For each of the following reactions identify the redox reactions and give the reductant and oxidant in each

i. $CH_4(g) + O_2(g) \Rightarrow CO_2(g) + H_2O(g)$

Find the oxidation number of each element in the reactants.

C = -4,

H = +1,

O = 0

Find the oxidation number of each element in the products.

C = +4,

H = +1,

O = -2

Reductant is the CH_4 where as the oxidant is the oxygen (O_2)

ii. $MnO_2(s) + 2H^+(aq) + S(s) \rightarrow Mn^{2+}(aq) + H_2O(l) + SO_2(g)$

Mn in MnO_2 = +4 => Mn^{2+} =+2 therefore Mn is reduced. MnO_2 is the oxidant

S is in its elemental form hence = 0 => S in SO_2 = +4 therefore S is oxidised. S is the reductant

iii. $2Cr_2O_7(aq) + 3CH_3CH_2OH(g) + 16H^+(aq) \rightarrow 4Cr^{3+}(aq) + 3CH_3COOH(aq) + 11H_2O(l)$

Cr in Cr_2O_7 has an oxidation state of +7 => Cr^{3+} = +3 therefore it is reduced. Cr_2O_7 is the oxidant

C in CH_3CH_2OH has an oxidation state of -2 => C in CH_3COOH is 0 therefore C is oxidised. CH_3CH_2OH is the reductant

iv. $H_2O_2(aq) + 2Br^-(aq) + 2H^+(aq) \rightarrow Br_2(l) + 2H_2O(l)$

O in H_2O_s = -1 => O in H_2O = -2 therefore it is reduced. H_2O_2 is the oxidant

Br^- = -1 => Br_2 is in its elemental form = 0 it is oxidised. Br^- is the reductant.

v. $AgNO_3(aq) + K_2Cr_2O_7(aq) \rightarrow Ag_2Cr_2O_7(s) + KNO_3(aq)$

There is no change in the oxidation state of any of the reactants. This is not a redox reaction but a precipitation reaction. Ag in $AgNO_3$ is +1 and is also +1 in $Ag_2Cr_2O_7$. There is no change in K it is +1 in $K_2Cr_2O_7$ and in KNO_3. Oxygen, hydrogen, Chromium and nitrogen all have unchanged oxidation states.

vi. $2H_2O_2(aq) \rightarrow 2H_2O(l) + O_2(g)$

O in H_2O_s = -1 => O in H_2O = -2 therefore it is reduced. H_2O_2 is the oxidant

O in H_2O_s = -1 => O in O_2 = O as its in elemental form, therefore it is oxidised. H_2O_2 is the reductant . H_2O_2 is both the reductant and the oxidant.

vii. $Fe_2O_3(l) + 3CO(g) \rightarrow 2Fe(l) + CO_2(g)$

Fe in Fe_2O_3 = +3 => Fe(l) = 0 is in its elemental form, therefore it is reduced. Fe_2O_3 is the oxidant

C in CO = +2 => C in CO_2 = +4 therefore it is oxidised. CO is the reductant

viii. $2Mg(s) + O_2(g) \rightarrow 2MgO(s)$

Mg(s) = 0 it is in elemental form => Mg in MgO = +2, therefore it is oxidised. Mg is the reductant

O in O_2 = 0 it is in elemental form => O in MgO = -2 , therefore it is reduced. O_2 is the oxidant

ix. $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

N in N_2 = 0 , it is in elemental form => N in NH_3 = -3, therefore it is reduced. N_2 is the oxidant

H in H_2 = 0 it is in elemental form => H in NH_3 = +1 it is oxidised. H_2 is therefore the reductant.