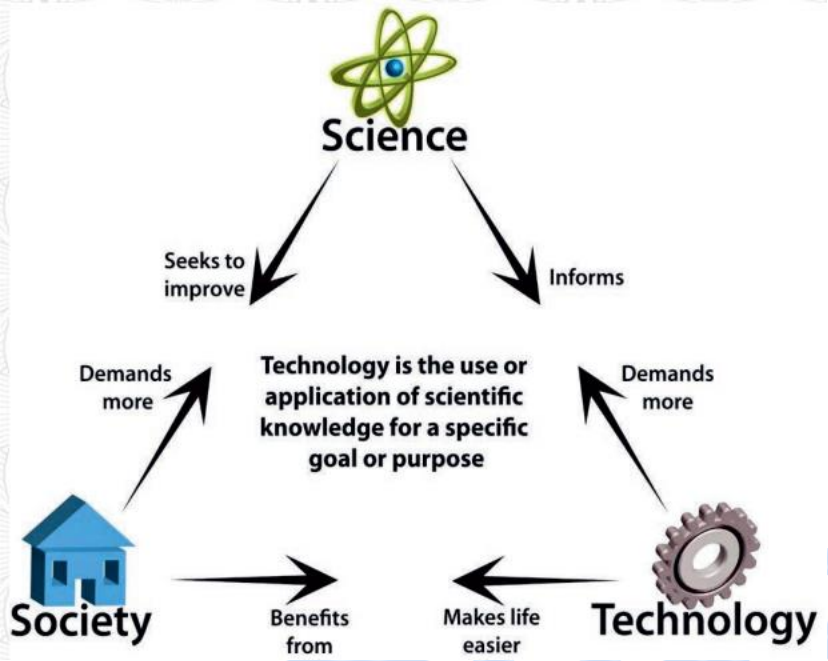
Unit one

Biology and technology



Learning from nature

- ✓ Nature is the physical, natural and material world of life that exists without human intervention.
- ✓ Nature provides us with doable structures and forms which can be developed as functional and applicable mechanisms for various technological systems.
- ✓ Scientists and engineers learn from nature through imitation of physical structures, shapes, materials and functional mechanisms of natural facts.
- ✓ Using imitation of nature, they can sketch the biological structures, design functional mechanisms and tune into more efficient technologies at macro (large) and nano (very small) scales through imitation.
- ✓ Scientists and engineers find inspiration in nature, which also provides a trustworthy source of information, concepts, and ideas for the development of new technologies.
- ✓ Buildings were made through the imitation of the mound architecture of termites that have
- ✓ chimneys, constant temperature and humidity. Examples of technology that imitates nature:

1. **Swallow nests have inspired the house building design.**
2. **Weaving technologies have been developed by studying the formation of spider webs.**
3. **Buildings have been made through the imitation of the mound architecture of termites. These buildings mimic termite mound architecture that has chimneys with constant temperature and humidity.**

4. **The first heavy aircraft technology was designed by imitating birds. Aircraft engineers designed aircraft wings and their flight techniques by imitating the wings of birds and bats**
5. **Engineers imitating human eyes made the technology of photograph camera.**
6. **The movement of bio-robots was designed from the movement of kangaroo.**
7. **Injection needle technology was copied from mosquito proboscis**
8. **The sensors of electrical devices were imitations of biological neurons.**
9. **A cutting saw was imitated from the nature of the sharp teeth of animals.**
10. **Synthetic bulletproof vests are imitations of the spin silks of spiders.**
11. **Ceramics are an imitation of the nature of crack-resistant shellfish exoskeleton.**
12. **A robotic arm was imitated from an elephant trunk**

Biology and technology

- ✓ Technology is the application of scientific knowledge, skills, methods and processes for the production of devices and tools for scientific investigations.
- ✓ Biotechnology h is a technology that utilizes biological systems to develop useful products.

The benefits of biology to technology

- ✓ . Biology is a source of materials that enable us to imitate, design, adapt and develop modern technologies and solve complex human problems.
- ✓ . Scientists and engineers imitate nature to innovate, problem solve and expand their scientific understanding.

Example biology use to technology

1. **Medicinal plants:**
2. **Gene engineering and biosynthetic materials**
3. **Building design**
4. **Bullet train design:**

Uses of technology in biology

Biological studies that use technological tools include:

1. Biochemical studies are helpful to investigate information on carbohydrates, proteins, lipids and nucleic acids.

2. Biomedical studies deal with providing detailed of information on the chemical components of medicinal plants.

3. Biophysical studies are the science of using physical devices to gather biological information at all scales of biological organization (molecular, organismic, and populations).

4. Environmental studies are a multidisciplinary system dealing with the interactions of humans with the environment.

5. Bioinformatics is a scientific discipline involving computer technology to collect, store, analyze, and disseminate biological data and information (DNA and amino acid sequences).

6. Biogeographical information is the study of the distribution of species along with geographic ecosystems through geological periods

the following are examples of technological devices

1. A digital thermometer r is an instrument used for measuring body temperatures
2. The diabetic blood test is a tool to measure the level of blood sugar taking sample blood
3. A pregnancy urine test is a tool that checks if a woman is pregnant or not
4. Microscopes used to magnify objects
5. Computer Information Technology Scanning (CITS) is a device used for investigating information on diseases or cancerous areas of the human body.
6. Computed Tomography scan (CT scan)
7. Positron Emission Tomography (PET scan) is an imaging technology device used to check for diseases or information in areas with cancer in the human body.
8. Geographical Position System (GPS)
9. Handheld Body fat calculator device used to measure body fat

Impacts of biology and technology on society and the natural world

✓ The impacts of biology and technology refer to factors that pose positive or negative effects on the society and the natural world.

The impact of biology refers to the effects arising from the advancement of biological knowledge and innovations.

Impacts of biology on the society and the natural world

The impact of biology refers to the effects arising from the advancement of biological knowledge

and innovations.

Examples:

- ✓ Ensuring food security as a result of an increase in productivity
- ✓ Medicine and disease treatments have resulted in improved health and longevity.
- ✓ Achieving better supply of energy and clean water.

- ✓ An increase in industrial production due to microbial action
- ✓ Creating antibiotics to treat bacterial infections

Impacts of technology on the society and the natural world

- ✓ Technological products and their applications in various fields of study have solved societal problems and had significant societal and environmental impacts.
- ✓ These technologies have damaged our world in two main ways through pollution and the depletion of natural resources.

Examples:

1. Industrial emissions and effluents pollute clean air and drinking water.
2. Biochemical agents, pesticides, and fertilizers cause toxicity and biohazards

Ethical issues in biology

- ✓ Ethical issues in biology are those issues that arise concerning the rightness or wrongness of using biological discoveries for the health and wellbeing of humans.

Ethical treatment of plants and animals during biological studies

Ethical treatment of plants and animals during biological studies is the process of subjecting animals and plants to various experiments and rigorous tests.

Ethical treatment of plants

Plants are primary producers and feeders for all living organisms.

Trees are living organisms that properly function in decentralized forms without any centralized order-providing unit (brain).

Unethical treatment of plants:

- ✓ Testing seeds or berries through destructive rays
- ✓ Cutting tree terminals for experiments
- ✓ Consumption of all seeds and fruits without conservation
- ✓ Unplanned cutting of trees or deforestation
- ✓ Burning forests and seedlings for farmlands
- ✓ Restructuring the shapes of trees for aesthetic appeal

Ethical treatment of animals in experiments

- ✓ The ethical treatment of animals is a moral question of whether it is acceptable to harm animals for scientific research.
- ✓ Animals are sentient creatures that have a nervous system, feel painful feelings, emotional stress, and have interests and values. Given this, it is unethical to harm animals during experiments or rigorous testing.
- ✓ Unethical treatments of animals in research include approaches which expose animals to rigorous experiment that may injure or cause pain to animals.

Researchers must reduce impacts of unethical treatments of animals through the three Rs principles described below (Reduction, Refinement, and Replacement)

A. Reduction aims to minimize the number of animals used in experiments by improving experimental techniques and sharing information with others.

B. Refinement is cleansing experiments in a way that enables to reduce suffering of animals using less invasive techniques, better medical care, and better living condition

C. Replacement is substituting experiments on animals with alternative techniques using cell cultures instead of whole animals, biosynthesis, and computer simulated models

php TUTORIAL