



Christ Church Chemistry Department

Redox Topic Test

Time allowed: 45 minutes
No reading time

Name: _____

Marks: _____ / 43

Teacher:
(circle your teacher)

CEM

DGM

JPT

NMO

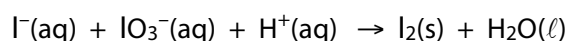
Section 1: Multiple Choice

10 marks

1. Which one of the following is not an oxidation-reduction reaction?

- A. $\text{Mg(s)} + 2 \text{H}^+(\text{aq}) \rightarrow \text{Mg}^{2+}(\text{aq}) + \text{H}_2(\text{g})$
- B. $2 \text{Ag}^+(\text{aq}) + \text{Zn(s)} \rightarrow 2 \text{Ag(s)} + \text{Zn}^{2+}(\text{aq})$
- C. $\text{Ag}^+(\text{aq}) + \text{I}^-(\text{aq}) \rightarrow \text{AgI(s)}$
- D. $\text{Cl}_2(\text{g}) + 2 \text{I}^-(\text{aq}) \rightarrow 2 \text{Cl}^-(\text{aq}) + \text{I}_2(\text{s})$

2. Consider the following unbalanced equation.



Which one of the following statements is true?

- A. H^+ is reduced.
 - B. IO_3^- is not the oxidising agent.
 - C. The oxidising agent is I_2 .
 - D. I^- is the reducing agent.
3. When arsenious acid, H_3AsO_3 , is oxidized to arsenic acid, H_3AsO_4 , the number of moles of electrons released per mole of arsenious acid is:
- A. 1
 - B. 2
 - C. 3
 - D. 4
4. An electrochemical cell based on the following reaction has an $E^\ominus = 1.50\text{V}$.



What is the standard reduction potential for the reduction of MnO_2 to Mn_2O_3 ?

- A. -0.74 V
- B. $+0.74 \text{ V}$
- C. $+2.26 \text{ V}$
- D. -2.26 V

5. Which of the following are redox reactions?

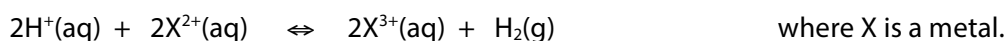
- I. $\text{O}^{2-} + \text{H}_2\text{O} \rightarrow 2\text{OH}^-$
- II. $\text{H}^- + \text{H}_2\text{O} \rightarrow \text{OH}^- + \text{H}_2$
- III. $2\text{H}_2\text{O}_2 \rightarrow 2\text{H}_2\text{O} + \text{O}_2$
- IV. $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$

- A. II and IV
- B. III and IV
- C. II, III and IV
- D. all of them

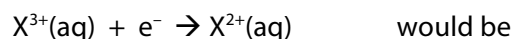
6. In which of the following is vanadium exhibiting the highest oxidation number?

- A. VO^{2+}
- B. NH_4VO_3
- C. $\text{V}_2(\text{SO}_4)_3$
- D. VBr_4

7. A cell with an EMF of 0.40 V has the cell reaction



If the concentrations of the ions were 1.00 mol L^{-1} and the pressure of H_2 was 101.3 kPa, then the Reduction Potential (E°) for the half reaction

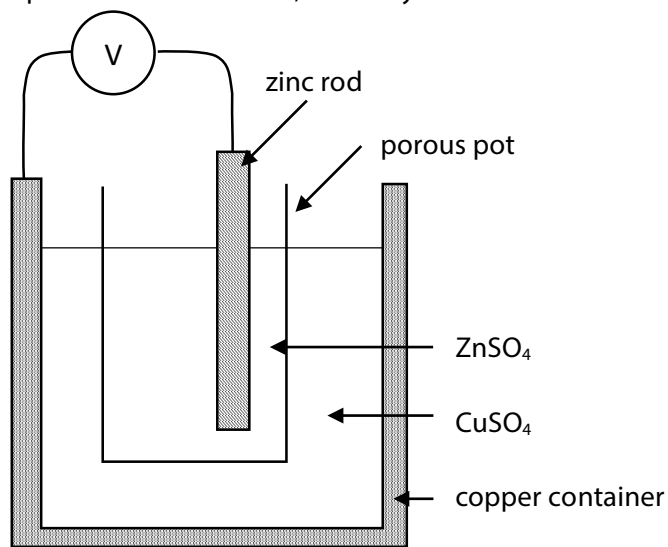


- A. -0.40 V
- B. -0.80 V
- C. $+0.40 \text{ V}$
- D. $+0.80 \text{ V}$

8. During the electrolysis of molten sodium bromide which one of the following equations best represents the reaction at the negative electrode?

- A. $\text{Na} \rightarrow \text{Na}^+ + \text{e}^-$
- B. $\text{Na}^+ + \text{e}^- \rightarrow \text{Na}$
- C. $2 \text{Br}^- \rightarrow \text{Br}_2 + 2 \text{e}^-$
- D. $\text{Br}_2 + 2 \text{e}^- \rightarrow 2 \text{Br}^-$

9. For the reaction $\text{H}_2\text{SO}_3 + \text{H}_2\text{O}_2 \rightleftharpoons \text{H}_2\text{SO}_4 + \text{H}_2\text{O}$ the true statement is:
- hydrogen peroxide is acting as an oxidant and as a reductant
 - hydrogen peroxide is acting as a reductant
 - the oxidation number of sulfur has decreased
 - the oxidation number of oxygen has decreased
10. The diagram below represents a Daniell Cell, a battery from the mid 1800s.



When the zinc rod and the copper container are connected as part of a completed electrical circuit, a current flows in this circuit. When the cell is operating, which one of the following statements is true?

- The copper container gradually dissolves.
- Electrons flow from the copper to the zinc through the external circuit.
- Zinc is deposited around the zinc rod.
- Sulfate ions migrate through the porous pot from the copper compartment to the zinc compartment.

Section 2: Short Answer**33 marks**

11. Write fully balanced, ionic equations (where possible) for any reactions that occur in the following procedures. If no reaction occurs, write 'no reaction'.

(a) Excess acidified potassium dichromate is added to propan-1-ol

Reduction half equation:

Oxidation half equation:

Overall Equation:

Observation: _____

(5 marks)

(b) Bromine water is added to potassium iodide solution.

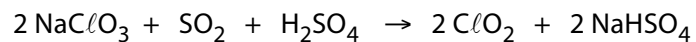
Equation: _____

Observation: _____

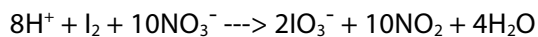
(3 marks)

12. Consider the reactions below and complete the table accordingly:

Reaction 1



Reaction 2



	Redox reaction? (circle correct answer)	Explanation using oxidation number
Reaction 1	Yes / No	
Reaction 2	Yes / No	

(6 marks)

13. When chromium is added to periodic acid, H_5IO_6 , the iodate ion, IO_3^- , is formed and the resulting solution turns deep green.

a) Determine the oxidation number of the iodine in:

H_5IO_6 : _____ and IO_3^- : _____ (2 marks)

b) Using this information construct suitable fully balanced, half and overall equations.

Oxidation half-equation
Reduction half equation
Overall

(4 marks)

14. Draw a simple diagram of a suitable cell for the electrolysis of molten sodium chloride in the space below. On your diagram include the following.
- the cathode and its polarity
 - the anode and its polarity
 - the direction of electron flow in the wire
 - the movement of ions in the cell

(4 marks)

- a) Provide the oxidation and reduction reactions occurring at the electrodes

Oxidation half-equation

(1 mark)

Reduction half-equation

(1 mark)

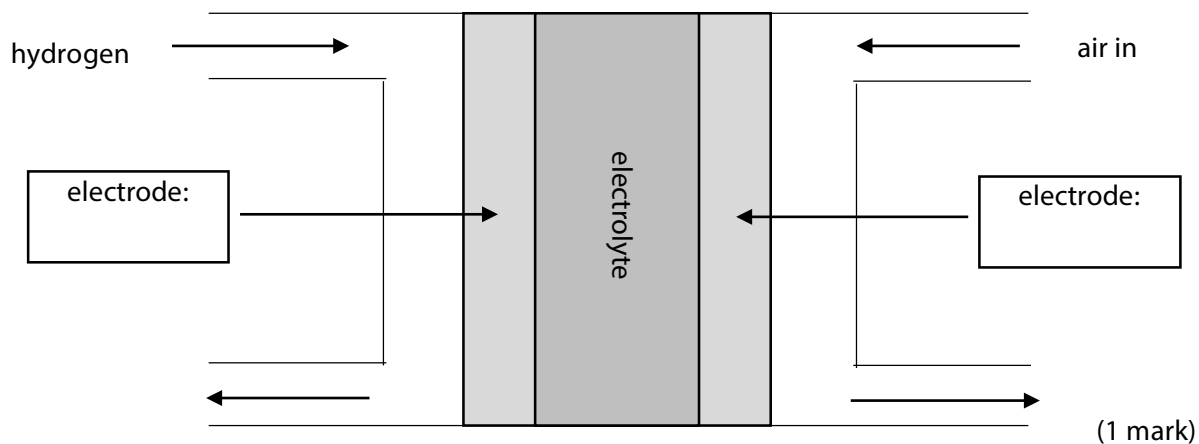
15. The most common type of corrosion is the redox process by which metals are oxidized by oxygen in the presence of moisture. The steel hull of a ship may be protected by having blocks of titanium attached to it. Use the standard potential table and that given below to explain this protection.



(3 marks)

16. The hydrogen fuel cell is shown in diagrammatic form below. The electrolyte used in this cell has a pH less than 7 and the external circuit is not shown.

a) Label the anode and cathode in the correct box.



b) Complete the equations for:

the anode:

(1 mark)

the cathode:

(1 mark)

c) What would the cell voltage generated by this cell be assuming standard conditions?

(1 mark)

END OF TEST