**Aims and Objectives Teaching General Sciences**

The aims of the teaching and study of sciences are to encourage and enable students to:

* develop inquiring minds and curiosity about science and the natural world
* acquire knowledge, conceptual understanding and skills to solve problems and make informed decisions in scientific and other contexts
* develop skills of scientific inquiry to design and carry out scientific investigations and evaluate scientific evidence to draw conclusions
* communicate scientific ideas, arguments and practical experiences accurately in a variety of ways
* think analytically, critically and creatively to solve problems, judge arguments and make decisions in scientific and other contexts
* appreciate the benefits and limitations of science and its application in technological developments
* understand the international nature of science and the interdependence of science, technology and society, including the benefits, limitations and implications imposed by social, economic, political, environmental, cultural and ethical factors
* demonstrate attitudes and develop values of honesty and respect for themselves, others, and their shared environment.

**Objectives**

The objectives of sciences listed below are final objectives and they describe what students should be able to do by the end of the course. These objectives have a direct correspondence with the final assessment criteria, A–F (see “Sciences assessment criteria”).

**A One world**

This objective refers to enabling students to understand the interdependence between science and society. Students should be aware of the global dimension of science, as a universal activity with consequences for our lives and subject to social, economic, political, environmental, cultural and ethical factors.

At the end of the course, and within local and global contexts, students should be able to:

* describe and discuss ways in which science is applied and used to solve local and global problems
* describe and evaluate the benefits and limitations of science and scientific applications as well as their effect on life and society
* discuss how science and technology are interdependent and assist each other in the development of knowledge and technological applications
* discuss how science and its applications interact with social, economic, political, environmental, cultural and ethical factors.

**B Communication in science**

This objective refers to enabling students to develop their communication skills in science. Students should be able to understand scientific information, such as data, ideas, arguments and investigations, and communicate it using appropriate scientific language in a variety of communication modes and formats as appropriate.

At the end of the course, students should be able to:

* communicate scientific information using a range of scientific language
* communicate scientific information using appropriate modes of communication
* present scientific information in a variety of formats, acknowledging sources as appropriate
* demonstrate honesty when handling data and information, acknowledging sources as appropriate
* use where appropriate a range of information and communication technology applications to access, process and communicate scientific information.

**C Knowledge and understanding of science**

This objective refers to enabling students to understand the main ideas and concepts of science and to apply them to solve problems in familiar and unfamiliar situations. Students are expected to develop critical and reflective thinking and judge the credibility of scientific information when this is presented to them.

At the end of the course, students should be able to:

* recognize and recall scientific information
* explain and apply scientific information to solve problems in familiar and unfamiliar situations
* analyse scientific information by identifying components, relationships and patterns, both in experimental data and ideas
* discuss and evaluate scientific information from different sources (Internet, newspaper articles, television, scientific texts and publications) and assess its credibility.

**D Scientific inquiry**

This objective refers to enabling students to develop scientific inquiry skills to design and carry out scientific investigations.

At the end of the course, students should be able to:

* define the problem or research question to be tested by a scientific investigation
* formulate a hypothesis and explain it using logical scientific reasoning
* design scientific investigations that include variables and controls, material/equipment needed, a method to be followed, data to be collected and suggestions for its analysis
* evaluate the method, commenting on its reliability and/or validity
* suggest improvements to the method.

**E Processing data**

This objective refers to enabling students to record, organize and process data. Students should be able to collect and transform data by numerical calculations into diagrammatic form. Students should be able to analyse and interpret data and explain appropriate conclusions.

At the end of the course, students should be able to:

* collect and record data using appropriate units of measurement
* organize and transform data into numerical and diagrammatic forms, including mathematical calculations and visual representation (tables, graphs and charts)
* present data in a variety of ways using appropriate communication modes and conventions (units of measurement)
* analyse and interpret data by identifying trends, patterns and relationships
* draw conclusions supported by scientific explanations and a reasoned interpretation of the analysis of the data.

**F Attitudes in science**

This objective goes beyond science and refers to encouraging attitudes and dispositions that will contribute to students’ development as caring and responsible individuals and members of society.

This objective is set in the context of the science class but will pervade other subjects and life outside school. It includes notions of safety and responsibility when working in science as well as respect for and collaboration with others and their shared environment.

During the course, students should:

* carry out scientific investigations using materials and techniques safely and skillfully
* work effectively as members of a team, collaborating, acknowledging and supporting others as well as ensuring a safe working environment
* show respect for themselves and others, and deal responsibly with the living and non-living environment.

**A Brief History of Science**

|  |  |  |
| --- | --- | --- |
| **Years BP** | **Events in Earth History** |  |
| **4 600 000 000** | **Earth and planets in the solar system formed** |  |
| **3 800 000 000** | **first evidence of life** |  |
| **440 000 000** | **evolution of first land plants** |  |
| **400 000 000** | **evolution of first land animals** |  |
| **3 000 000** | **evolution of first hominids (human-like creatures)** |  |
|  | **Developments in science and technology** | **Developments in communication** |
| **35 000** |  | **fluent human speech** |
| **12 000** | **first human settlements** |  |
| **9 000** | **use of stone tools** |  |
| **6 000** |  | **first primitive writing based on pictures (Egypt and Mesopotamia)** |
| **5 800** | **first use of bronze (alloy of tin and copper)** |  |
| **3 700** |  | **first alphabet developed (Palestine)** |
| **3 500** | **first use of iron** |  |
| **2 600** | **era of Greek science, based on philosophy (Aristotle, Pythagoras)** |  |
| **1 000** |  | **Chinese invented printing** |
| **700** | **experimental science of William of Occam** |  |
| **500** | **Earth orbits the Sun (Copernicus)** | **first printing press (Caxton)** |
| **400** | **circulation of blood (Harvey)** |  |
| **300** | **theory of gravity (Newton); invention of telescope** |  |
| **200** | **Industrial Revolution (in Britain)** |  |
| **150** | **Theory of evolution by natural selection (Darwin); early railways** | **photography invented** |
| **100** | **first powered flight; theory of special relativity (Einstein)** | **wireless telegraphy invented** |
| **50-60** |  | **first fully-electronic computer** |
| **40-50** | **structure of DNA (Watson and Crick); first human in Earth orbit (Gagarin)** |  |
| **30-40** | **first human on the moon (Armstrong)** | **computers with silicon chips** |
| **0-20** | **Human Genome Mapping Project; multiple organ transplants** | **lap-top computers; communications networking; the Internet; artificial intelligence** |

Scientific theories take centuries to come into existence and they keep on evolving. Uncountable intellectual minds work on these theories; some fail to do anything about it; some add a little after tremendous efforts, and some people give remarkable and unforgettable contribution.