

# **ESL Lab Science Standards and Benchmarks**

## **Earth and Space Sciences**

### **1. Understands atmospheric processes and the water cycle**

1.1

Knows the processes involved in the water cycle

1.2

Knows that gravitational forces and the position of the Earth relative to the sun allow for an atmosphere

1.3

Knows how elevation and temperature affect atmospheric pressure

## **Life Sciences**

### **6. Understands relationships among organisms and their physical environment**

6.1

Knows how variation of organisms within a species increases the chance of survival of the species, and how the great diversity of species on earth increases the chance of survival of life in the event of major global changes

### **7. Understands biological evolution and the diversity of life**

7.1

Knows that as matter and energy flow through different levels of organization in living systems and between living systems and the physical environment, chemical elements are recombined in different ways

7.2

Knows how matter is recycled within ecosystems (e.g., matter is transferred from one organism to another repeatedly, and between organisms and their physical environment; the total amount of matter remains constant, even though its form and location change)

7.3

Knows how the interrelationships and interdependencies among organisms generate stable ecosystems that fluctuate around a state of rough equilibrium for hundreds or thousands of years

7.4

Knows how energy is transferred through food webs in an ecosystem

7.5

Knows ways in which humans can alter the equilibrium of ecosystems, causing potentially irreversible effects

## **Physical Sciences**

### **8. Understands the structure and properties of matter**

8.1

Knows that matter is made up of tiny particles called atoms, and different arrangements of atoms into groups compose all substances.

8.2

Know that states of matter depend on molecular arrangement and motion.

8.3

Understands the conservation of mass in physical and chemical changes

8.4

Knows that substances react chemically in characteristic ways with other substances to form new substances (compounds) with different characteristic properties

8.5

Knows the structure of an atom

8.6

Knows how the electron configuration of atoms governs the chemical properties of an element as atoms interact with one another by transferring or sharing the outermost electrons

8.7

Understands how elements are arranged in the periodic table, and how this arrangement shows repeating patterns among elements with similar properties (e.g., numbers of protons, neutrons, and electrons; relation between atomic number and atomic mass)

8.8

Knows that atoms may be bonded together into molecules or crystalline solids, and compounds are formed from chemical bonds between two or more different kinds of atoms

8.9

Knows that the number of electrons in an atom determines whether the atom is electrically neutral or an ion (i.e., electrically neutral atoms contain equal numbers of protons and electrons; a positively charged atom has lost one or more electrons; a negatively charged atom has gained one or more electrons)

### 8.10

Knows the variety of structures that may be formed from the bonding of carbon atoms and their roles in chemical reactions including those required for life processes

## **9. Understands the sources and properties of energy**

### 9.1

Know that waves have energy and can transfer energy when they interact with matter.

### 9.2

Know that matter and energy are conserved

## **Nature of Science**

## **11. Understands the nature of scientific knowledge**

### 11.1

Knows ways in which science distinguishes itself from other ways of knowing and from other bodies of knowledge

### 11.2

Knows that scientific explanations must meet certain criteria to be considered valid

### 11.3

Understands how scientific knowledge changes and accumulates over time

### 11.4

Knows that from time to time, major shifts occur in the scientific view of how the world works, but usually the changes that take place in the body of scientific knowledge are small modifications of prior knowledge

## **12. Understands the nature of scientific inquiry**

### 12.1

Understands the use of hypotheses in science

### 12.2

Designs and conducts scientific investigations

### 12.3

Knows that, when conditions of an investigation cannot be controlled, it may be necessary to discern patterns by observing a wide range of natural occurrences

12.4

Uses technology (e.g., hand tools, measuring instruments, calculators, computers) and mathematics (e.g., measurement, formulas, charts, graphs) to perform accurate scientific investigations and communications

12.5

Knows that conceptual principles and knowledge guide scientific inquiries; historical and current scientific knowledge influence the design and interpretation of investigations and the evaluation of proposed explanations made by other scientists

12.6

Knows that scientists conduct investigations for a variety of reasons

### **13. Understands the scientific enterprise**

13.1

Knows that, throughout history, diverse cultures have developed scientific ideas and solved human problems through technology

13.5

Understands that science involves different types of work in many different disciplines