AUSTRALIAN HOMESCHOOLING SERIES

General Science

Secondary Science 7A

Years 7–9

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CORONEOS PUBLICATIONS

Item No 541

Secondary Science 7A
General Science

Contents

What is Science?

Science is knowledge gained by systematic study. Sir Humphrey Davy (1778-1829 A.D.) was the first person to use the name science in its present meaning. He was a professor at London's Royal Institution, where his lectures attracted large crowds. Later he became director of the Royal Society.

When we think of science we think of experiments, but science also involves theoretical work as well. Scientists spend a lot of their time reading papers published by other scientists to get ideas and to verify other scientists' work. When a scientist makes a discovery, he writes it up in a paper to let others know what he has found. His discovery will only be accepted when other scientists have been able to reproduce his results. This process also helps to eliminate fraud.

An example of fraud was the Piltdown man. A skull was found in Sussex, England in 1912. It was believed to be the missing link between man and ape. It was later found to be made up from the painted bones of an animal with the teeth filed down.

However one scientific discovery, which was first thought to be a fraud, but was really genuine, was the discovery of the platypus. When it was first found in Australia a mounted specimen was sent back to England for examination. Nobody in England could believe that an animal could live in water, be covered in fur and have webbed feet and a bill like a duck. It was not until a live specimen was sent to England that people believed that it really existed. It was later found to lay eggs and suckle its young which, for the thinking of that time, was more unbelievable!

Branches of Science

Science is made up of many branches. The common ones are:

1. **Chemistry.** The science, which investigates the composition of compounds and elements. It includes physical chemistry, inorganic chemistry, organic chemistry, analytical chemistry, biochemistry, nuclear chemistry, geochemistry, environmental chemistry and pharmaceutical chemistry.

2. **Physics**. The observation and interpretation of natural laws, processes and properties of non-living matter. It derives its name from the Greek meaning pertaining to nature or natural. Physics includes astronomy, geography, the study of heat & cold, sound, light, electricity, magnetism and energy.

3. **Biology.** Biology is the study of living things. It includes both animals and plants. Biology is divided into two sub-groups: Zoology, the study of animals and Botany, the study of plants.

4. **Astronomy.** The study of the heavens.

5. **Geography.** The study of the earth and its composition. Geography consists of several branches.

   - **Physical Geography**, the study of the physical shape of the Earth.
   - **Meteorology**, the study of the weather.
   - **Climatology**, which is the study of the long-term behaviour of the atmosphere in specific areas. It is the allied science to meteorology.
   - **Geology**, the study of rocks.

6. **Nuclear Science.** The science of the structure of the atom.

Match the term to the definition.

1. Chemistry ___	a. the study of living things.
2. Physics ___	b. study of the earth and its composition
3. Biology ___	c. the science which investigates the composition of compounds and elements .
4. Astronomy ___	d. the science of the structure of the atom.
5. Geography ___	e. the observation and interpretation of natural laws, processes and properties of non-living matter.
6. Nuclear Science ___	f. study of the heavens.

Complete the following:

7. Science is _____

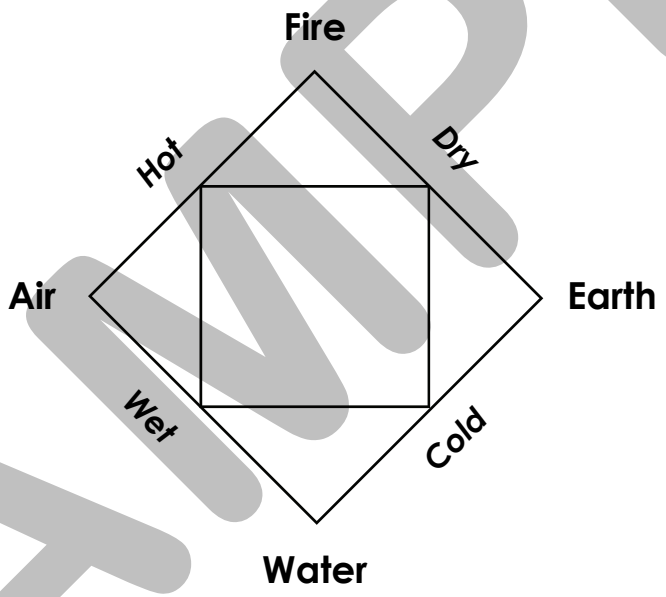
_____

8. When a scientist makes a _____, he _____ it up in a paper. His discovery will only be accepted when others have _____ his _____.

Chemistry

Chemistry arose from two different, and unrelated, areas. Firstly it arose from the crafts and trades such as metallurgy, brewing, tanning & dyeing. These trades used chemicals to make the goods that they produced. Metallurgy advanced largely by experiment and without any theoretical development. The metals that were known in ancient times were gold, silver, copper, tin and lead.

Secondly chemistry arose from the philosophers of ancient Greece. In Greece the approach to chemistry was largely philosophical, i.e. through thought rather than experimentation. The Greek philosophers believed that all matter was made up of only four elements; fire, water air and earth. Burning a log, for example, produced the four elements; flame (fire), smoke (air), sap (water) and ashes (earth). The basic properties of these elements they referred to as "coldness, hotness, dryness, and wetness."



The Greeks thought each element had two associated properties. In the case of water, for example, it was both wet and cold.

They believed that water could be changed to earth by changing the property of "wetness" to "dryness." This concept of chemistry continued until the Middle Ages when alchemists tried to convert elements into gold using the Greek philosophy. They believed that by adding the essential quality or "property of nobility" to these metals they could cause them to change into gold. Despite the many experiments that were carried out, they were unable to do this as gold itself is an element. However, in the course of these experiments, the alchemists did discover many new chemicals.

Alchemists still held the Greek idea of confusing elements with their properties. It led to the belief that all matter that burnt contained "*phlogiston*", named after the Greek word for fire. Objects could only burn while they contained phlogiston. Once the object was no longer flammable, all the phlogiston was said to have left it. Scientists noted that when metals were heated they lost their metallic properties and turned to powder. This was attributed to the metal losing its phlogiston.

Theories began to change in 1772 when Antoine Lavoisier (1743-94 A.D.), a Frenchman, noted that when objects were burnt they actually gained weight, not lost it.

He concluded that the object was not giving up "phlogiston" upon combustion but instead gaining something from the air. He demonstrated this fact by burning an object in a sealed container. The container weighed the same before combustion but the object was heavier after combustion. Lavoisier became known as the "Father of Modern Chemistry" because of his use of quantitative measurements and not just qualitative observations, i.e. he actually measured what he used instead of just simply observing the results.

Answer the following questions:

1. What were the earliest metals known to man?

   _____

   _____

2. What two unrelated areas did the study of chemistry arise from?

   a. _____

   b. _____

3. Briefly outline what the Greek philosophers believed.

   _____

   _____

   _____

   _____

4. What positive results came from the alchemists' attempts to turn metal into gold?

   _____

   _____

   _____

Answers for Secondary Science 7A

Page 3
Match the definition
1. c
2. e
3. a
4. f
5. b
6. d

Complete the following:
7. knowledge gained by systematic study.

8. Discovery writes
reproduced results

Page 5
Answer the following:
1. gold, silver, copper, tin and lead

2. a. crafts and trades such as metallurgy, brewing, tanning and dyeing.
b. philosophers of ancient Greece.

3.
- All matter was made up of only four elements—fire, water, air and earth.
- Each element had two associated properties, e.g., water was both cold and wet.
- One element could be changed to another by changing the properties.

4. They discovered many new chemicals.

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5. He noted that when objects were burnt they actually gained weight.

6. He measured what he used instead of just observing the results
- quantitative measurement and not just qualitative observation.

Page 8
1. They established an early classification system for plans and animals.

2. When plants were exposed to an atmosphere of carbon dioxide, oxygen was given off.

3. He concluded that the green, fleshy parts of the plant, when subjected to sunlight, were involved in a process that converted carbon dioxide to oxygen.

4. because they were not fixed in the sky but moved about in relation to the rest of the stars.

5. Nicolas Copernicus. He showed that the earth moved around the sun.

6. He discovered Jupiter's moons. He also discovered that the Milky Way was made up of many, very faint stars.

Page 9
7. a. atoms,
b. molecules,
c. elements and
d. compounds.

Page 11
1. to help solve everyday problems.

2. a. observation
b. research
c. measurement
d. experimentation