Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Redox Chemistry** **Personal Learning Plan**

**What I should already know:**

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| No. | **Outcome** | | **Success Criteria** | ☹ | 😐 | ☺ |
| 1 | I can state what is meant by a displacement (single replacement) reaction. | | In a displacement reaction, a metal will displace a less reactive metal from a solution of its ions. |  |  |  |
| 2 | I can use a displacement reaction to determine an order of reactivity for metals. | | If metal A is added to a solution of metal B and a displacement reaction occurs, metal A must be more reactive than metal B.  If metal B was then added to a solution of metal A, no displacement reaction would occur as metal B is less reactive than metal A. |  |  |  |
| 3 | I can explain the meaning of the terms oxidation and reduction, in terms of electrons. | | Oxidation is a loss of electrons.  Reduction is a gain of electrons.  Memory aid: OIL RIG |  |  |  |
| 4 | I can state the organic chemistry definition of a redox reaction | | Oxidation is an increase in the oxygen:hydrogen ratio. This can be achieved by either adding oxygen and/or removing hydrogen from the molecule.  Reduction is a decrease in the oxygen:hydrogen ratio. This can be achieved by either removing oxygen and/or adding hydrogen from the molecule. |  |  |  |
| 4 | I can explain the electrical conductivity of ionic compounds | | Electricity is a flow of charge. Therefore, you need 2 things for this: charge (either ions or electrons) and they must be able free to move. Ionic compounds have ions but when solid these charges can't move so they can't conduct. However, when ionic compounds melt or are dissolved the ions can move and therefore can conduct. Substances that don't conduct when solid but do when molten or dissolved in water are called **electrolytes.** |  |  |  |
| 5 | I can determine the oxidation state/number for a substance. | | Rules for working out oxidation number (state).  Elements on their own are always **zero.** Thus, the atoms in O2, O3, P4, S8, and aluminum metal all have an oxidation number of 0.   * The oxidation number of a single ion is the same as its charge. E.g. Na+ = +1, O2- = -2 etc * Therefore: Group 1 elements have oxidation states of +1, Group 7 have oxidation states of -1 * The other elements may vary but mostly follow their ions, so group 3 would be +3, group 6, -2. * The sum of the oxidation states in a compound must equal zero (since the compound is neutral). * The sum of the oxidation states in a polyatomic ion must equal the charge on the ion. * Elements toward the bottom left corner of the periodic table are more likely to have positive oxidation numbers than those toward the upper right corner of the table. Sulfur has a positive oxidation number in SO2, for example, because it is below oxygen in the periodic table. SO2: (+4) + 2(-2) = 0   **Some exceptions**  The oxidation number of **hydrogen** is +1 when it is combined with a *nonmetal* as in CH4, NH3, H2O, and HCl, but -1 when when it is combined with a *metal* as in. LiH, NaH, CaH2, and LiAlH4.  **Oxygen** usually has an oxidation number of -2. Exception is in hydrogen peroxide, H2O2, where it is -1. |  |  |  |
| **Learning Intention**  We are learning about redox reactions | | | | | | |
| No. | **Outcome** | **What you know and understand** | | ☹ | 😐 | ☺ |
| 1 | I can state what an oxidising agent is and know which are the strongest ones |  | |  |  |  |
| 2 | I can state what a reducing agent is and know which are the strongest ones |  | |  |  |  |
| 3 | I can state what reduction and oxidation are in terms of oxidation numbers |  | |  |  |  |
| 4 | I can balance 2 ion-electron half equations | e.g. Fe 🡪 Fe3+ + 3e-  I2 + 2e- 🡪 2I-­ | |  |  |  |
| 5 | I can use the data book to work out which pair of chemicals will react | e.g. Copper (I) Chloride and Iron (III) Nitrate | |  |  |  |
| 6 | I can follow the steps to write a balanced reduction/oxidation equation for a complex ion | e.g. SO32- 🡪SO42- | |  |  |  |
| 7 | I can write a balanced redox equation for a pair of chemicals reacting | e.g. Potassium Permanganate and Sodium Sulphite | |  |  |  |
| 8 | I can do calculations involving redox titrations (including the Winkler method). | e.g. A 250 cm3 solution of vitamin C was prepared. 25cm3 of this solution was titrated against 0.031mol/L iodine solution. The average titre was 17.6cm3. Calculate the mass of vitamin C (C6H8O6) in the original tablet.  C6H8O6  +I2 🡪 C6H6O6 + 2H+ + 2I- | |  |  |  |

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| **Learning Intention**  We are learning about electrochemistry | | | | | |
| No. | **Outcome** | **What you know and understand** | ☹ | 😐 | ☺ |
|  | I can draw a circuit diagram for a voltaic cell and explain what happens at each part. |  |  |  |  |
|  | I can state what electrodes oxidation and reduction occur at in a voltaic cell |  |  |  |  |
|  | I can predict the direction of electron flow in an voltaic cell |  |  |  |  |
|  | I know how the voltage can be changed in a voltaic cell |  |  |  |  |
|  | I can interpret cell notation for a voltaic cell |  |  |  |  |
|  | I can draw a circuit diagram for an electrolytic cell and explain what happens at each part |  |  |  |  |
|  | I can state what electrodes oxidation and reduction occur at in an electrolytic cell |  |  |  |  |
|  | I can predict the products of the electrolysis of a molten salt including the ion-electron equations. | e.g. Al2O3 |  |  |  |

Key words and phrases

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| **Key Word or Phrase** | **Meaning** |
| Redox |  |
| Ion-electron equation |  |
| Reducing agent |  |
| Oxidizing agent |  |
| Biological oxygen demand (BOD)/Winkler method |  |
| Voltaic cell |  |
| Electrolytic cell |  |
| Electrolysis |  |

**Redox IB Past Paper Questions**

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