Oxidation Numbers

1. Consider the following reaction.

4Zn(s) + 10H+(aq) + NO3-(aq) 🡪 NH4+(aq) + 4Zn2+(aq) + 3H2O(l)

Nitrogen undergoes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and its oxidation number \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ by \_\_\_\_\_\_\_\_\_\_\_

|  |  |  |  |
| --- | --- | --- | --- |
| a | Oxidation | Increases | 8 |
| b | Reduction | Decreases | 8 |
| c | Oxidation | Decreases | 5 |
| d | reduction | Increases | 5 |

1. Harold and George consider four chemicals that contain **chlorine**.

|  |  |
| --- | --- |
| **I** | **NaClO3** |
| **II** | **NaClO4** |
| **III** | **Cl2** |
| **IV** | **NaClO** |

They put the chemicals in order from the lowest oxidation number for chlorine to the highest oxidation number for chorine. The correct order is \_\_\_, \_\_\_, \_\_\_, and \_\_\_

|  |  |
| --- | --- |
| a | II, I, IV, III |
| b | III, IV, II, I |
| c | III, IV, I, II |
| d | I, II, IV, III |

1. Mary and Sylvia assign oxidation numbers to the following compounds.

|  |  |  |  |
| --- | --- | --- | --- |
| **NaHSO3** | **Na2SO4** | **NaHS** | **Na2S2O3** |

They find that the oxidation number of sulfur in the compounds in the order given will be \_\_\_, \_\_\_\_, \_\_\_, and \_\_\_\_.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| a | +5 | +4 | -2 | +2 |
| b | -4 | -4 | +2 | +3 |
| c | +4 | -6 | +2 | -2 |
| d | +4 | +6 | -2 | +2 |

1. Aaron and Gerald are asked to balance the following reaction in an **acidic solution** using the smallest whole number coefficients possible.

ClO3-(aq) + Cl2(g) 🡪 ClO-(aq)

The coefficient for the number of H+(aq) used in the reaction will be \_\_\_\_ and this value will be found on the \_\_\_\_\_\_\_\_\_\_\_ side of the reaction.

|  |  |  |
| --- | --- | --- |
| a | 2 | Reactant |
| b | 4 | Product |
| c | 2 | Product |
| d | 4 | Reactant |

1. Consider the balanced reaction given below.

Au(s) + 3 HNO3(aq) + 4HCl(aq) 🡪 HAuCl4(aq) + 3 H­2O(l) + 3 NO2(g)

In this reaction, nitrogen undergoes \_\_\_\_\_\_\_\_\_\_\_\_ when its oxidation number changes from \_\_\_\_ to \_\_\_\_\_

|  |  |  |  |
| --- | --- | --- | --- |
| a | Oxidation | +5 | +4 |
| b | Reduction | +5 | +4 |
| c | Oxidation | +4 | +5 |
| d | reduction | +4 | +5 |

1. In the processing of acid rain, sulfates are converted to sulfites as indicated by the **incomplete and unbalanced half reaction** **H2SO4(aq) 🡪 H2SO3(aq)**

In this half reaction the oxidation number of sulfur \_\_\_\_\_\_ and \_\_\_\_\_ occurs.

|  |  |  |
| --- | --- | --- |
| a | Decreases | Reduction |
| b | Increases | Oxidation |
| c | Decreases | Oxidation |
| d | Increases | Reduction |

1. Wes and Krysten consider how dichromate ions convert to chromium (III) ions as shown below

Cr2O72-(aq) 🡪 Cr3+aq)

In this half reaction, the oxidation number of chromium \_\_\_ and \_\_\_\_\_ occurs.

|  |  |  |
| --- | --- | --- |
| a | Increases | Oxidation |
| b | Decreases | Reduction |
| c | Decreases | Oxidation |
| d | Increases | Reduction |

1. Marion considers the unbalanced oxidation reduction reaction given below.

NO­2­-(aq) 🡪 NO(g) + NO2(g)

She recognizes that this is a disproportionation equation. In the oxidation half reaction, the nitrogen atom changes its oxidation number from \_\_\_\_ to \_\_\_\_, while in the reduction half reaction; the nitrogen atom changes its oxidation number from \_\_\_to \_\_\_

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| a | 3 | 2 | 3 | 4 |
| b | 3 | 4 | 3 | 2 |
| c | 4 | 3 | 2 | 3 |
| d | 3 | 2 | 5 | 4 |

1. Jaycee and Samantha both study Chemistry 30 and Biology 30 so they are experts on cellular respiration.

They know that in a cellular respiration reaction, \_\_\_\_\_ is the oxidizing agent and \_\_\_\_ is the reducing agent.

They recognize that in calculating the enthalpy of a cellular respiration reaction, that water must be in the \_\_\_\_\_ state.

|  |  |  |  |
| --- | --- | --- | --- |
| a | Carbon | Oxygen | Liquid |
| b | Oxygen | Carbon | Liquid |
| c | Carbon | Oxygen | Gaseous |
| d | Oxygen | Carbon | Gaseous |

1. **Numerical response question:** Left justify your answer in the boxes provided.

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

|  |
| --- |
| Each chemical reagent in the reaction below is assigned a number  2Br2(l) + Sn(s) 🡪 SnBr4(aq)  1 2 3  Using the assigned numbers, complete the boxes as indicated  1st box: oxidizing agent  2nd box: reducing agent  3rd box: oxidation number of bromine  4th box: oxidation number of tin ion |

1. **Numerical response question:** Left justify your answer in the boxes provided.

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

|  |
| --- |
| For the following compound, determine the oxidation number for carbon.  Place your answer(s) in the box that is indicated.    CS2(s) CH4(g) CO2(g) C2H6(g)  Box 1 Box 2 Box 3 Box 4  (you do not need to record if the oxidation numbers are positive or negative) |

Solutions

1. B
2. C
3. d
4. b
5. b
6. a
7. b
8. b
9. b
10. 1204
11. 4443