶ $NaCl$ + HOH

H^+ (acid) [produce H^+]

OH^- (base) [produces OH^-]

$^+\ \ ^-$ (salt) Ionic compound from neutralization (acid + base)

Water (H_2O) acid and base

$$\_\_ H_2SO_4 + \underline{2}\ ZnOH \longrightarrow$$

H_2SO_4 (acid): A* $+1$, B -2

$ZnOH$ (base): C $+1$, D* -1

$Zn(OH)$

$a = 1 \quad b = 1$

$Zn = \frac{|1 \cdot -1|}{1} = \pm 1$

*Always +1/−1

$$\_\_ Zn_2SO_4 + \underline{2}\ HOH$$

Zn_2SO_4 (salt): Zn $+1$, SO_4 -2

HOH (water): H $+1$, OH -1