



Name _____ Class: _____

Start Time _____ End Time _____ Time Taken _____

Time allowed: 40 minutes**INSTRUCTIONS TO CANDIDATES**

- This document is designed to be used as a practice test.
- Complete the test under exam conditions in one sitting.
- Optional: Before marking it, go through the paper with a set of notes and improve your answers.
- Mark the test using the mark scheme make corrections on the paper.
- Complete the table on the front page.
- Improve your notes so that they better reflect your weaknesses.
- Make a note of your strengths and weaknesses for future revision.

Success Criteria	Questions In Paper	Mark	Out of	%	Rank Order
Redox Calculations	1, 7c		7, 5		
Oxidation state	2, 5a _{ii} , 5a _{iii} , 6c _{ii}		1, 2, 1, 1		
Definitions	3, 5a _i , 6a		1, 1, 1		
Half equations	4, 5b _i , 5b _{ii} , 6b _{ii} , 6c _i , 6c _{iii}		1, 1, 1, 1, 1, 1		
Full redox Half Equations	5b _{iii} , 6c _{iv} , 6d _i , 7b		1, 1, 1, 1		
Identifying agents	6b _i , 6d _{ii}		2, 1		
General equations	7a		1		
Practical considerations	7d, 7e		2		
Total			36		

**Q2.**

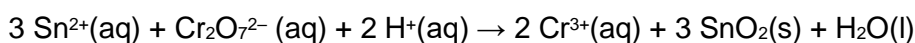
In which species is chlorine in its highest oxidation state?

- A ClF_2^-
- B ClO_4^-
- C ClO_2
- D ClF_3

(Total 1 mark)

Q3.

Which statement about this redox reaction is correct?



- A Sn^{2+} is the oxidising agent and it gains electrons.
- B Sn^{2+} is the reducing agent and it gains electrons.
- C $\text{Cr}_2\text{O}_7^{2-}$ is the oxidising agent and it gains electrons.
- D $\text{Cr}_2\text{O}_7^{2-}$ is the reducing agent and it gains electrons.

(Total 1 mark)

Q4.

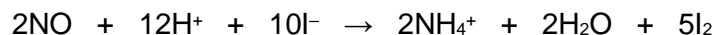
Which incomplete half-equation is balanced by adding two H^+ ions and one electron to the left-hand side?

- A $\text{CH}_3\text{CHO} \rightarrow \text{CH}_3\text{CH}_2\text{OH}$
- B $\text{VO}^{2+} \rightarrow \text{V}^{3+} + \text{H}_2\text{O}$
- C $\text{HNO}_2 \rightarrow \text{NO} + \text{H}_2\text{O}$
- D $\text{O}_2 \rightarrow \text{H}_2\text{O}_2$

(Total 1 mark)

**Q5.**

- (a) The following is an equation for a redox reaction.



- (i) Define *oxidation* in terms of electrons.

- (ii) Deduce the oxidation state of nitrogen in NO and of nitrogen in NH_4^+

Oxidation state of nitrogen in NO _____

Oxidation state of nitrogen in NH_4^+ _____

- (iii) Identify the species formed by oxidation in this reaction _____

(4)

- (b) When chlorine gas is bubbled into an aqueous solution of sulphur dioxide, hydrogen ions, sulphate ions and chloride ions are formed.

- (i) Write a half-equation for the formation of chloride ions from chlorine.

- (ii) Write a half-equation for the formation of hydrogen ions and sulphate ions from sulphur dioxide and water.

- (iii) Hence, deduce an overall equation for the reaction which occurs when chlorine is bubbled into aqueous sulphur dioxide.

(3)

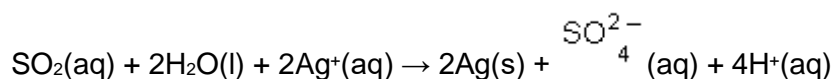
(Total 7 marks)

Q6.

- (a) In terms of electrons, what happens to an oxidising agent during a redox reaction?

(1)

- (b) Consider the following redox reaction.



- (i) Identify the oxidising agent and the reducing agent in this reaction.

Oxidising agent _____

Reducing agent _____



- (ii) In a different reaction, sulfur dioxide is reduced to form hydrogen sulfide. Write a half equation for this equation.

(3)

- (c) Fe^{2+} ions are oxidised to Fe^{3+} ions by ClO_3^- ions in acidic conditions. The ClO_3^- ions are reduced to Cl^- ions.

- (i) Write a half-equation for the oxidation of Fe^{2+} ions in this reaction.

- (ii) Deduce the oxidation state of chlorine in ClO_3^- ions.

- (iii) Write a half-equation for the reduction of ClO_3^- ions to Cl^- ions in acidic conditions.

- (iv) Hence, write an overall equation for the reaction.

(4)

- (d) Write an equation to show how sulphur is removed from impure iron using magnesium. Identify the oxidising agent in this reaction.

Equation _____

Oxidising agent _____

(2)

(Total 10 marks)

Q7.

Iron from the Blast Furnace contains carbon. In the steel-making process, oxygen is blown through molten impure iron. At stages during this process samples of iron are taken and analysed to determine the remaining carbon content. One method of analysis involves a redox titration.

At one stage a 1.27g sample of this impure iron was reacted with an excess of dilute sulphuric acid. All of the iron in the sample was converted into iron(II) sulfate, and hydrogen was evolved. The solution formed was made up to 250 cm^3 . A 25.0 cm^3 sample of this solution reacted completely with exactly 19.6 cm^3 of a $0.0220 \text{ mol dm}^{-3}$ solution of potassium manganate(VII).

- (a) Write an equation for the reaction between iron and dilute sulphuric acid.

(1)



- (b) Write an equation for the reaction of iron(II) ions with manganate(VII) ions in acid solution.

(1)

- (c) Assuming that carbon is the only impurity, calculate the percentage by mass of carbon in the 1.27g sample.

(5)

- (d) How would you ensure the reliability of the result obtained in this experiment?

(1)

- (e) Suggest one way in which the reliability of this analysis could be improved.

(1)

(Total 9 marks)