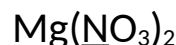


NAME: \_\_\_\_\_

TIME ALLOWED: 50 MINUTES

**Part A: Multiple Choice Questions. (10 marks)**

Q1. The sum of the Oxidation Numbers of the underlined elements of the following species is

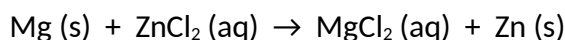


- A) 11+
- B) 13+
- C) 15+
- D) 16+

Q2. An Oxidising agent is one which

- A) Contains Hydrogen atoms
- B) Can donate electrons
- C) Can accept electrons
- D) Must contain an Oxygen atom

Q3. In the reaction below, which is true of Zinc ions?



- A) It is oxidised by losing electrons
- B) It is oxidised by gaining electrons
- C) It is reduced by losing electrons
- D) It is reduced by gaining electrons

Q4. Acidified Potassium Permanganate solution is a strong Oxidising agent because

- A) the Mn in the compound has a high oxidation number which can be lowered by a reducing agent.
- B) the  $\text{K}^+$  ion in the compound can easily be reduced.
- C) the compound has 4 Oxygen atoms.
- D) the solution forms a precipitate of  $\text{MnO}_2$  with a reducing agent.

Q5. Which one of the following is not a redox reaction?

- A)  $\text{Cl}_2 + 2\text{KBr} \rightarrow 2\text{KCl} + \text{Br}_2$
- B)  $\text{Mg} + \text{CuSO}_4 \rightarrow \text{MgSO}_4 + \text{Cu}$
- C)  $\text{CuSO}_4 + \text{H}_2\text{S} \rightarrow \text{CuS} + \text{H}_2\text{SO}_4$
- D)  $\text{PbS} + 4\text{H}_2\text{O}_2 \rightarrow \text{PbSO}_4 + 4\text{H}_2\text{O}$

Q6. Which of the following statements about oxidation numbers is false?

- A) The oxidation number of a free element is Zero.
- B) The oxidation number of a compound is Zero.
- C) Cations always have positive oxidation numbers.
- D) Non-metals always have negative oxidation numbers.

Q7. If a metal is found in its elemental form in nature, we expect that the metal

- A) Is very reactive
- B) Is very electropositive
- C) Will form very stable compounds
- D) To be completely pure

Q8. The Oxidation Numbers of element M in  $\text{Na}_2\text{H}_2\text{M}_2\text{O}_7 \cdot 6\text{H}_2\text{O}$  is

- A) 0
- B) +7
- C) +5
- D) +3

Q9. In the compound magnesium hydride, the oxidation numbers of the magnesium and the hydrogen are

	Oxidation number			
	A.	B.	C.	D.
<b>Mg</b>	+2	-2	-2	+2
<b>H</b>	-2	+2	+1	-1

Q10. Which of the following reactions shows that Hydrogen Peroxide is a reducing agent?

- A)  $\text{H}_2\text{S} + \text{H}_2\text{O}_2 \rightarrow \text{S} + 2\text{H}_2\text{O}$
- B)  $\text{PbO}_2 + \text{H}_2\text{O}_2 \rightarrow \text{PbO} + \text{H}_2\text{O} + \text{O}_2$
- C)  $\text{H}_2\text{O}_2 + \text{dye} \rightarrow \text{H}_2\text{O} + (\text{dye} + \text{O})$
- D)  $\text{H}_2\text{SO}_3 + 4\text{H}_2\text{O}_2 \rightarrow \text{H}_2\text{SO}_4 + \text{H}_2\text{O}$

**END OF PART A**

## PART B : SHORT ANSWER QUESTIONS (42 marks)

Q11. Several Redox reactions were carried out in the lab and some of the observations were recorded. From the information provided write one complete half equation for each experiment.

- A) An unknown halogen was added to a colourless solution of iodide ions to form a brown solution.

Half-equation: \_\_\_\_\_

- B) Aluminium metal was added to an unknown solution. The Aluminium dissolved producing a clear colourless solution.

Half-equation: \_\_\_\_\_

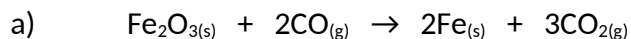
- C) A metal was added to an unknown acid solution and a colourless gas was produced.

Half-equation: \_\_\_\_\_

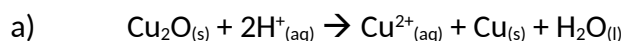
[3 marks]

Q12. Identify the oxidising and reducing agents in each of the following:

[2 marks]

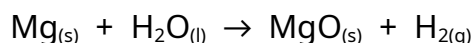


Oxidising agent: \_\_\_\_\_ Reducing agent: \_\_\_\_\_



Oxidising agent: \_\_\_\_\_ Reducing agent: \_\_\_\_\_

13. Consider the reaction:



- What substance is oxidised? To what?
- What substance is reduced? To what?
- What substance is the oxidant (oxidising agent)?
- What substance is the reductant (reducing agent)?

(4 marks)

14. (a) Write the **two half equations**, the **overall reaction equation** and what you would **observe** if 5mL of a solution of potassium bromide is added to an aqueous solution of Chlorine (chlorine water). (4 marks)

(b) Write the **two half equations**, the **overall reaction equation** and what you would **observe** if 5 mL of acidified  $\text{K}_2\text{Cr}_2\text{O}_7$  is added to an aqueous solution of  $\text{FeSO}_4$  (iron (II) sulfate). (4 marks)

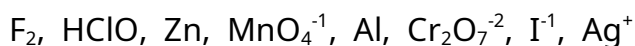
(4 marks)

15. What is the oxidation number of:

- |  |                                |
|--|--------------------------------|
| a. Cr in $\text{K}_2\text{Cr}_2\text{O}_7$ | f. P in $\text{HPO}_4^{2-}$    |
| b. Mn in $\text{MnO}_4^{1-}$               | g. O in $\text{H}_2\text{O}_2$ |
| c. N in $\text{NH}_4^+$                    | h. Cl in $\text{HClO}$         |
| d. I in $\text{IO}_3^-$                    | i. N in $\text{N}_2\text{O}_3$ |
| e. S in $\text{S}_2\text{O}_3^{2-}$        | j. Xe in $\text{HXeO}_4^{1-}$  |

(5 marks)

16. Make two lists (1) oxidants and (2) reductants and classify the following into these two groups:



(4 marks)

17. 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.  $\text{Cr}(\text{OH})_3 \rightarrow \text{Cr}_2\text{O}_7^{2-}$
- b.  $\text{ClO}^1 \rightarrow \text{Cl}^1$
- c.  $\text{MnO}_2 \rightarrow \text{Mn}_2\text{O}_3$
- d.  $\text{Cu}_2\text{S}_{(s)} \rightarrow \text{Cu}_2\text{O}_{(s)}$

(8 marks)

18. Determine whether the following reactions represent SPONTANEOUS redox reactions or NOT. Be sure to justify your answer with working showing half equations with  $E^0$  values, and the full equations with phases for any reactions that occur. Where a reaction is not spontaneous you must state this as well, and show your working to justify this conclusion.

- a. Potassium metal added to water.
- b. Copper filings added to dilute sulfuric acid.
- c. Silver metal added to a solution of zinc nitrate.
- d. Magnesium ribbon added to a solution of tin (II) sulfate.

## UNIT 3 Sample Test

## REDOX TEST

52 marks

NAME: Solutions

TIME ALLOWED: 55 MINUTES

## Part A: Multiple Choice Questions. (10 marks)

1	2	3	4	5	6	7	8	9	10
D	C	D	A	C	D	D	C	D	B

## PART B : SHORT ANSWER QUESTIONS (10 marks)

Q11. Several Redox reactions were carried out in the lab and some of the observations were recorded. From the information provided write one complete half equation for each experiment.

- D) An unknown halogen was added to a colourless solution of iodide ions to form a brown solution.

Half-equation:  $2\text{I}^{-}(\text{aq}) \rightarrow \text{I}_{2(\text{aq})} + 2\text{e}^{-}(\text{g})$

- E) Aluminium metal was added to an unknown solution. The Aluminium dissolved producing a clear colourless solution.

Half-equation:  $\text{Al}_{(\text{s})} \rightarrow \text{Al}^{3+}(\text{aq}) + 3\text{e}^{-}$

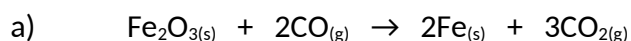
- F) A metal was added to an unknown acid solution and a colourless gas was produced.

Half-equation:  $2\text{H}^{+}(\text{aq}) + 2\text{e}^{-} \rightarrow \text{H}_{2(\text{g})}$

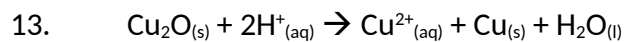
[3 marks]

Q12. Identify the oxidising and reducing agents in each of the following:

[2 marks]



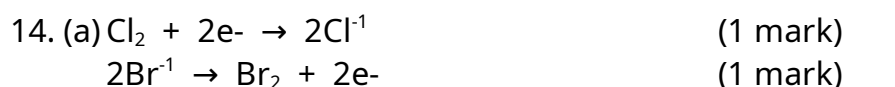
Oxidising agent:  $\text{Fe}_2\text{O}_3$  Reducing agent:  $\text{CO}$

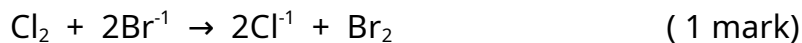


Oxidising agent:  $\text{Cu}_2\text{O}$  Reducing agent:  $\text{Cu}_2\text{O}$

13. a.  $\text{Mg} \rightarrow \text{Mg}^{2+}$  or  $\text{MgO}$  (1 each)  
 b.  $\text{H}_2\text{O} \rightarrow \text{H}_2$  (1 each)  
 c.  $\text{H}_2\text{O}$  (1 mark)  
 d.  $\text{Mg}$  (1 mark)

4 marks





**Obs:** A clear colourless solution is added to a pale yellow solution. Upon addition the solution turns orange. (1 mark)

4 marks



**Obs:** An orange coloured solution is added to a pale green solution. Upon addition a dark green solution is produced. (1 mark)

4 marks

15. a. Cr = +6 f. P = +5  
 b. Mn = +7 g. O = -1  
 c. N = -3 h. Cl = +1  
 d. I = +5 i. N = +3  
 e. S = +2 j. Xe = +6

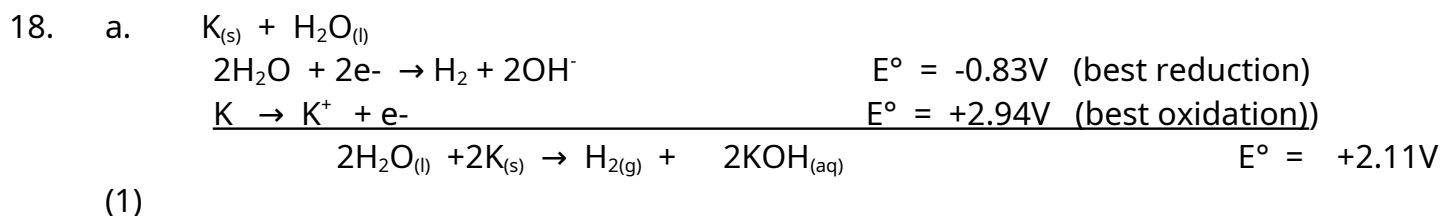
5 marks

16. 1. Oxididants =  $\text{F}_2$ ,  $\text{HClO}$ ,  $\text{MnO}_4^{-1}$ ,  $\text{Cr}_2\text{O}_7^{2-}$ ,  $\text{Ag}^+$   
 2. Reductants = Zn, Al,  $\text{I}^{-1}$

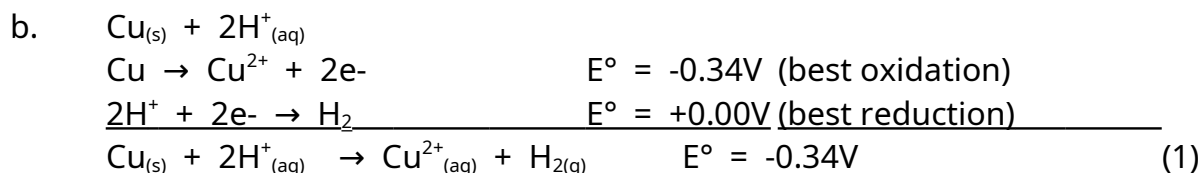
1/2 each x 8 = 4 marks

17. a.  $\text{Cr}(\text{OH})_3 \rightarrow \text{Cr}_2\text{O}_7^{2-}$   
 (+3) (+6)  $\Delta = +3$  (1 mark)  $\rightarrow$  Oxidation (1/2 mark)  
 b.  $\text{ClO}^{-1} \rightarrow \text{Cl}^{-1}$   
 (+1) (-1)  $\Delta = -2$  (1 mark)  $\rightarrow$  Reduction (1/2 mark)  
 c.  $\text{MnO}_2 \rightarrow \text{Mn}_2\text{O}_3$   
 (+4) (+3)  $\Delta = -1$  (1 mark)  $\rightarrow$  Reduction (1/2 mark)  
 d.  $\text{Cu}_2\text{S} \rightarrow \text{Cu}_2\text{O}$   
 (+1) (+1)  $\Delta = 0$  (1 mark)  $\rightarrow$  Neither (1/2 mark)

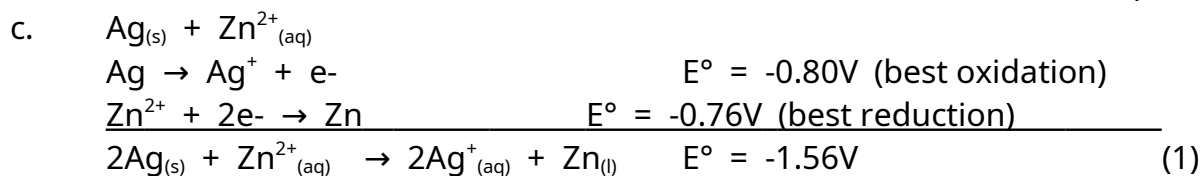
8 marks



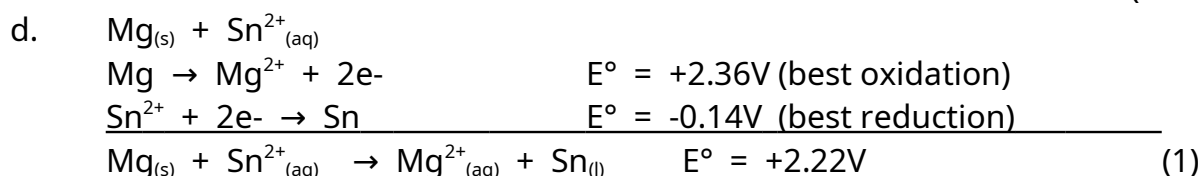
Positive  $E^\circ$  value, therefore reaction is spontaneous. (1)  
 (2 marks total)



Negative  $E^\circ$  value, therefore reaction NOT spontaneous. (1)  
 (2 marks total)



Negative  $E^\circ$  value, therefore reaction is NOT spontaneous. (1)  
 (2 marks total)



Positive  $E^\circ$  value, therefore reaction IS spontaneous. (1)  
 (2 marks total)