CHAPTER 1: SCIENTIFIC INQUIRY 3

Developing a simple hypothesis and testing it

Scientists start by finding out as much as possible about a problem. Then they make a hypothesis, which is an attempt to explain the problem. They test the hypothesis with an experiment. If the experiment supports the hypothesis, other scientists repeat the experiment to make sure that they get the same results. If they do get the same results, the hypothesis will be accepted as true.

Acids are regarded by Mauritian students as being corrosive substances. Thus, if different acids are tested for their ability to corrode, we may come up to the hypothesis "if we add a metal to an acid, the metal will corrode".

We can take different metals found in the laboratory to test whether they are all corroded by the acids found in the laboratory.

Conducting investigations safely in co-operation with others

A class consisting of 30 students can be divided into smaller groups, each of which will experiment with different acids. Since acids may be dangerous liquids, all students must wear gloves and goggles.

By sharing the work in reasonable chunks, students can all participate in testing the hypothesis "if we add a metal to an acid, the metal will corrode." Dilute (not concentrated) acids will be used in all experiments. Owing to their too high reactivity, metals like potassium and sodium are avoided for safety reasons. Mercury is also avoided because it is toxic.

Recording data using appropriate graphic representations

Tables

A table consists of a list of facts or numbers arranged in a special order, usually in rows and columns.

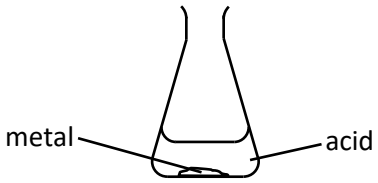
The following table can be used to write down the observations made with different acids and with different metals:

Metal ↓ Acid→	Ethanoic acid	Hydrochloric acid	Nitric acid	Sulfuric acid
Calcium	*corrodes*	*corrodes*	*corrodes*	*corrodes*
Magnesium	*corrodes*	*corrodes*	*corrodes*	*corrodes*
Aluminium	*Doesn't corrode*	*Doesn't corrode*	*Doesn't corrode*	*Doesn't corrode*
Zinc	*corrodes*	*corrodes*	*corrodes*	*corrodes*
Iron	*corrodes*	*corrodes*	*corrodes*	*corrodes*
Lead	*Doesn't corrode*	*Doesn't corrode*	*Doesn't corrode*	*Doesn't corrode*
Copper	*Doesn't corrode*	*Doesn't corrode*	*Doesn't corrode*	*Doesn't corrode*
Silver	*Doesn't corrode*	*Doesn't corrode*	*Doesn't corrode*	*Doesn't corrode*
Gold	*Doesn't corrode*	*Doesn't corrode*	*Doesn't corrode*	*Doesn't corrode*

Diagrams

A diagram is a simple drawing using lines to explain how something works or how to set up an apparatus. In science, we use a pencil and a ruler or other writing material to draw and label a diagram.

We can thus draw the following diagram to show the apparatus that we can use to investigate whether all acids corrode all metals.



Charts

A chart is a graphical representation of data, in which the data is represented by symbols, such as bars in a bar chart or slices in a pie chart. We can represent the names of different metals as “corrodes” or “doesn’t corrode.”

If we can estimate or even determine the degree of corrosion of different metals with different acids, we can represent this data on an appropriate chart.

Graphs

A graph is a planned drawing, consisting of a line or lines showing how two sets of numbers are related to each other.

By plotting a graph, we can view the degree of corrosion of different metals for the different acids.

Handling the results of an investigation

The results of an investigations can be properly handled only if we use measured values and not arbitrary ones. Thus, if we can measure the degree of corrosion of the different metals with different acids, we will get reliable results for our investigation.

Processing the results

By doing our investigation in a certain order, we can process our results scientifically.

Our investigation has shown us that all acids do not corrode all metals. Some metals will not be corroded at all, while others are quickly corroded until nothing remains.

Interpreting the results

By interpreting the results of an investigation, we can explain the meaning of these results.

The results show that, for a specific acid, not all metals are corroded. The results also show that, for a specific metal, not all acids will corrode it.

Evaluating the results

To evaluate is to form an opinion of the amount, value or quantity of something after thinking about it carefully.

At this stage of our investigation, we can now conclude that “all acids do not corrode all metals”

Applying simple mathematics

By using mathematics in science, we can better show how two quantities are related.

To determine a missing quantity in an expression

An expression is a group of signs that represent an idea or quantity. Thus, "$2x + y$" is an expression.

An equation, on the other hand, is a statement showing that two amounts or values are equal. Thus, "$2x + y = 4$" is an equation. If we know the value of x then by substituting in the equation, the value of y can be calculated.

Communicating the steps of an investigation

Written reports

A report is a written or spoken account of an event, especially one that is published or broadcast.

Oral presentations

A presentation is a meeting at which something, especially a new product or idea, or piece of work is shown to a group of people.

Thus, the team leader of every group can give a spoken presentation to the class about their own testing of the hypothesis "if we add a metal to an acid, the metal will corrode."

Using a variety of resources to collect information during an investigation

A resource is something that can be used to help achieve an aim, especially a book, equipment, etc. that provides information for teachers and students.

Print resources

Print resources can be encyclopaedias, books, newspapers, letters or even pictures.

Internet resources

Internet resources can consist of texts, videos, audios or even applications.

Presenting information and the results of an investigation using ICT

For presenting results in the form of tables, diagrams, charts and graphs appropriate software may be generated and shared through printing or via the internet. Computer applications like spreadsheets, word processors, internet browsers, diagramming and vector graphics applications are used for such purpose.

By using Virtual Reality (VR) and Augmented Reality (AR) hardware and software, scientists can now simulate an experiment in three dimensions without putting his life in danger. This also reduces the costs of laboratory equipment and chemicals.