**WORKSHEET: Redox reactions**

1. **Define** the process of **oxidation** in terms of :

a) transfer (gain or loss) of oxygen \_\_\_\_\_\_\_\_\_\_\_\_

b) transfer (gain or loss) of electrons \_\_\_\_\_\_\_\_\_\_\_

c) transfer (gain or loss) of hydrogen \_\_\_\_\_\_\_\_\_\_\_\_

d) decrease or increase in oxidation number \_\_\_\_\_\_\_\_\_\_\_\_

2. **Define** the process of **reduction** in terms of:

a) transfer (gain or loss) of oxygen \_\_\_\_\_\_\_\_\_\_\_\_

b) transfer (gain or loss) of electrons \_\_\_\_\_\_\_\_\_\_\_

c) transfer(gain or loss) of hydrogen \_\_\_\_\_\_\_\_\_\_\_\_\_

d) decrease or increase in oxidation number\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. a) Complete the half equations by balancing it and identify each half reaction as either an **oxidation (O)** or **reduction (R)** reaction.

(i) Na (s) → Na+ (aq)(ii) Mg2+(aq) → Mg (s)

(iii) Fe (s) → Fe3+(aq) (iv) Cl- (aq) → Cl2 (g)

v) K(s) → K+ (aq) vi) O2 (g) → O2- (aq)

vii) F- (aq) → F2 (g) viii) Cu 2+ (aq) → Cu(s)

ix) S (s) → S2- (aq) x) H2 (g) → H+ (aq)

4 Consider the incomplete reaction (partial ionic equation) given below:

A) Cu2+ + Zn → Zn2+ + Cu

i) Give the two half equations for this reaction; oxidation + reduction

ii) Identify the chemical substance (species) that has undergone oxidation

iii) Identify the chemical substance (species) that has undergone reduction

iv) Identify (from the reactants) the oxidising agent (oxidant) in this reaction;

v) Identify (from the reactants) the reducing agent (reductant) in this reaction

REPEAT QUESTIONS I---V FOR THE FOLLOWING REACTIONS (Unbalanced):

B) Cl2 (aq) chlorine water + Br- (aq) → Br2(aq) + Cl- (aq)

C) Fe (s) + Ag+(aq) → Ag (s) + Fe2+ (aq)

D) Mg (s) + S (s) → MgS (s)

E) S(s) + O2 (g) → SO2 (g)

F) Al(s) + O2 (g) → Al2O3 (s)

G) Pb2+(aq) + Mg (s) → Mg2+ (aq) + Pb (s)

H) Al (s) + Fe 2+ (aq) → Al3+(aq) + Fe (s)

5 ) Identify the following (some are half reactions) as involving either oxidation or reduction or neither:

a) Mg (s) → Mg2+(aq) +2e-

b) O2 (g) + 2H2O (l) + 4e- → 4OH- (aq)

c) Cu2+(aq) + 2e-  → Cu(s)

d) Fe(s) → Fe2+ (aq) + 2e-

6) Write the oxidation number for each element in the following species

a) CO b) SO3 c) H3PO4 d) Cr2O7 2- e) ClO-

**7. For the following equations:**

**A) Balance then,**

**B) Assign oxidation numbers to all species and show where oxidation**

**and reduction occur.**

**C) Label the oxidizing agent and the reducing agent.**

1. **K + Cl2 → KCl ii) N2  + H2 → NH3**
2. **S + Cl2 → SCl6 iv)Mg + N2 → Mg3 N2**
3. **SO2 + O2 → SO3  vi) Al + F2 → AlF3**
4. **NH3 + O2 → NO + H2O viii) H2 + F2 → HF**

**ELECTROLYTIC CELLS: ELECTROLYSIS OF ACIDIFIED WATER**

1. **Draw a fully labelled diagram of the Hoffmann volta meter when acidified water undergoes electrolysis.**
2. **Explain how and where each gas is produced in the electrolysis of the acidified water.**
3. **Which half reaction takes place at the anode?**
4. **Write the half reaction that takes place at the anode.**
5. **Write the half reaction that takes place at the cathode**
6. **At which electrode does oxidation take place?**
7. **At which electrode does reduction take place?**
8. **What are the electrodes made of and why?**
9. **Give the energy conversion that takes place in this electrolytic cell.**
10. **Why is it important to acidify the pure water before an electric current is sent through it ?**
11. **Name at least four differences between a galvanic and an electrolytic cell.**
12. **What would be observed if the dilute H2SO4 was replaced with**

**a) dilute NaCl (aq)**

**b) concentrated NaCl (aq)**

**c) What observation can now be made from the above results regarding**

**the concentration of the electrolyte ?**

**13. Write the half reactions at the anode and at the cathode for Q12a and Q12b**