



Christ Church
Grammar School

Year 12 Chemistry

Redox test 2018

Time allowed:

45 minutes

Name: _____

Mark =/45

Teacher:

KLW

CEM

JPT

NMO

Section 1 Multiple Choice

10 marks

1. In which of the following is sulfur in the highest oxidation state (oxidation number)?

- A. $\text{S}_2\text{O}_6^{2-}$
- B. $\text{S}_2\text{O}_4^{2-}$
- C. $\text{S}_2\text{O}_8^{2-}$
- D. $\text{S}_4\text{O}_6^{2-}$

2. Which of the following contains nitrogen with an oxidation number of +5?

- A. N_2H_4
- B. $(\text{NH}_4)_3\text{PO}_4$
- C. $\text{Ba}(\text{NO}_3)_2$
- D. $\text{Al}(\text{NO}_2)_3$

3. Which of the following are redox reactions?

- I. $\text{Ca} + 2\text{HCl} \rightarrow \text{CaCl}_2 + \text{H}_2$
- II. $\text{CaO} + 2\text{HCl} \rightarrow \text{CaCl}_2 + \text{H}_2\text{O}$
- III. $\text{Ca}(\text{OH})_2 + 2\text{HCl} \rightarrow \text{CaCl}_2 + 2\text{H}_2\text{O}$
- IV. $\text{CaCO}_3 + 2\text{HCl} \rightarrow \text{CaCl}_2 + \text{CO}_2 + \text{H}_2\text{O}$

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

The following 3 questions refer to a galvanic cell comprising a $\text{Ag}(\text{s})/\text{Ag}^+(\text{aq})$ half-cell and a $\text{Co}(\text{s})/\text{Co}^{2+}(\text{aq})$ half-cell under standard conditions

4. What will be the voltage of the galvanic cell?

- A. 0.52V
- B. 0.80V
- C. -0.28V
- D. 1.08V

5. During the operation of the cell, which of the following will occur?

- A. The mass of the cathode will decrease
- B. The concentration of $\text{Ag}^+(\text{aq})$ will increase
- C. Electrons will flow from the Ag electrode to the Co electrode
- D. Anions flow to the $\text{Co}(\text{s})/\text{Co}^{2+}(\text{aq})$ half-cell through the salt bridge.

6. If a student used aqueous sodium carbonate for his salt bridge, which of the following would you be most likely to observe?

- A. The voltage of the cell would drop and a yellow precipitate would form in one of the half cells.
- B. The voltage of the cell would drop and a pink precipitate would form in one of the half cells.
- C. The voltage of the cell would be unchanged and a yellow precipitate would form in one of the half cells.
- D. The voltage of the cell would be unchanged and a pink precipitate would form in one of the half cells.

7. Which of the following is true of galvanic cells?
- A. The overall reaction is an endothermic process.
 - B. Electrical energy is converted into chemical potential energy.
 - C. Electrical energy is required to overcome the activation energy.
 - D. The enthalpy of the products is lower than that of the reactants.
8. How many electrons are transferred when 2 moles of thiosulfate ions ($\text{S}_2\text{O}_3^{2-}$) are converted into sulfate ions (SO_4^{2-})
- A. 16.
 - B. 8.
 - C. 4.
 - D. 2.
9. Which of the following is true for electrolytic cells?
- A. Cations in the electrolyte flow towards the anode.
 - B. Oxidation occurs at the negative electrode.
 - C. Electrons flow from the anode to the cathode through the external circuit.
 - D. A salt bridge is not used because of the high temperatures.
10. Which of the following is true about 1.0molL^{-1} hydrogen peroxide solution
- I. It can decompose into water and $\text{O}_2(\text{g})$
 - II. It can be reduced by $\text{Mn}^{2+}(\text{aq})$.
 - III. It can oxidise $\text{Mn}^{2+}(\text{aq})$.
 - IV. It can be reduced by Mn.
- A. I and II
 - B. III and IV
 - C. II, III and IV
 - D. all of them

Section 2 Written questions

37 marks

Question 11

(10 marks)

Write balanced half-equations and a full equation that account for the following observations.

- (a) A colourless solution reacts with a pale pink solution and the solution turns purple.

Oxidation half equation	
Reduction half equation	
Full redox equation	

- (b) When nitrate ions are added to dithionate ($S_2O_4^{2-}$) ions, sulfate ions are formed and a brown gas is given off.

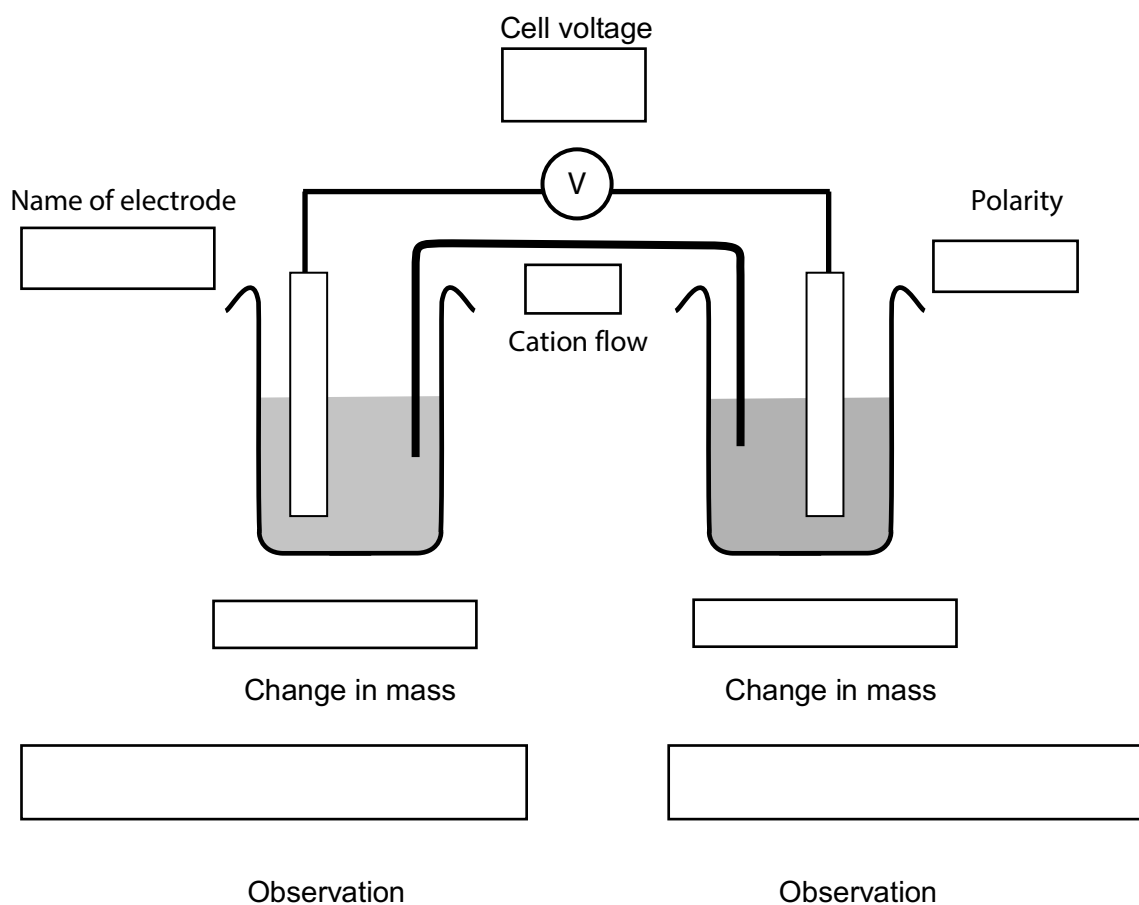
Oxidation half equation	
Reduction half equation	
Full redox equation	

Question 12

(6 marks)

An galvanic cell is constructed as follows. In the half-cell on the left, a platinum electrode is placed into a solution that contains both $1.00\text{molL}^{-1} \text{Fe}^{2+}(\text{aq})$ and $1.00\text{molL}^{-1} \text{Fe}^{3+}(\text{aq})$. In the half-cell on the right, a chromium electrode is placed in a solution of $1.00\text{molL}^{-1} \text{Cr}^{3+}(\text{aq})$. Complete the diagram below, indicating the following in the relevant spaces provided.

- Name of the left-hand electrode (anode or cathode).
- Polarity of the right-hand electrode (+ or -).
- Direction of flow of cations in the salt bridge.
- Observation at each electrode
- Change in mass of each electrode (increase, decrease, no change)
- Cell voltage



Question 13**(6 marks)**

Chromium is a corrosion resistant metal and chrome plating is a method of coating iron objects with chromium. It is similar to the silver plating of cutlery.

Draw a diagram below to show a cell that would be suitable for conducting this process on a kitchen tap fitting. In addition to the general layout of the cell, clearly indicate the following

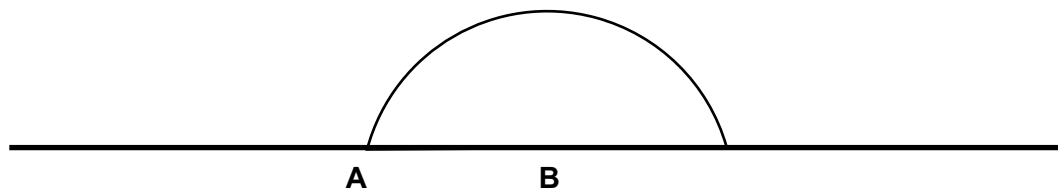
- The electrode that is the tap
- The most suitable material for the other electrode
- The cathode
- The direction of flow of electrons
- A suitable solution for the electrolyte



Question 14

(5 marks)

Below is a simplified diagram of a drop of water on an iron surface.



Write 'true' or 'false' in the boxes below alongside the following statements

Statement	True or False
Loss of iron metal will most likely be seen at location A	
B is a cathodic area	
Electrons will flow through the iron from B to A	
During the corrosion process, Fe(s) is oxidised to Fe ²⁺ (aq) and O ₂ (g) is reduced to OH ⁻ (aq)	
The red/brown colour of the rust is due Fe(OH) ₂ (s)	

