**Name: Block:**

**Group Members: Date: / / 2018**

**Due Date: Drop Date:**

The report is submitted in full, **on the due date**. If you are absent on the day, the report is expected to be submitted electronically. Late reports are penalized, and will *not accepted past the drop date*.

**Objective**

1. To predict the acidity/basicity of a salt solution and then test predictions by pH determination.

2. To effectively use a universal indicator & an electronic pH meter

|  |  |  |
| --- | --- | --- |
| **Criteria** | **Student Self Evaluation** | **Teacher Assessment** |
| **Flow Chart:** a flow chart diagram of the procedure completed individually by each group member ***before the lab****! (for part 2 of the lab only)***Pre-Lab Questions:** displays a critical understanding of the background theory. | **/4** | **/4** |
| **Data, Results:** *(word processed)*Provides results & detailed observations (and diagrams where appropriate) that are presented in **correctly labelled** tables with **descriptive, numbered titles**.  | **/20** | **/20** |
| **Questions & Calculations:** *(may be hand written* ***IF neat****, or typed up…all working out for calculations must be shown)*Correctly identifies and explains the theory relating to the experiment and supports this with accurate observations & data. | **/30** | **/30** |
| **Presentation:**Practical report is presented in the **correct format**, is written fluently and provides **appropriate section headings** and accurate referencing. ***Tables & graphs*** have numbered headings. Data & calculations may be hand written, however the remainder of the report is to be **word-processed.** | **/2** | **/2** |
| **Conclusion:** *(word processed)*Identifies and defines important concepts and principles relevant to the experiment by relating back to the objective and hypothesis. Be sure to address the points listed in the lab handout when answering the conclusion. | **/3** | **/3** |
| **Practical:**Demonstrates an organized and safe approach to experimental work during the lab. Shows maturity, cooperation and leadership during laboratory work. | **/5** | **/5** |
| **Results Summary** | **/64** | **/64** |

*We will be doing the lab on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. In order to be ready to go, you need to complete the following sections of your lab report BEFORE arrive to class that day:*

* *Flow Chart*
* *Pre-Lab Questions (on day of lab, will be marked for completion only. When handing in full lab report, you may wish to make corrections as these will be marked)*

Materials

Various salt solutions

Universal indicator

Litmus paper

pH meter

ceramic/plastic spot plate

safety goggles

Pre-Lab Questions: *(to be completed on a separate page)*

1. For each solution, **write the dissociation equation of the salt, and any hydrolysis** reactions. For salts which hydrolyze both acidically and basically, or any ion that is amphiprotic, compare Ka and Kb values.
2. **Predict & justify** if each solution should produce an *acidic, basic, or neutral solution* and *record this in your data table* on the following page.

Procedure

1. For each solution, fill a section in the spot plate with approximately 1-2 drops of salt solution. *(You should create a map of your spot plate, as not to mix up solutions)*
2. Cut a piece of Universal Indicator *paper* into several small pieces. Using tweezers, place paper into salt solution and *record colour change in your data table*.
3. **Repeat step 2** using **both** Litmus Blue and Litmus Red. *Indicate whether the result suggests the solution is and ‘acid’ or a ‘base’ in your data table.*
4. Add **one or two drops of universal indicator** to initiate colour change. *Record results in your data table.*
5. Collect pieces of indicator paper and put in **garbage.** Pour solutions down the sink with plenty of water. Clean all equipment used and return to trolley.

Follow-up Questions *(to be completed on a separate page)*

1. Full working out for Pre-lab questions assessed here *(ie: hydrolysis chemical equations & any calculations)*
2. Are there any solutions where the prediction does not match the outcome? If so, what could be the reason?

Conclusion:

* Briefly summarize experiment
* State overall results of the experiment by addressing the objective(s)
* Discuss any sources of *experimental error* and suggest improvement for future experimentation

Data and Observations: **Hydrolyzed Solutions**

**Table 1: Single ions**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Solution** | **Prediction****a, b, neutral** | **pH Result** | **✓****or****X** | **Ka** | **Kb** |
| **Universal Paper** | **Litmus Paper** | **Universal Indicator** | **pH meter** |
| NaCH3COO |  |  |  |  | 8 |  |  |  |
| NaCl |  |  |  |  | 6 |  |  |  |
| NH4Cl |  |  |  |  | 5.5 |  |  |  |
| AlCl3 |  |  |  |  | 4 |  |  |  |
| Ca(NO3)2 |  |  |  |  | 6 |  |  |  |
| Na2CO3 |  |  |  |  | ≥10 |  |  |  |
| Na3PO4 |  |  |  |  | ≥10 |  |  |  |
| K2SO4 |  |  |  |  | 7 |  |  |  |
| KBr |  |  |  |  | 6 |  |  |  |
| **Table 2: 2 ions** |  |  |  |  |  |  |  |
| **Solution** | **Prediction****a, b, neutral** | **pH Result** | **✓****or****X** | **Ka** | **Kb** |
| **Universal Paper** | **Litmus Paper** | **Universal Indicator** | **pH meter** |
| (NH4)2SO4 |  |  |  |  | 5.5 |  |  |  |
| (NH4)2C2O4 |  |  |  |  | 6.5 |  |  |  |
| NH4CH3COO |  |  |  |  | 6.5 |  |  |  |
| (NH4)2CO3 |  |  |  |  | 8.5 |  |  |  |
| Fe2(SO4)3 |  |  |  |  | ≤4 |  |  |  |
| **Table 3: 2 Ions** |  |  |  |  |  |  |  |
| **Solution** | **Prediction****a, b, neutral** | **pH Result** | **✓****or****X** | **Ka** | **Kb** |
| **Universal Paper** | **Litmus Paper** | **Universal Indicator** | **pH meter** |
| Na2HPO4 |  |  |  |  | 9 |  |  |  |
| KH2PO4 |  |  |  |  | 4 |  |  |  |
| NaHCO3 |  |  |  |  | 9 |  |  |  |
| KHSO4 |  |  |  |  | <4 |  |  |  |
| NaHSO3 |  |  |  |  | 5.5 |  |  |  |