|  |
| --- |
| **Science (S1–3)**  **Updated Curriculum (2017)** |

**Unit 9 Common Acids and Alkalis**

**Glass Etching and Corrosion of Metals by Acid**

**(Student’s version)**

**Ms Tsui Tsui Ping Edith**

**Seconded Teacher**

**Science Education Section, Curriculum Development Institute, Education Bureau**

|  |
| --- |
| **Unit 9 Common Acids and Alkalis**  Topic: Corrosive Nature of Acids  Estimated lesson time: 80 mins |

**Glass Etching and Metal Corrosion by Acid**

|  |
| --- |
| **[ Learning Objectives]**  After the learning activity, students should be able to   1. recognise that acids corrode glass and metals; 2. perform a practical work of glass etching to create their own art piece; 3. conduct experiment to compare the extent of corrosion in metals by dilute hydrochloric acid; and 4. be aware of safety precautions to be taken when using acid in everyday life. |

1. **Glass etching**

**A. Materials (per group)**

● pH paper with its colour chart ● etching solution for glass

● a piece of glass (e.g. microscopic slide) ● a piece of adhesive vinyl sheet

● a water-colour paintbrush ● cutter knife

**B. Safety Precaution**

Write down the two precautions to be taken when doing the etching experiment by considering the following hazard warning symbols.

|  |  |  |
| --- | --- | --- |
| 1 | Image result for wear safety glasses |  |
| 2 | International Symbols Labels - Wear Hand Protection |  |

**C. Procedure**

1. Wear safety goggles and protective gloves.
2. Test for the pH of the etching solution by using a piece of pH paper. Record the pH value.
3. Observe a piece of glass and describe the appearance of the glass. Write down the observations in the table in part D2 below.
4. Draw a pattern on the paper side of a piece of adhesive vinyl sheet. Cut the pattern out by a cutter knife.
5. Peel the paper of the adhesive vinyl sheet off and stick the pattern onto a piece of glass.
6. Press the adhesive vinyl pattern onto the glass really well, making sure the edges of pattern are stuck properly to the glass that etching solution does not seep under the edges.
7. Brush a layer of etching solution onto the area of the piece of glass which is not covered by the adhesive vinyl sheet using a water-colour paintbrush . Leave it for *5* minutes.
8. Rinse the piece of glass under water in the sink to remove the etching solution.
9. Peel the adhesive vinyl sheet off the piece of glass and dry it. Take off the safety goggles and protective gloves.
10. Observe the appearance of the piece of glass again and write down the observations in the table in part D2 below.

**D. Observation**

1. The pH value of etching solution is .

2. Complete the table.

|  |  |  |
| --- | --- | --- |
|  | **Before etching** | **After Etching** |
| Is the glass transparent? |  |  |
| Is the surface of the glass smooth or rough? |  |  |

**E. Discussion**

1. Suggest a hazard warning label for a bottle of etching solution.

|  |
| --- |
|  |

2. Suggest another daily-life application of acid corrosion.

|  |
| --- |
|  |

**F. Conclusion**

The piece of glass turned and by the corrosive action of an \_\_\_\_\_\_\_\_\_\_\_\_.

**II. Corrosion of metals by acid**

**A. Materials**

● 10 mL dilute hydrochloric acid ● 50 mL beaker × 1

● electronic balance × 1 ● watch glass × 1

● filter paper × 1 ● scissors × 1 pair

● stop watch × 1 ● 100 mL beaker × 1

● forceps × 1 pair ● oven × 1

● Metal: 0.5 g aluminium / magnesium / iron / copper / zinc (one type each group)

**B. Safety Precaution**

1. Wear safety goggles and protective gloves.
2. Be aware of the sharp edge of metal to avoid being cut.

**C. Procedure**

1. Measure 10 mL dilute hydrochloric acid and pour it into a 50 mL beaker.
2. Weigh 0.50 g of the given metal using an electronic balance with a watch glass. Remember to take the metal by a pair of forceps.
3. Observe the shape of metal and record it in the table in part D2.
4. Add the pieces of metal into the beaker with dilute hydrochloric acid and start the stopwatch at once. Observe what happened to the metal.
5. Add about 50mL water into a 100 mL beaker.
6. After the pieces of metal have been immersed in the dilute hydrochloric acid for five minutes, take out the metal using forceps and wash them with the water in the 100 mL beaker.
7. Dry the metal by filter paper and then place the metal in an oven set at 100 oC for 5 minutes.
8. Weigh the mass of the metal and record it in the table in part D2.
9. Share the data with other groups in the same team. Record the data in the table in part D2.

**D. Result**

1. Write down the observable changes when adding the pieces of metal into diluted hydrochloric acid.

|  |
| --- |
|  |
|  |

2. Complete the following table.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Metal** | **Shape of metal**  **(e.g. Foil, Granule, Strip, Wire, )** | **Initial mass ( )** | **Final mass( )** | **Mass loss ( )** | **Extent of corrosion (percentage change in mass)** |
| Copper |  |  |  |  |  |
| Iron |  |  |  |  |  |
| Magnesium |  |  |  |  |  |
| Zinc |  |  |  |  |  |
| Aluminum |  |  |  |  |  |

**E. Discussion**

1. Is the experiment a fair test? Suggest way(s) to make it more fair.

|  |
| --- |
|  |

1. State possible error(s) in the experiment.

|  |
| --- |
|  |
|  |

**F. Conclusion**

The extent of corrosion of different metals by acid in ascending order is:

|  |
| --- |
|  |

**End**