

UNIT 5B: CHEMICAL REACTIONS II - REDOX REACTIONS

WASHINGTON LATIN PUBLIC CHARTER SCHOOL

HONORS CHEMISTRY 2019-20

UNIT 5B TEST - CHEMICAL REACTIONS II: REDOX REACTIONS

Answer all questions

Recommended time = 30 minutes

You must have a Periodic Table and a copy of the reactivity series.

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| Name: | |
| Score (open response) | /20 |
| Score (multiple choice) | /5 |
| Bonus (Submits quiz on time and in correct format) | /25 |
| Total: | /50 |

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SECTION 1 - OPEN RESPONSE

Fill in all green cells

| | | |
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| 1. | <p>The elements in Group 2 are known as the “alkali earth metals”. Calcium and magnesium are very abundant but the others are not.</p> <p>Nina dropped a small piece of calcium metal into a beaker of cold water. She then dropped a small piece of strontium into another beaker of cold water.</p> | |
| (a) | Explain what she would observe when she dropped the calcium into the water. | 2 |
| | You watched this (Lab 5.6) – what happens to the Ca? Is a gas produced? | |
| (b) | Write an equation for the reaction. | 2 |
| | Look it up – it’s a type of displacement reaction; an example for Na is in the course notes | |
| (c) | Identify the atom oxidized and the atom reduced in this reaction, and hence explain why this reaction takes place. | 2 |
| | More reactive atom = oxidized (increases ON) Less reactive atom = reduced (decreases ON) | |
| (d) | State and explain how Nina’s observations would be different when she added the strontium to the water. | 3 |
| | Compare the position of Sr and Ca in the Periodic Table How does reactivity change down a group? Why? | |
| | TOTAL | 9 |

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| 2. | <p>Cobalt lies between iron and tin in the reactivity series. It forms mainly Co^{2+} ions which are pink in color. Zinc forms mainly Zn^{2+} ions which are colorless.</p> <p>Micah set up a galvanic cell. On one side she immersed a cobalt electrode into a solution of cobalt (II) sulfate. On the other side she immersed a zinc electrode into a solution of zinc (II) sulfate. She connects the electrodes with a wire and a light bulb. She connects the solutions with a salt bridge. When she does this the light comes on, but after a while she notices that the light gradually becomes dimmer.</p> | | |
| | (a) | Write an equation for the overall cell reaction taking place (you can either include or omit the spectator ions - it is up to you) | |
| | | Atom of more reactive metal is oxidised Ion of less reactive metal is reduced | 1 |
| | (b) | Identify the positive electrode and the negative electrode. | |
| | | positive electrode: Reduction electrode | |
| | | negative electrode: Oxidation electrode | 1 |
| | (c) | Explain why the bulb lights up. | |
| | | What is electricity? What is causing it here? | 1 |
| | (d) | Identify an ion which might move through the salt bridge, state the direction in which it will move. Explain your answer. | |
| | | Cations gradually build up in the anode compartment. What needs to move, and where, to balance this out? | 2 |
| | (e) | As the light starts to dim, Micah notices that the electrodes and solutions look a bit different to how they originally did. | |
| | (i) | State one change she would observe in the appearance of the electrodes. Explain your answer. | |
| | | Cations move off the anode and on to the cathode – so what will you see? | |
| | (ii) | State one change she would observe in the appearance of the solutions. Explain your answer. | |
| | | Which solution has color? What will happen to this color? | 2 |
| | TOTAL | | 7 |

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| 3. | Will decided to electrolyse an aqueous solution of copper sulfate. | | |
| | (a) | Write the half-equation for the reaction occurring at the cathode of the cell. | |
| | | What's reduced? Cu^{2+} or H^+ ? | |
| | (b) | Write the half-equation for the reaction occurring at the anode of the cell. | |
| | | What's oxidised? OH^- or SO_4^{2-} ? | |
| | (c) | Hence write an overall equation for the electrolysis of aqueous copper sulfate. | |
| | | Add up (a) and (b) | |
| TOTAL | | | 3 |

SECTION 2 - MULTIPLE CHOICE

**Do not answer these questions on this sheet
Make a note of your answers and enter them in the answer sheet.**

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| 4. | Which of the following will not happen when a piece of copper metal is dropped into a solution of silver nitrate? $\text{Cu} + 2\text{AgNO}_3 \rightarrow \text{Cu}(\text{NO}_3)_2 + 2\text{Ag}$ | |
| A | The solution will gradually turn blue. | |
| B | A grey solid will appear. | |
| C | The silver will be oxidized. | |
| D | The copper will gradually dissolve. | |
| E | The concentration of silver ions in the solution will decrease. | |
| 1 | | |

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| 5. | Which of the following is true of electrolytic cells but not true of galvanic cells? <i>Look at the final page of the course notes</i> | |
| A | Oxidation takes place at the anode. | |
| B | Reduction takes place at the cathode. | |
| C | The anode is the negative electrode. | |
| D | Electrical energy is converted into chemical energy. | |
| E | Chemical energy is converted into electrical energy. | |
| 1 | | |

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| 6. | Which of the following statements about lithium-ion batteries is untrue? <i>Look at equations in course notes</i> | |
| A | They are low-density, compact and easily portable. | |
| B | MnO_2 is the oxidising agent when the battery is operating. <i>(or CoO_2)</i> | |
| C | The lithium is the positive electrode <i>(is it being reduced?)</i> | |
| D | When the battery is charging, lithium ions are reduced. <i>(reverse the reaction)</i> | |
| E | They are used in almost all cellphones. | |
| 1 | | |

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| 7. | Which of the following statements about the electrolysis of molten aluminium oxide is untrue? <i>Metal \rightarrow cathode; non-metal \rightarrow anode; you must melt the ionic compound first It's cheaper to use carbon – would this work for Al_2O_3?</i> | |
| A | Aluminium will form at the cathode. | |
| B | The process uses a lot of energy. | |
| C | Oxygen will form at the anode. | |
| D | The cathode lasts a long time but the anodes need to be regularly replaced. <i>($\text{C} + \text{O}_2 \rightarrow \text{CO}_2$)</i> | |
| E | There are cheaper ways to make aluminium. | |
| 1 | | |

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| 8. | Which of the following aqueous solutions, when electrolysed, will not produce both hydrogen at the cathode and oxygen at the anode? | |
| A | potassium carbonate (K^+ , H^+ , OH^- , CO_3^{2-}) | |
| B | sodium hydroxide (Na^+ , H^+ , OH^-) | |
| C | zinc bromide (Zn^{2+} , H^+ , OH^- , Br^-) | |
| D | magnesium sulfate (Mg^{2+} , H^+ , OH^- , SO_4^{2-}) | |
| E | sulfuric acid (H^+ , OH^- , SO_4^{2-}) | |
| | | 1 |

End of Test - [click here to go straight to the answer sheet and exit ticket](#)