Catalysis of the Zinc-Acid Reaction

**Equipment List**

1. 250cm3 conical flask
2. Bung fitted to a glass tube
3. Burette

**Chemical List**

1. 0.20 mol dm-3 Copper Sulfate (aq)
2. 1.0 mol dm-3 Sulfuric Acid(aq)
3. Granulated Zinc(s)
4. Mixture of different catalysts

**Method**

**Setting Up**

1. Fill the Burette with distilled water.
2. Fit the bung (fitted with glass tube) into the conical flask
3. Fit the inverted Burette to the end of the glass tube.

**Carrying out the Experiment**

1. Remove the bung from the conical flask and pour 30 cm3 of distilled water and 10 cm3 of sulfuric acid into the conical flask
2. Weigh out 1.0 g of granulated zinc
3. Add the measured 1.0 g of granulated zinc to the conical flask
4. Place the bung back into the conical flask
5. Record the volume of hydrogen produced in cm3 every 30 seconds for 5 minutes from the burette markings to 1 decimal place.
6. Repeat the experiment but use 30cm3 of copper sulfate instead of distilled water

**Interpreting the Data**

1. Plot a graph of the volume of hydrogen against time
2. From the graph draw a tangent to the line at the initial point
3. Calculate the gradient of the tangent by using the equation
4. The gradient is equal to the rate of reaction

**Results Table**

|  |  |
| --- | --- |
| **Time (Seconds)** | **Volume of Hydrogen Produced (cm3)** |
| 30 |  |
| 60 |  |
| 90 |  |
| 120 |  |
| 150 |  |
| 180 |  |
| 210 |  |
| 240 |  |
| 270 |  |
| 300 |  |

**Topics To Cover**

* Define rate of reaction
* Describe and explain catalysts
* Describe and explain factors that affect the rate in terms of collision theory
* Enthalpy level diagrams
* Compare methods of finding rate of reactions (progress graphs)
* Explain how the rate of reaction is determined by the experiment
* Describe rate equations
* Describe “Orders” of reactions
* Transition metal catalysts
* D-orbital properties
* Complexes and their properties

**References**

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**Extension Ideas**

* Measure the Ea (activation energy) with and without catalyst and compare them.
* Order of the reaction in terms of catalyst/H+
* Do different acids produce different results
* Find other transition metal ion catalysts
* Are the anions involved (SO42-)
* Does solid copper work, and is surface area a factor