**Unit 2: Topic test 3: Redox reactions Student name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**SECTION A – Multiple-choice questions**

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| **Instructions for Section A**Answer **all** questions. Choose the response that is **correct** or **best answers** the question. A correct answer scores 1, an incorrect answer scores 0. No mark will be given if more than one answer is completed for any question. Marks will **not** be deducted for incorrect answers.  |

**Question 1**

Which of the following reactions would be considered a redox reaction?

**A**. AgNO3(aq) + KCl(aq) 🡪 AgCl(s) + KNO3(aq)

**B**. NaOH(s) 🡪 Na+(aq) + OH-(aq)

**C**. HCl(aq) + LIOH(aq) 🡪 LiCl(aq) + H2O(l)

**D**. Fe(s) + CuSO4(aq) 🡪 FeSO4(aq) + Cu(s)

**Question 2**

In metal displacement reactions,

**A**. the more reactive metal is oxidised and it donates its electrons to the ion of the less reactive metal.

**B**. the more reactive metal is oxidised and it accepts electrons from the less reactive metal.

**C**. the more reactive metal is reduced and it donates its electrons to the ion of the less reactive metal.

**D**. the more reactive metal is reduced and it accepts electrons from the less reactive metal.

**Question 3**

The atom shown loses its two outer shell electrons in a half reaction.

The diagram could be representing the

**A**. reduction of sodium atoms

**B**. oxidation of magnesium ions

**C**. reduction of magnesium atoms

**D**. oxidation of magnesium atoms

**Question 4**

The half-equation for the reduction of oxygen gas to oxide ions is

**A**. 2O2-(s O2(g) + 4e 🡪 O2(g)

**B**. O2(g) + 2e 🡪 2O2-(s)

**C**. O2(g) + 4e 🡪 2O2-(s)

**D**. O2(g) 🡪 2O2-(s) + 4e

*Use the following information to answers Questions 5 and 6*

A reaction can occur between zinc and hydrochloric acid;

Zn(s) + 2HCl(aq) 🡪 ZnCl2(aq) + H2(g)

**Question 5**

In this reaction, the zinc atoms are

**A**. reduced to zinc ions

**B**. oxidised to zinc ions

**C**. acting as the oxidant

**D**. spectators to the reactions of the hydrogen ions

**Question 6**

In this reaction, hydrogen ions are

**A**. oxidised to hydrogen gas

**B**. changed from positive ions to negative ions

**C**. reduced to hydrogen gas

**D**. spectators to the reactions of the metal atoms

**Question 7**

The diagram below is of a half cell.

The half equation for this half-cell will be

**A**. Fe3+(aq) + e- ⇄ Fe2+(aq)

**B**. Fe(s) ⇄ Fe2+(aq) + 2e-

**C**. Fe3+(aq) + 3e- ⇄ Fe(s)

**D**. Pt2+(aq) + 2e ⇄ Pt(s)

**Question 8**

In a galvanic cell,

**A**. oxidation will occur at the negative electrode

**B**. electrons will flow from the positive electrode to the negative electrode

**C**. reduction will occur at the negative electrode

**D**. a salt bridge is used to allow electrons to move through the whole circuit.

**Question 9**

Aluminium can corrode to form a grey powder. In this reaction,

**A**. aluminium ions are reduced to aluminium atoms

**B**. oxygen ions are oxidised to oxygen atoms

**C**. aluminium atoms lose one electron each

**D**. each aluminium atom will lose three electrons

**Question 10**

The order of reactivity of three particular metals is, highest to lowest,

 aluminium copper gold

A reaction that will occur spontaneously is

**A**. copper and aluminium nitrate

**B**. gold and aluminium nitrate

**C**. gold and copper sulfate

**D**. aluminium and gold nitrate

**SECTION B- Short-answer questions**

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| **Instructions for Section B**Questions must be answered in the spaces provided in this book. To obtain full marks for your responses you should * Give simplified answers with an appropriate number of significant figures to all numerical questions; unsimplified answers will not be given full marks.
* Show all workings in your answers to numerical questions. No credit will be given for an incorrect answer unless it is accompanied by details of the working.

Make sure chemical equations are balanced and that the formulas for individual substances include an indication of state; for example, H2(g); NaCl(s)  |

**Question 1**

**a**. Complete and balance the following half equations;

 **i**. Al(s) 🡪 Al3+(aq) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 **ii**. Fe3+(aq) 🡪 Fe2+(aq) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 **iii**. I2(s) 🡪 2I-(aq) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1 + 1 + 1 = 3 marks

**b**. For each half equation in part a. use the space provided to indicate if the reaction is oxidation

 or reduction. 3 marks

Total 6 marks

**Question 2**

For each of the following equations, identify the oxidant and the reductant.

**a**. Mg(s) + Pb2+(aq) 🡪 Mg2+(aq) + Pb(s)

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**b**. 2Li(s) + MgBr2(aq) 🡪 2LiBr(aq) + Mg(s)

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**c**. Cl2(g) + 2KBr(aq) 🡪 2KCl(aq) + Br2(l)

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2 + 2 + 2 = 6 marks

**Question 3**

**a**. Which of the following reactions will occur spontaneously?

 **i**. Cu(s) + LiBr(aq) 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

  **ii**. Li(s) + CuBr2(aq) 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**b.** Balance and complete the equation for the combination which does react.

**c**. Identify the oxidant and reductant in the equation that reacted.

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2 + 1 + 2 = 5 marks

**Question 4**

The equation for the reaction between sodium and calcium chloride is

2Na(s) + CaCl2(aq) 🡪 2NaCl(aq) + Ca(s)

**a**. Which of the two metals is the more reactive? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1 mark

**b. i**. Write the electron configuration of a calcium atom. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 **ii**. Write the electron configuration of a calcium ion. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 **iii**. Describe what is happening to calcium in the reaction above.

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 **iv**. Write a balanced half equation for the reaction of the calcium ions.

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 **v**. Explain whether calcium ions are being oxidized or reduced.

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1 + 1 + 1 + 1 + 1 = 5 marks

**c. i**. Write a balanced half equation for the reaction of sodium.

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 **ii**. Is sodium an oxidant or a reductant? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1 + 1 = 2 marks

Total 8 marks

**Question 5**

If zinc is added to a NiSO4 solution the zinc reacts and displaces the nickel in solution.

A galvanic cell can be constructed based on this reaction that could be used to power a small appliance.



 anode: \_\_\_\_\_\_\_\_\_\_\_\_ cathode: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

 overall equation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**a**. Use the template provided to;

* label the two electrodes
* suggest suitable solutions
* write half equations
* write an overall equation
* show the direction of electron flow
* identify the positive and negative electrodes

8 marks

**b**. Over time, describe how the appearance of the;

 **i**. positive electrode will change

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 **ii**. negative electrode will change

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1 + 1 = 2 marks

Total 10 marks

**Question 6**

One example of redox reactions in society is the corrosion of metals. In corrosion reactions, the metal combines with oxygen gas to form an oxide or hydroxide.

The overall equation for the reaction between iron and oxygen in a moist environment can be summarized as

4Fe(s) + 3O2(g) + 2H2O(l) 🡪 2Fe2O3.H2O(s)

**a. i.** What is the oxidation state change of iron in this reaction? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 **ii**. What is the oxidant? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1 + 1 = 2 marks

**b**. Use the equation provided to explain why iron rusts faster when an item is left in the rain.

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1 mark

**c**. Refer to this equation to explain

 **i**. how painting an item can prevent corrosion.

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 **ii.** other methods you can use to limit corrosion.

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1 + 1 = 2 marks

Total 5 marks

**END OF KEY TOPIC TEST**