ALL SAINTS' COLLEGE

Science Department

Year 12 Chemistry ATAR

Test 4: Redox - Fundamentals

Name: _____

Teacher: _____

Instructions to Students:

1. 50 minutes permitted
2. Attempt all questions
3. Write in the spaces provided
4. Show all working when required
5. All answers to be in blue or black pen, diagrams in pencil.

TOTAL	Final Percentage
/63	

Year 12 Chemistry ATAR

REDOX - Fundamentals Test 2016

Total – 63 marks

1. Consider the reaction:

   $Mg_{(s)} + H_2O_{(g)} \rightarrow MgO_{(s)} + H_{2(g)}$

   a. What substance is oxidised? _____ To what? _____

   b. What substance is reduced? _____ To what? _____

   c. What substance is the oxidising agent?

   _____

   d. What substance is the reducing agent? _____

   (6 marks)

2. Write the **two half equations**, the **overall reaction equation** and what you would **observe** if 5mL of a solution of potassium bromide is added drop-wise to an aqueous solution of Chlorine gas (Chlorine water).

   Half Eqn 1: _____

   Half Eqn 2: _____

   Combination:_____

   Final Equation:_____

   Observation: _____

   _____

   _____

   _____

   _____

(4 marks)

3. Write the **two half equations** and the **overall reaction equation** for a solution of acidified $K_2Cr_2O_7$ being added to an aqueous solution of $FeSO_4$ (iron(II)sulfate). Write a **full observation** for this reaction.

Half Eqn 1: _____

Half Eqn 2: _____

Combination: _____

Final Equation: _____

Observation: _____

_____

_____

_____

_____

(4 marks)

4. What is the oxidation number of:

a. Cr in $K_2Cr_2O_7$ _____
b. Mn in MnO_4^{1-} _____
c. N in NH_4^+ _____
d. N in N_2 _____
e. S in $S_2O_3^{2-}$ _____
f. P in HPO_4^{2-} _____
g. O in H_2O_2 _____
h. Cl in HClO _____
i. C in $H_4C_2O_2$ _____
j. Xe in $HXeO_4^{1-}$ _____

(5 marks)

5. Classify the following as either oxidising or reducing agents:

F_2, HCl, Zn, MnO_4^-, Al, $Cr_2O_7^{-2}$; I^-, Ag^+

Oxidising agents	Reducing agents

(4 marks)

6. For each of the following changes, state whether it is oxidation, reduction or neither and give the change in oxidation state of the element involved.

a. $Cl_2 \rightarrow Cl^{-1}$

Type: _____ Change(Δ): _____

b. $ClO^{-1} \rightarrow Cl^{-1}$

Type: _____ Change(Δ): _____

c. $MnO_2 \rightarrow Mn_2O_3$

Type: _____ Change(Δ): _____

d. $Cu_2S_{(s)} \rightarrow Cu_2O_{(s)}$

Type: _____ Change(Δ): _____

(8 marks)

7. Determine whether the following reactions represent SPONTANEOUS redox reactions.

Be sure to justify your answer with working, and show half equations with E° values. Finally, show the overall ionic equation with phases and overall E° value for any reactions that occur.

Where a reaction is not predicted you must state this as well as show your working to justify this conclusion.

a. Potassium Fluoride added to Bromine water.

_____

_____

_____

_____

_____

b. Copper added to dilute sulfuric acid.

_____

_____

_____

_____

_____

c. Silver metal added to a solution of zinc nitrate.

_____

_____

_____

_____

_____

d. Magnesium added to a solution of tin (II) sulfate.

_____

_____

_____

_____

_____

e. Sodium Iodide is added to a solution of hydrogen peroxide.

_____

_____

_____

_____

_____

(10 marks)

8. Copper metal **will** dissolve in concentrated nitric acid solution. When the nitric acid reacts, the nitrate ions are converted to NO_2 gas.
Use 1st principles balancing to write a **balanced half equation** for the reaction of the nitric acid and then add this to the appropriate half equation that explains the dissolution of the copper to produce a balanced redox reaction equation. **Write a full observation** for this reaction.

Half Eqn 1: _____

Half Eqn 2: _____

Combination:_____

Final Equation:_____

Observation: _____

_____

_____

_____

_____

(4 marks)

9. Predict the anode and cathode reaction and write a balanced overall equation for the following cells. Also calculate the cell EMF.

(a) A half-cell consisting of a platinum electrode in a solution containing Bromide ions and Bromine water is connected electrically and via salt bridge to another half-cell consisting of a copper electrode in a copper (II) ion solution.

Anode reaction: _____

Cathode reaction: _____

Overall: _____

Cell EMF: _____

(b) A half-cell consisting of a magnesium electrode in a solution containing magnesium ions is connected electrically and via salt bridge to another half-cell consisting of a copper electrode in a copper (II) ion solution.

Anode reaction: _____

Cathode reaction: _____

Overall: _____

Cell EMF: _____

(8 marks)

10. A tin rod dipping into a 1M $Sn(NO_3)_2$ solution, and a cobalt rod dipping into 1M $CoSO_4$ solution are connected to a voltmeter (a salt bridge of potassium nitrate is included). **Draw a large diagram** of the circuit, indicating:

- the flow of electrons,
- the anode,
- the cathode,
- the overall equation for the cell
- the overall E° of the cell,
- the movement of ions in each half cell,
- the flow of ions across the salt bridge,
- the electrode that loses mass and
- the electrode gaining mass (if any).

Note: A mark is given for the neatness of your diagram.

(10 marks)