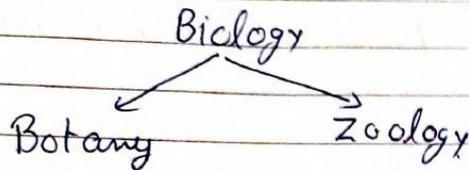


Biology - Various aspects of living organisms
eg- Botany, Zoology, Microbiology etc.



(deals with plants and animals)

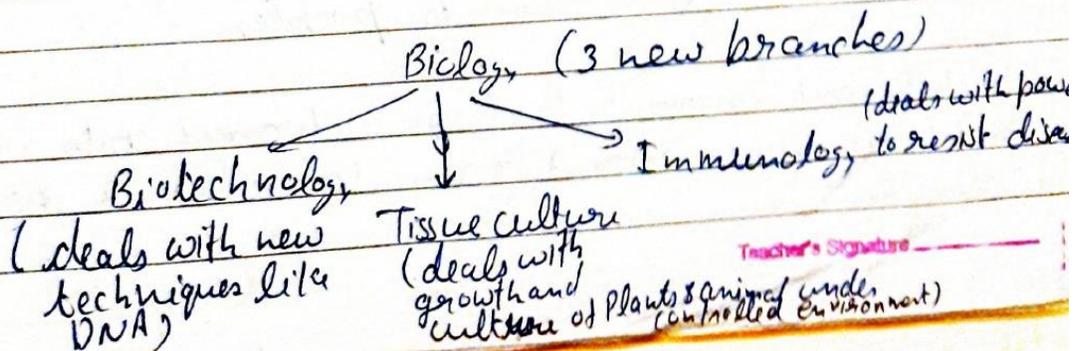
Cytology - Cell under sub-branch.

Physiology - emphasis on the various metabolic function going on in the cell or in organism.

Genetics - focuses on the basis of heredity and the principles involved in it.

Bio-chemistry - deals with metabolic reactions, their catalysis and mechanism of enzyme action.

Ecology - interaction of organism with other living organism and also with the surrounding environment.



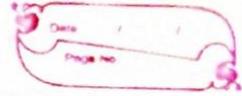
Scope Notes

- 1) helps the students to realise the importance & requirement of knowledge of Biology in engineering.
- 2) Emphasis on the importance of classification of living worlds
- 3) Knowledge of various types helps one to understand their systematic classification.
- 4) able to understand the mechanism of transfer of genetic information.

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Outcome -

- 1) Understand the significance of Biology.
- 2) Distinguish & classify the living form on basis of their characters.
- 3) responsible for the resemblance and variations amongst parents and their offsprings
- 4) Utilize the knowledge of biology for minimizing and solving several environmental problem.
- 5) will benefit engineers to design advanced instruments or devices and software to be used in health care.



Biology - study of living organism their structure, functioning and interactions with the environment

Bios ^{means} life

logos ^{means} study.

Basically related to

1) Cell theory -

- 1) cell is basic unit of life.
- 2) All living organism are made up of cells.
- 3) New cells arise from pre-existing cells

2) Energy

3) Heredity - Genetic information is coded in the form of nucleic acids (DNA).

Responsible for transfer of characters from one generation to other.

3) Equilibrium -

4) Evolution - change in the inheritable characteristics of life forms over successive generations that led to e

Biology ^{Notes} - A scientific discipline as important as physics, chemistry, and mathematics.

Benefits of
Integration of biology to engineering science

- 1) Designing of the tools or appliances for comfort or benefit of mankind utilizing the basic ideas eg: aircrafts, camera, wind turbine etc.
- 2) Provides solutions for minimization of different environmental issues like pollution.
- 3) Conceptual knowledge of biology and its application in medicine science has developed technologies like artificial limbs, bionic implants (mimic the original function of the organ or body part very closely).
- 4) Developments of optimal design of structures by integrating the principles of physics, biology with engineering models.

Bio inspired inventions and developments in field of

1) Bee-hive architecture and behaviour of bees ^{engineering} lead to ^{inspired} the development of electric grid.

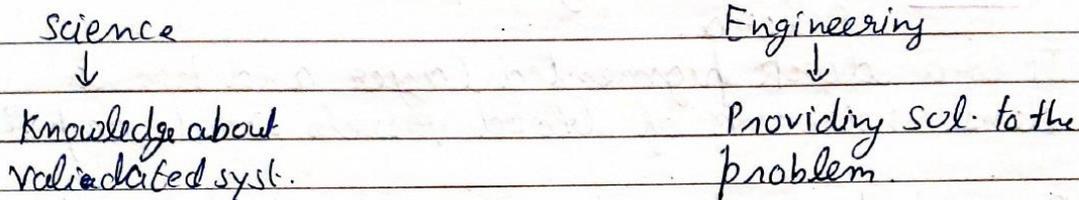
2) Design of the turbine blades was inspired by fins of whales. The prof. Frank observed the tubercles present on the edges of the fins of whale are responsible for easy swimming of these heavy bodies. Imposition of this idea in the blade of wind

Notes

turbines reduced the drag and noise produced by them with an increase in about 20% of the power.

- 3) High speed train system was inspired by the bird kingfisher. Train was designed with a nose shaped as the beak event could induce noise due to air pressure.

Relationship between Science and engineering -



- * Engineering is considered to originate from basic science as it utilizes the scientific and practical knowledge of science to design and build machines, devices & structures to help and improve human life.

Camera and eye

Human Eye = sensory organ which helps to visualize i.e. see objects in nature.

Main parts of eyes are -

1) Eye ball.

* Eye lies in the eye socket which is suspended with the help of muscles. It is a spherical hollow ball like structures called eye ball which is $\frac{1}{3}$ outside the sockets and rest $\frac{2}{3}$ of eye ball remains embedded into the socket.

Notes

It has 3 layered structure

a) Sclera or Scleroid - outermost layer of the ball which is opaque and white in colour in the part that lies in the internal part of the ball but in the $\frac{1}{3}$ part that remains outside the sockets. It is transparent and is called cornea.

b) Choroid - Middle layer present ^{just} inside to the Sclera.

It is a dark pigmented layer and has a dense network of blood vessels and capillaries.

Toward the outer side ciliary muscle form a circular round extension called Iris. This iris is located almost at the centre of the cornea and has a round central opening called pupil.

Behind the pupil, lies the eye lens. It is a spherical structure made up of protein and is hung by suspensory ligaments. It has an excellent power of accommodation where it can change its refractive power.

The suspensory muscles contract or get relaxed, this helps the lens to change shape, allowing the eyes to focus on near or far objects. (known as power accommodation of the eyes).

c) Retina - innermost layer of the eye ball that has a number of cells called rods and cones.

Notes

rods

It helps to distinguish between light and dark while cones helps to distinguish between colours. These cells transform the optical sig and transfer them to the brain where image of object is formed.

At the point where optic nerve crosses the eye ball, the layer of eye ball are interrupted and this point is called. punctum caecum. No image is formed here because of the absence of photo receptors on this point, thus it is also called Blind spot.

Light ray that are reflected from an object pass through the cornea and the pupil in the front of the eye and are focused by the lens onto the retina at the back of the eye.

2) Amount of light entering the eye is controlled by the iris. When the light intensity or amount is high, the iris contracts to reduce the size of the pupil, allowing less light to enter the eye.

The camera has an aperture allows to control the amount of light that enters the interior of the camera.

3) The cornea of eye is the transparent layer or structure in outer part of the eye ball and has small curvature. It resembles the lens of the camera.

Similar example is Bird flying and Aircraft.

Teacher's Signature _____

Notes Observation in scientific inquiry =

ways how scientists explore and seek the truth about the world or earth is called scientific inquiry.

Scientific Method = traditional model for conducting a scientific inquiry.

It includes

- 1) Observation =
- 2) Research = question which arises during observation and are solved by further studies and research.
- 3) Hypothesis = logical guesses or answer to the questions which explains the observation.
- 4) Experimentation = designing and conduction of experiment is done after formation of a logical hypothesis to the problem. Experiments are repeated no. of times until the same result is obtained a number of times while the results are recorded.
- 5) Conclusion =

Notes Significant Biological Observations in 18th Century

- 1) Carolus Linnaeus proposed a system for naming and classification of plants and animals.
- 2) Charles Darwin observed that nature selects the most suitable organism in a habitat and allows it to survive.
- 3) Louis Pasteur discovered diseases caused by bacteria and developed first vaccine.
- 4) Robert Koch developed germ theory of diseases.
- 5) Antoine Lavoisier proposed law of conservation of mass.
- 6) Jacques Charles gave Charles law of ideal gases.
- 7) Rudolf Virchow proposed cell theory.
- 8) Joule, studied the nature of heat and related to its mechanical work.

Brownian Movement -

- Robert Brown made his first observation in 1827.
- Working on Gymnosperms he identified presence of naked ovules.
- Ovules in Gymnosperms is devoid of any wall or layer enclosing it. i.e. it was directly exposed to the action of pollen grain.

Notes

- While working on pollen-pistil interaction, he was observing the pollen grains carefully and noticed motion in the pollen grains. This is known as Brown's movement.

Observations of Julius Mayer:

published a paper titled "the forces of inorganic nature" which was based on mechanical theory of heat and also conservation of energy.

- He observed that the blood of a patient was redder in colour than that usually observed to be in temperate climates. This led to the discovery of mechanical theory of heat and to the laws of conservation.