**Lab Investigation – Quantitative Paramagnetism**

**Instructions**

1. Write a prediction as a Hypothesis (in the form of an If … then … statement) and provide your reasoning based on your knowledge of electron configurations.
2. Read about the experimental design below and the evidence as provided in the Observations table to answer the following Analysis Questions:
3. What is the significance of a zero mass reading for some substances and negative mass reading for other substances?
4. How does this change in mass relate to the paramagnetic strength of the substance?

Note: In order to make a valid comparison, you need to know the change in mass per mole of the substance (using a controlled mass of 3.00g) since each substance has a different molar mass.

1. Create a table with the headings *ionic compound, molar mass* and *moles*. Then create another table with the headings *metal ion, electron configuration, number of unpaired electrons* and *mass decrease per mole*. (Shown Below)
2. Plot a graph of the number of unpaired electrons (x-axis) and mass decrease per mole (y-axis). Draw a line of best-fit.
3. Write a Conclusion based on the Purpose of the experiment to evaluate your Hypothesis.

**Observations**

Data Table 1 Reductions in scale reading compared to unpaired electrons in metal ion

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Sample compound | Metal  ion | Electron configuration in the d sublevel | # of unpaired electrons in metal ion | Molar mass (g/mol) | Moles of compound  (mol) | mass reading  (g) | mass per mole (g/mol) |
| CaSO4.2H2O |  |  |  |  |  | 0.00 |  |
| MnSO4.H2O |  |  |  |  |  | -1.26 |  |
| FeSO4.7H2O |  |  |  |  |  | -0.51 |  |
| NiSO4.7H2O |  |  |  |  |  | -0.22 |  |
| CuSO4.5H2O |  |  |  |  |  | -0.09 |  |
| FeCl3.6H2O |  |  |  |  |  | -0.95 |  |
| CoCl2.6H2O |  |  |  |  |  | -0.47 |  |

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***Laboratory Report Evaluation Guidelines***

**Purpose 0 1**

*To determine …*

**Hypothesis 0 1 2**

*If … then … statement*

**Discussion**

*Answers to the Analysis Questions*

1. *Significance of mass readings* **0 1 2**
2. *Relationship between change in mass and*

*Paramagnetism* **0 1 2**

1. *Tables of calculated results* **0 1 2 3 4**
2. *Graphical representation* **0 1 2 3**

**Conclusion 0 1**

*It was determined that …*

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