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General Science

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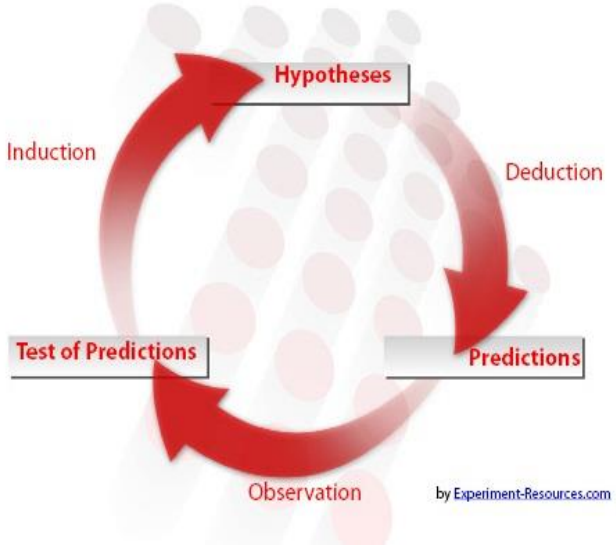
Q:What is scientific method? And what steps are involved in scientific method?

The scientific method:

The ***Oxford English Dictionary*** says that the scientific method is: "a method or procedure that has characterized natural science since the 17th century, consisting in systematic observation, measurement, and experiment, and the formulation, testing, and modification of hypotheses."

The Scientific Method involves a series of steps that are used to investigate a natural occurrence. Following general steps involves in scientific method in sequence. These are:

- Problem/Question
- Observation/Research
- Formulating a Hypothesis
- Prediction
- Experiment
- Conclusion (result)



Following is a brief description of above steps:

1. Problem/Question

The problem or research question is the single most important part of the scientific method. Every part of your project is done to answer this question. The research question is sometimes formed as a statement and is called the "Problem" or "Problem Statement."

What is your goal or what idea are you trying to test? What is the scientific question that you are trying to answer?

2. Observation

Scientific observation is the central element of scientific method or process. The core skill of a scientist is to make observation. Observation consists of receiving knowledge of the outside world through our senses, or recording information using scientific tools and instrument can be called an **observation**. It is also called **research**.

3. Formulating a Hypothesis

The hypothesis is an "educated guess," formed as a statement that you propose to be the answer to the research question.

A hypothesis is an explanation that is proposed for a phenomenon. Formulating a hypothesis is a step of the scientific method. A hypothesis is a scientific testable prediction about what you expect to happen in your study.

Usually, a hypothesis can be supported or refuted through experimentation or more observation. A hypothesis can be disproven, but not proven to be true.

4. Prediction

A **prediction** or **forecast** is a statement about the way things will happen in the future, often but not always based on experience or knowledge. While there is much overlap between prediction and forecast, a prediction may be a statement that some outcome is expected.

In science, a **prediction** is a rigorous, often quantitative, statement, forecasting what will happen under specific conditions; for example, if an apple falls from a tree it will be attracted towards the center of the earth by **gravity** with a specified and constant **acceleration.** The **scientific method** is built on testing statements that are logical consequences of scientific theories. This is done through repeatable experiments or observational studies.

It can also be a prophecy.

5. Experiment

This is the part of the scientific method that tests your hypothesis. An **experiment** is a tool that you design to find out if your ideas about your topic are right or wrong.

It is absolutely necessary to design a science fair experiment that will accurately test your hypothesis. The **experiment** is the most important part of the scientific method.

A test under controlled conditions that is made to demonstrate a known truth, examine the validity of a hypothesis, or determine the efficacy of something previously untried is called **experiment.**

6. Conclusion or Result

The final step in scientific method is **conclusion.** The conclusion is a summary of the research and the results of the experiment. This is where you answer your problem or research question. And how these results match up to your hypothesis.

A science fair experiment isn't a failure if it proves your hypothesis wrong or if your prediction isn't accurate. If the hypothesis is false, repeat the steps in the scientific method and make adjustments to your hypothesis.

The conclusion is based on the data that you got from the experiment.

Living and Non-living things

Q:How we can differentiate living things from non-living things?

We are surrounded by living and non-living things**.** All animals and plants are living things and biology is the study of these living things**.** A cat playing with a ball is obviously living**.** A pigeon flying from tree to tree is also a living thing**.**

Sometimes it is not so easy to decide**.** Plants are living things but they do not play with balls or fly. Some non-living things also do things like living things. Machines**,** such as washing machines, can move**.** The car needs to be fed with petrol in order to move**.**

Following are the categories of living and non-living things**:**

Living Things:

There are two categories of living things**:**

- Animals
- Plants

Non-living Things:

There are three categories of non- living things**:**

- Gas
- Liquid
- Solid

Characteristics of Living Things:

First here is the list of characteristics for living things**:**

- Survivability
- Nutrition
- Sensitivity
- Genetic Variation
- Adaptation
- Responsiveness
- Genetic Composition
- Mutation
- Evolution
- Cellular composition
- Metabolism
- Movement(locomotion)
- Reproduction
- Development
- Growth
- Homeostasis
- Organization
- Breathing or respiration
- eat thing

Non-living things fail in at least one of these "rules" of life**.**

Plants**,** animals and humans**,** are the only **living things.**
Objects like radios**,** tables and books are **non-living things.**

Living Things	Non-living Things
Living things need nutrition**,** climate that they can stand**,** air**,** and rest if they do not eat**,** warm up**,** breath air or rest**,** they might die**.**	Objects do not need these things**.**
Living things contain information which defines them.	Non-living things also contain information which defines them.
Living things need a suitable habitat that supplies their basic needs.	Non- living things do not need a habitat.

Basic Needs Of Living Things

Following are the five basic needs of all living organisms **:**

There are millions of different living organisms in the world. From plants to animals and humans, organisms live different existences. Despite the variations, there are five basic needs that are applicable to all living organisms. All living organisms need air, water, food, sunlight and a proper habitat in order to survive.

- Air
- Water
- Food
- sunlight
- Habitat
- Temperature

Air and Temperature:

Air is a combination of gases used differently by many organisms. Carbon dioxide and oxygen make up two key components of air. Plants use the carbon dioxide in air to create sugars and oxygen. The oxygen created by plants ensures that many other living organisms, including humans, have oxygen to breathe. Oxygen is required in the human body to create ATP, a molecule needed to provide energy to living organisms.

Living things need air temperature because:

- Air is essential for their survival.
- They need oxygen in air to breath.
- They also need moderate temperature to survive.

Water:

The amount needed varies, but all living organisms require water. Some organisms live in water, some need salt water and others can only survive with fresh water. Plants take water to grow and create food. Certain plants, including algae, can only survive submerged in water, and they absorb carbon dioxide. For humans and animals, water serves as a digestion assistant, as well as a critical component of body fluids.

Food:

All living organisms need a source of nutrients. Nutrients, or food, can include fats, carbohydrates and proteins that are needed to maintain health and growth. Plants take in nutrients from the soil or the surrounding environment. This food allows the plant to carry out its processes. Humans and animals eat a variety of foods filled with nutrients. Because the body can store nutrients, humans can survive several days without food, but eventually the body's nutrient levels need replenishment.

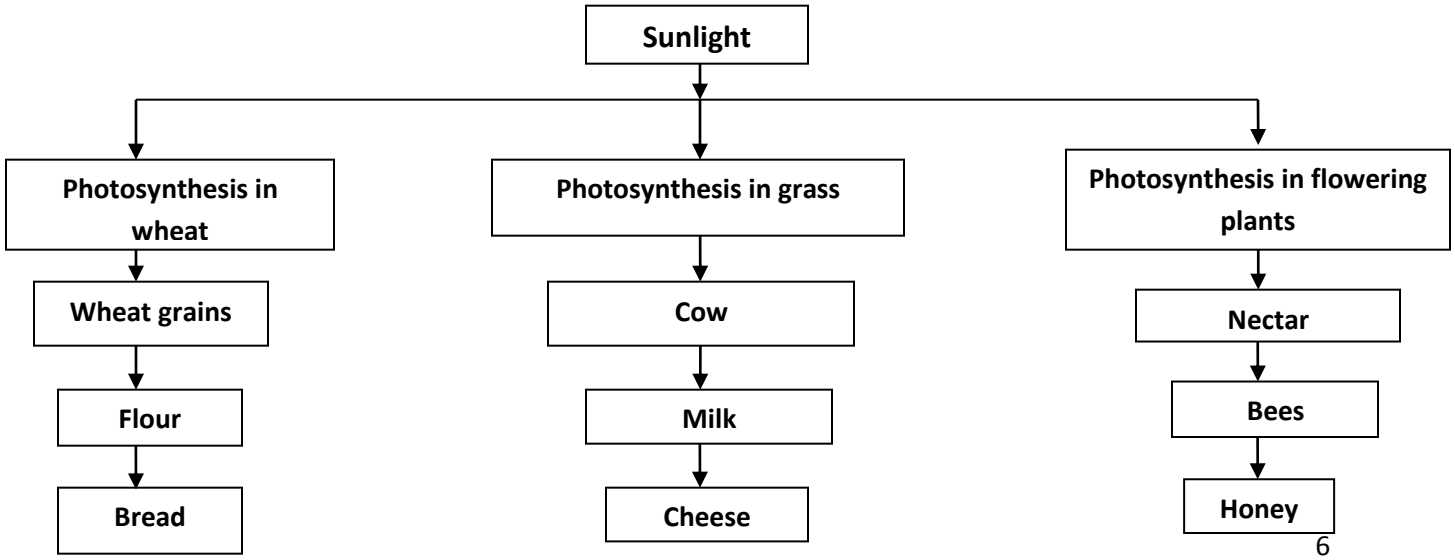
Living things need food for:

- Growth
- Repairing of tissues
- Energy
- Defense against diseases
- Producing heat to keep the body warm (animals)

Sunlight

Sunlight provides multiple uses to all living organisms. First, the sun serves as a heat source that warms the environment. The main necessity for sunlight stems from a plant's requirement for building food. Plants take in energy from the sun and use it to maintain growth and develop food and oxygen. Animals and humans indirectly need sunlight as a result, as they are heavily dependent on the functions of plants for food and oxygen. Sunlight also provides humans with vitamin D, a vitamin that ensures bone strength.

All Organisms depend on sunlight



Habitat

While habitats vary greatly from organism to organism, every living thing needs an efficient living space in order to survive. A key component of such a habitat is the proper temperature. Some plants can only survive in the dampest of conditions, while others require a drier home. The habitat must also have sufficient resources for the living organism. Limited resources will result in competition, leading to the death of certain organisms.

Interdependence Of Living Things:

An ecosystem is made up of all the living animals and plants and the non-living matter in a particular place**,** like a forest or lake**.** All the living things in an ecosystem depend on all the other things - living and non-living for continued survival **-** for food supplies and other needs**.**

Animals and plants share the **biosphere** with each other. Many organisms live in groups and some of these groups are highly organized. Other organisms have very close associations with each other, some living in or on the bodies of others. All animals ultimately depend on the green plants, the producers, for their food. Humans share the biosphere with all the other organisms; the only difference is that humans have the ability to influence their environment.

In some ways, the actions and reaction that take place within an ecosystem are like a spider web **-** when one strand is broken**,** the web starts to unravel**.** What affects one part of an ecosystem**,** affects the whole in some way**.**

Interdependence' means the way in which living organisms depend on each other to remain alive, grow and reproduce. For example, bees depend for their food on pollen and nectar from the flowers. Flowers depend on bees for pollination. Bees and flowers are therefore, **interdependent.**

The idea of the web of life is shown by the interdependence within an ecosystem. Animals and plants depend on a complex system of food for survival**.** In a typical prairie ecosystem**,** the web might work like this**:**

1) The sun provides energy for the grass
2) grasshoppers feed on the grass
3) birds and frogs eat the grasshoppers
4) snakes eat birds
5) frogs and mice; owls and hawks will eat the birds as well as snakes, frogs and mice.
6) After death it is decomposed by worms, fungi and bacteria action and nutrients are released to the soil during the decaying process for the grass to use again.

Interdependence of Human and nature:

The relationship between humans and nature should be interdependence. Dependence of human nature, people need water, air to survive, you need coal to generate electricity, need oil to provide power ... so, if none of these things also can not live a day.

But human beings do not cherish the survival of the environment, this has flowers, trees of the environment, the hundreds of millions of planets in a unique environment for biological survival; but it continues to damage, destroy it. Rivers, lakes have been polluted, and continues, coal and oil non-renewable resources have been overexploited, serious air pollution, global warming, natural disasters, species extinction and so serious, the human nature to knock ring the alarm, but does ignore human ignorance, to continue their self-defeating behavior.