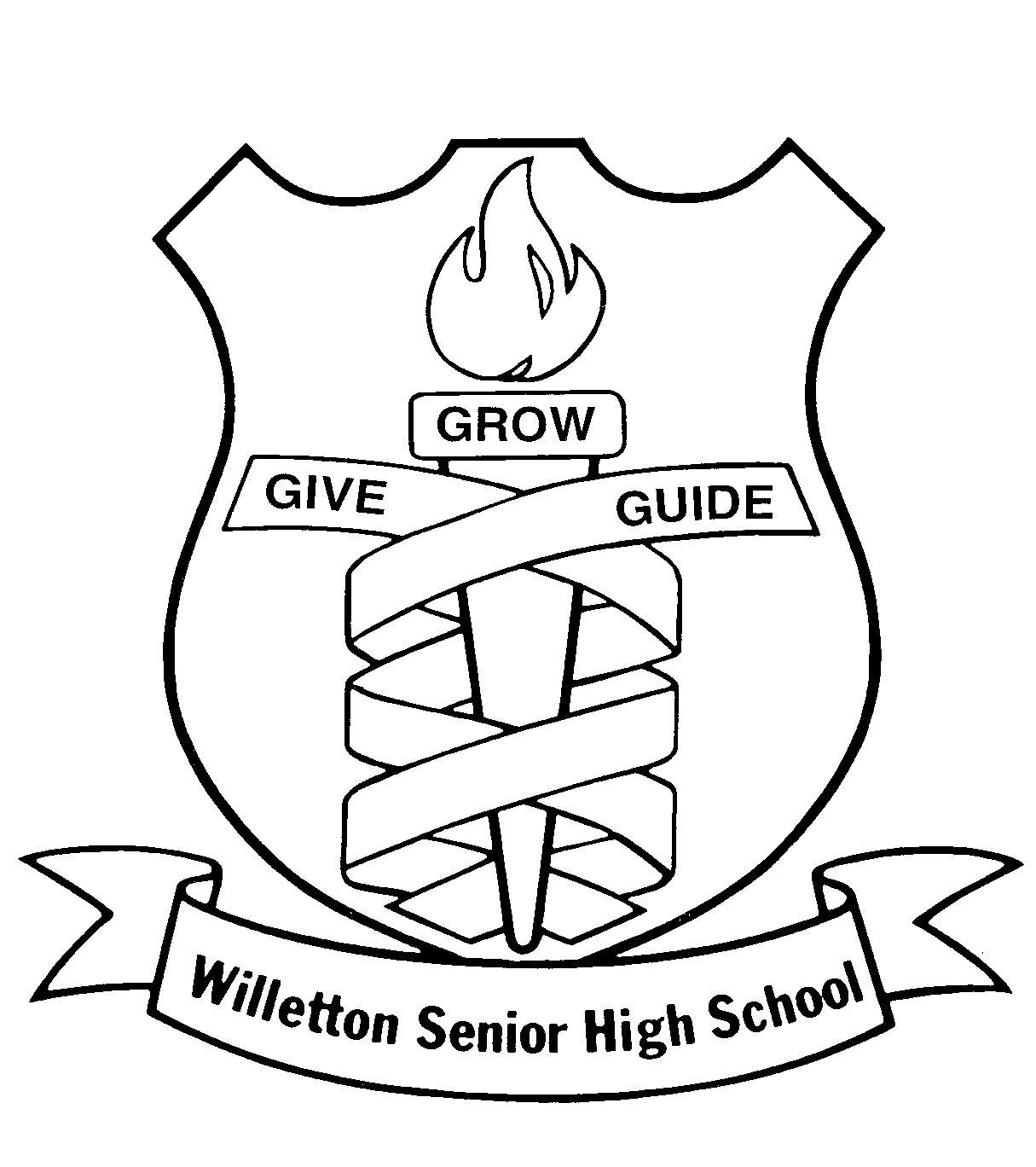
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**YEAR 12 CHEMISTRY ATCHE**

**TEST 3 2021**

**Redox reactions, Electrochemical cells,**

**/30**

**Corrosion**

**Recommended time: 40 minutes**

This test consists of two (2) parts.

**Part 1:** Multiple choice style consisting of TEN (10) questions.

Each question is worth 1 mark.

Write your answers on this booklet.

Attempt ALL Questions.

**Part 2:** Short and/or Extended Answer questions

Write all answers in the spaces provided.

The marks allocated are shown next to each question.

Total: 20 marks.

Answer Booklet

**Marking Key**

### MULTIPLE CHOICE ANSWER SHEET

|  |  |
| --- | --- |
| **1** | a □ b □ c □ d □ |
| **2** | a □ b □ c □ d □ |
| **3** | a □ b □ c □ d □ |
| **4** | a □ b □ c □ d □ |
| **5** | a □ b □ c □ d □ |
| **6** | a □ b □ c □ d □ |
| **7** | a □ b □ c □ d □ |
| **8** | a □ b □ c □ d □ |
| **9** | a □ b □ c □ d □ |
| **10** | a □ b □ c □ d □ |

|  |  |  |  |
| --- | --- | --- | --- |
|  | Multi Choice | Written Response | Total |
| Score | /10 | /20 | /30 |

**Written Response Questions: 20 Marks**

**1.**The **unbalanced** equation for the reaction between KMnO4 and ClO2–  ion in acidic solution is

MnO4– + ClO2–  + H+ 🡒 MnO2 + ClO4– + H2O

a.Given this information construct the relevant ionic half equations and then combine these to produce the overall ionic redox equation. (**States are not required)** (3 marks)

|  |  |
| --- | --- |
| Oxidation  Half-equation |  |
| Reduction  Half-equation |  |
| *Working Space* |  |
| Overall redox equation |  |

b. Write one observation when the above reaction occurs. (1 mark)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. (8 marks)

(a) Define a primary cell. (1 mark)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| A cell that cannot be recharged | 1 |
| **Total** | **1** |

(b) In the boxes on the diagram above, label the anode and cathode, polarity of each electrode, and direction of electron flow. (3 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Cathode and anode labels | 1 |
| Polarity (+/-) labels | 1 |
| Direction of electron flow label | 1 |
| **Total** | **3** |
| Example of a three mark response:  cathode  (+)  anode  (-) |  |

(c) The Leclanché cell provides an EMF of +1.4 V. If this EMF was produced under standard conditions, complete the table above by adding in the E0 values. (2 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| E0(red) = + 0.64 V | 1 |
| E0(ox) = + 0.76 V | 1 |
| **Total** | **2** |

(d) Which component on the diagram above is acting as the ‘salt bridge’? Describe the functions of this component. (3 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Porous pot | 1 |
| Any **two** of the following: |  |
| * allows ions to flow between half-cells * complete the electrical circuit * prevents reactants from coming into contact * maintains electrical neutrality | 2 |
| **Total** | **3** |

1. (8 marks)

a) On the diagram above, label the

* direction of electron flow through the power source, and
* direction of cation flow. (2 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Direction of electron flow label | 1 |
| Direction of cation flow label | 1 |
| **Total** | **2** |
| Example of a two mark response:  electrons  cations |  |

(b) Write balanced half-equations representing the processes occurring at the cathode and the anode. (2 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| cathode: Pb2+(aq) + 2 e- → Pb(s) | 1 |
| anode: Pb(s) → Pb2+(aq) + 2 e- | 1 |
| **Total** | **2** |

(c) Use the Standard Reduction Potential table to calculate the overall EMF for this process.

|  |  |
| --- | --- |
| **Description** | **Marks** |
| 0 volts | 1 |
| **Total** | **1** |

(d) In this industrial process, the voltage applied was 0.5 V. State one(1) possible reason as to why this voltage is applied. (1 mark)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| The temperature used in the industrial process is 45 degree of Celcius  Or  An external voltage is required to overcome the circuit resistance  Or  To increase the reaction rate | 1 |
| **Total** | **1** |

(e) If copper metal was one of the impurities in the lead, would this likely be found in the electrolyte or the anode mud, once the electrorefining process was complete? Justify your answer. (2 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Anode mud | 1 |
| Copper has a lower oxidation potential than lead  **or**  Copper is a less reactive metal than lead | 1 |
| **Total** | **2** |
| Note: full marks may be awarded if students predict that copper is present in the electrolyte, and justify this by saying that the voltage of 0.5 V used in the Betts process is greater than the 0.2 V used in the electrolytic refining of copper, therefore the copper has the potential to be oxidised. | |

**End of Written Response Questions**