



Science Department

Year 12 Chemistry ATAR  
2017

## 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
/57

Final Percentage





## Year 12 Chemistry ATAR

### REDOX - Fundamentals Test 2017

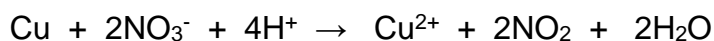
Total – 52 marks

#### Multiple Choice

1. Which one of the following reactions is an example of an oxidation-reduction reaction?

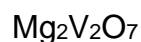
- a)  $\text{AgNO}_3 + \text{NaCl} \rightarrow \text{NaNO}_3 + \text{AgCl}$
- b)  $\text{H}_3\text{O}^+ + \text{OH}^- \rightarrow 2\text{H}_2\text{O}$
- c)  $2\text{PbO} + \text{C} \rightarrow 2\text{Pb} + \text{CO}_2$
- d)  $\text{H}_2\text{SO}_4 + \text{NaCl} \rightarrow \text{NaHSO}_4 + \text{HCl}$

2. In the following equation:



- a) nitrogen is reduced and copper is oxidized.
- b) nitrogen is oxidized and oxygen is reduced.
- c) nitrogen ion is oxidized and copper is reduced.
- d) there is no change in oxidation state.

3. Consider the following formulae:



From the above information, it may be concluded that the oxidation number of vanadium (V) can be:

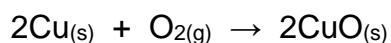
- a) +4, +5 and +6 and +7
- b) +2, +3 and +7
- c) +4, +5, +6
- d) +4, +5, +6 and +8

4. Which one of the following statements is FALSE?
- a) Oxidation and Reduction occur simultaneously.
  - b) The substance which donates the electrons in an oxidation-reduction reaction is called the reducing agent.
  - c) The oxidising agent is the substance which is reduced in an oxidation reduction reaction.
  - d) The reducing agent will experience a lowering of its oxidation state.
5. Which one of the following statements about redox reactions is **FALSE**?
- a) The oxidising agent is reduced by gaining electrons from the reducing agent.
  - b) Reduction is the acceptance of electrons.
  - c) The stronger the reducing agent, the more electrons each atom can donate.
  - d) All electrons donated by the reducing agent are accepted by the oxidising agent.

**Continued on next page**

## Short Answer Section

1. Consider the reaction:



(a) What substance is oxidised? \_\_\_\_\_

(b) What substance is reduced? \_\_\_\_\_

(c) What substance is the oxidant? \_\_\_\_\_

(d) What substance is the reductant? \_\_\_\_\_

(e) What substance donates or loses electrons?  
\_\_\_\_\_

(f) What substance receives electrons?  
\_\_\_\_\_

(g) Write the oxidation half reaction.  
\_\_\_\_\_

(h) Write the reduction half reaction.  
\_\_\_\_\_

(i) What is the change in oxidation number of the  $\text{Cu}_{(s)}$ ?  
\_\_\_\_\_

(j) What is the change in oxidation number of the  $\text{O}_{2(g)}$ ?  
\_\_\_\_\_

(10 marks)

2. Write the **two half equations**, the **overall reaction equation** and what you would **observe** if solution of iron (II) sulfate is added drop-wise to an aqueous solution of hydrogen peroxide.

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 potassium dichromate ( $K_2Cr_2O_7$ ) being added to an aqueous solution of sodium iodide (KI). 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. Fe in  $Fe(s)$  \_\_\_\_\_ f. N in NO \_\_\_\_\_

b. Fe in  $FeCl_2$  \_\_\_\_\_ g. N in  $NO_2$  \_\_\_\_\_

c. Fe in  $FeCl_3$  \_\_\_\_\_ h. N in  $NH_4^+$  \_\_\_\_\_

d. Zn in  $Zn(OH)_4^{2-}$  \_\_\_\_\_ i. N in  $HNO_3$  \_\_\_\_\_

e. N in  $N_2$  \_\_\_\_\_ j. Xe in  $HXeO_4^{1-}$  \_\_\_\_\_

(5 marks)

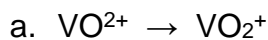
5. Classify the following as either oxidising or reducing agents:

$Cl_2$ , Pb, Mn,  $MnO_4^-$ ,  $Fe^{3+}$ ,  $H^+$ ,  $I^-$ ,  $Ag^+$

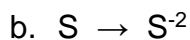
Oxidising agents	Reducing agents

(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.



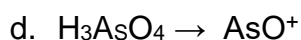
Type: \_\_\_\_\_ Change( $\Delta$ ): \_\_\_\_\_



Type: \_\_\_\_\_ Change( $\Delta$ ): \_\_\_\_\_



Type: \_\_\_\_\_ Change( $\Delta$ ): \_\_\_\_\_



Type: \_\_\_\_\_ Change( $\Delta$ ): \_\_\_\_\_

(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  $E^\circ$  values. Finally, show the overall ionic equation with phases and overall  $E^\circ$  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. Copper nitrate added to potassium bromide.

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b. Sodium chloride added to lead sulfate

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c. Zinc added to tin nitrate

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d. Hydrogen peroxide added to potassium permanganate. (Assume  $\text{MnO}_4^-$  is the oxidising agent)

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e. Silver nitrate added to oxalic acid.

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(15 marks)

8. You have been asked by your teacher to select the most powerful oxidising agent and most powerful reducing agent from a selection of chemicals listed below. Indicate your choices in the spaces provided.



a. Most powerful oxidising agent: \_\_\_\_\_

b. Most powerful reducing agent: \_\_\_\_\_

(2 marks)