In the following groups, give the oxidation number for the indicated atoms:

Na2SO3 HSO4 –

KMnO4 H2O2

Ca(NO3)2 Al2S3

Na2CO3 MnCl2

NO2 ZnO

For each of the following reactions, indicate whether the reaction is redox or non-redox. If redox, tell what is oxidized and what is reduced, and indicate the oxidizing and reducing agents. Use Coefficients to balance the equations.

a. MgSO4 (aq) + Ca(OH)2 (aq) 🡪 Mg(OH)2 (aq) + CaSO4 (s)

b. HNO3 (aq) + I2 (s) 🡪 HIO3 (aq) + NO2 (g) + H2O (l)

c. FeBr2 (aq) + Br2 (l) 🡪 FeBr3 (aq)

d. PbS (s) + H2O2 (aq) 🡪 PbSO4 (s) + H2O (l)

e. H+ (aq) + NO3- (aq) + Fe+2 (aq)  🡪 Fe+3 (aq)  + NO (g) + H2O (l)

f. C (s) + H2O (l) 🡪 + CO (g) + H2 (g)

g. HNO3 (aq) + H3PO3 (aq) 🡪 H3PO4 (aq) + NO (g) + H2O (l)

h. Cu (s)  + HNO3 (aq) 🡪 Cu(NO3)2 (aq) + NO (g) + H2O (l)

i. H2S (g) + H2SO3 (aq) 🡪 S (s) + H2O (l)

The oxidation number for the indicated atoms:

Na2SO3 oxidation number of S = +4 HSO4– oxidation number of S = +6

2Na + S + 3O = 0 … 2(+1) + S + 3(-2) = 0 H + S + 4O = -1 … (+1) + S + 4(-2) = -1

KMnO4 oxidation number of Mn = +7H2O2 oxidation number of O = 0

K + Mn + 4O = 0 … (+1) + Mn + 4(-2) = 0 2H + 2O = 0 … 2(+1) + 2O = 0

Ca(NO3)2 oxidation number of N = +5Al2S3 oxidation number of S = -2

Ca + 2N + 6O = 0 … (+2) + 2N + 6(-2) = 0 2Al + 3S = 0 … 2(+3) + 3S = 0

Na2CO3 oxidation number of C = +4MnCl2 oxidation number of Mn = +2

2Na + C + 3O = 0 … 2(+1) + C + 3(-2) = 0 Mn + 2Cl = 0 … Mn + 2(-1) = 0

NO2 oxidation number of N = +4ZnO oxidation number of Zn = +2

N + 2O = 0 … N +2(-2) = 0 Zn + O = 0 … Zn + (-2) = 0

Reduction gains e- and the oxidation state DEcreases

Oxidation loses e- and the oxidation state INcreases

a. Mg+2(SO4)-2 (aq) + Ca+2(OH)2-1(aq) 🡪 Mg+2(OH)2-1 (aq) + Ca+2(SO4)-2(s)

not a REDOX Reaction … all atoms have the same charge

b. 10H+1N+5O3-2 (aq) + I20 (s) 🡪 2H+1I+5O3-2 (aq) + 10N+4O2 -2 (g) + 4H2O (l)

N is reduced (+5 to +4) [oxidizing agent] and I is oxidized (0 to +5) [reducing agent]

c. 2Fe+2Br2-1 (aq) + 3Br20 (l) 🡪 2Fe+3Br3-1 (aq)

Br is reduced (0 to -1) [oxidizing agent] & Fe is oxidized (+2 to +3) [reducing agent]

d. Pb+2S-2 (s) + 4H2+1O2-1 (aq) 🡪 Pb+2(S+6O4)-2 (s) + 4H2+1O-2 (l)

O is reduced (-1 to -2) [oxidizing agent] & S is oxidized (-2 to +6) [reducing agent]

e. 4H+1 (aq) + (N+5O3-2)-1 (aq) + 3Fe+2 (aq)  🡪 3Fe+3 (aq)  + N+2O-2 (g) + 2H2+1O-2 (l)

N is reduced (+5 to +2) [oxidizing agent] & Fe is oxidized (+2 to +3) [reducing agent]

f. C0 (s) + H2+1O-2 (l) 🡪 C+2O (g) + H20 (g)

H is reduced (+1 to 0) [oxidizing agent] & C is oxidized (0 to +2) [reducing agent]

g. 2H+1N+5O3-2 (aq) + 3H3+1(P+3O3-2)-3 (aq) 🡪 3H3+1(P+5O4-2)-3 (aq) + 2N+2O-2 (g) + H2+1O-2 (l)

N is reduced (+5 to +2) [oxidizing agent] & P is oxidized (+3 to +5) [reducing agent]

h. 3Cu0 (s)  + 8H+1N+5O3-2 (aq) 🡪 3Cu+2(N+5O3)2 (aq) + 2N+2O-2 (g) + 4H2+1O-2 (l)

N is reduced (+5 to +2) [oxidizing agent] & Cu is oxidized (0 to +2) [reducing agent]

i. 4H2+1S-2 (g) + 2H2+1(S+4O3-2)-2 (aq) 🡪 6S0 (s) + 6H2+1O-2 (l)

S is reduced (+4 to 0) [oxidizing agent] & S is oxidized (-2 to 0) [reducing agent]