FUNDAMENTALS OF BIOLOGY

STUDY OF LIVING ORGANISMS

Class 9th and above

Living organisms are bundles of cells
that carry out specialized functions

Uncertainty in the study of Social Sciences

1. Uncertainty lies at the core of all human efforts to progress, to understand the unknown in 'Life'.
2. BIOLOGY studies the physical side of 'LIFE'. How does Life begin and end. What changes occur during its growth. Why do living organisms fall ill, and how to cure the various ailments. These issues are studied in Biology.
3. The 'known' is the bright side of knowledge. Philosophical and Scientific thoughts, codify and record the known aspects of knowledge.
4. Philosophy, Religious thought, and Scientific Research, attempt to reduce the uncertainties of Life. Humans tend to fear what they do not know. The 'unknown' and the 'uncertain', are two sides of the same coin of 'unknown side ' of Life.

‘Organic / Biotic’ Matter

1. Life is uncertain because Organic Matter is born, it grows, and it dies or comes t an end in its physical form.
2. All forms of life : plant, animal, birds, insects, humar , are ‘Living or Organic’ matter on Earth.
3. Organism have movement or locomotion, and the ability to re-create its own kind. Animals and human bring up their young ones.
4. When a form of life will end or how it will react in various situations is uncertain. This is a basic feature of life.

Reducing Uncertainty through General Principles

Social Sciences study Life or reactions of organic matter .

Life forms have emotions, intelligence and an ability to adapt different situations.

Therefore, they react differently in the same situation.

This makes predicting their reactions more difficult and uncertain.

Only General Principles of reactions, can be formulated for study of life and society.

1. Emotions are a major characteristic of humans and other life forms. Emotions are changeable and differ from person to person , even within the same group or family. Humans are most unpredictable in their reactions.

2. In Social Sciences , only General Principles are formulated on basis of Emotions + Reason

3. This factor makes General Principles of group behaviour less 'Certain' than Scientific Principles .

4. Socio- economic History and culture are a key factor in study of society.

But as peoples differ in thought, cultural practices and historical heritage, their society has different structures, reactions, and behaviour norms.

Example of General Principles from Sociology

The basic principles of Sociology:

1. People behave differently in groups than they do as individuals.
2. People obey rules that are socially constructed.
3. People socially construct the rules.
4. Some people have more say than others in making the rules.
5. There are rewards for following the rules and penalties for breaking the rules.
6. The rules of society can be studied scientifically.

Scope of Biology

Ecology

(Relation with environment)

- Physiology (Life Processes)
- Palaeontology (Fossils)

Genetics

(Inheritance)

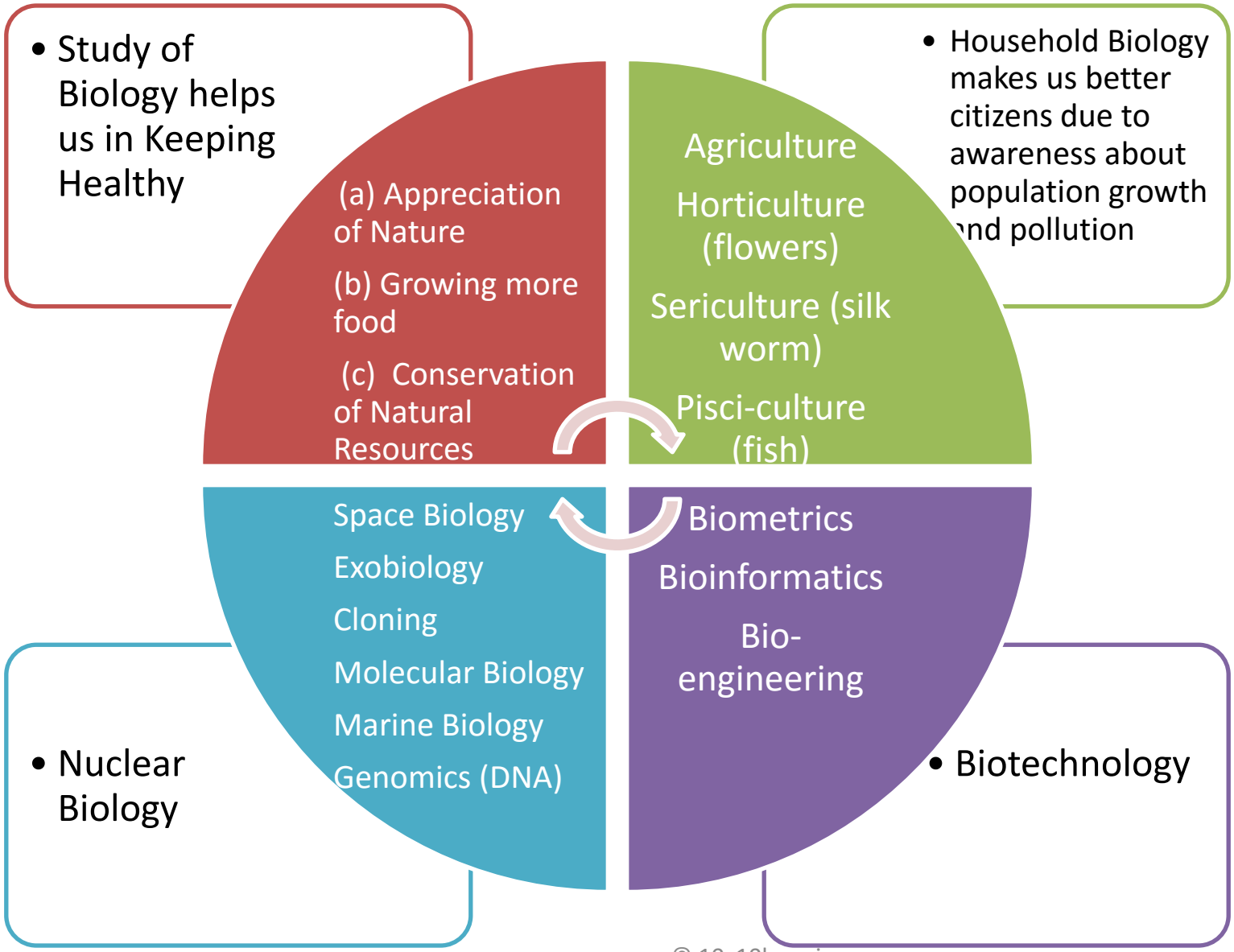
- Cytology (Cells)
- Histology (Tissues)
- Embryology (Development)

Anatomy

(Gross structure)

- Morphology (Interpretation of structure)
- Parasitology (Parasites)

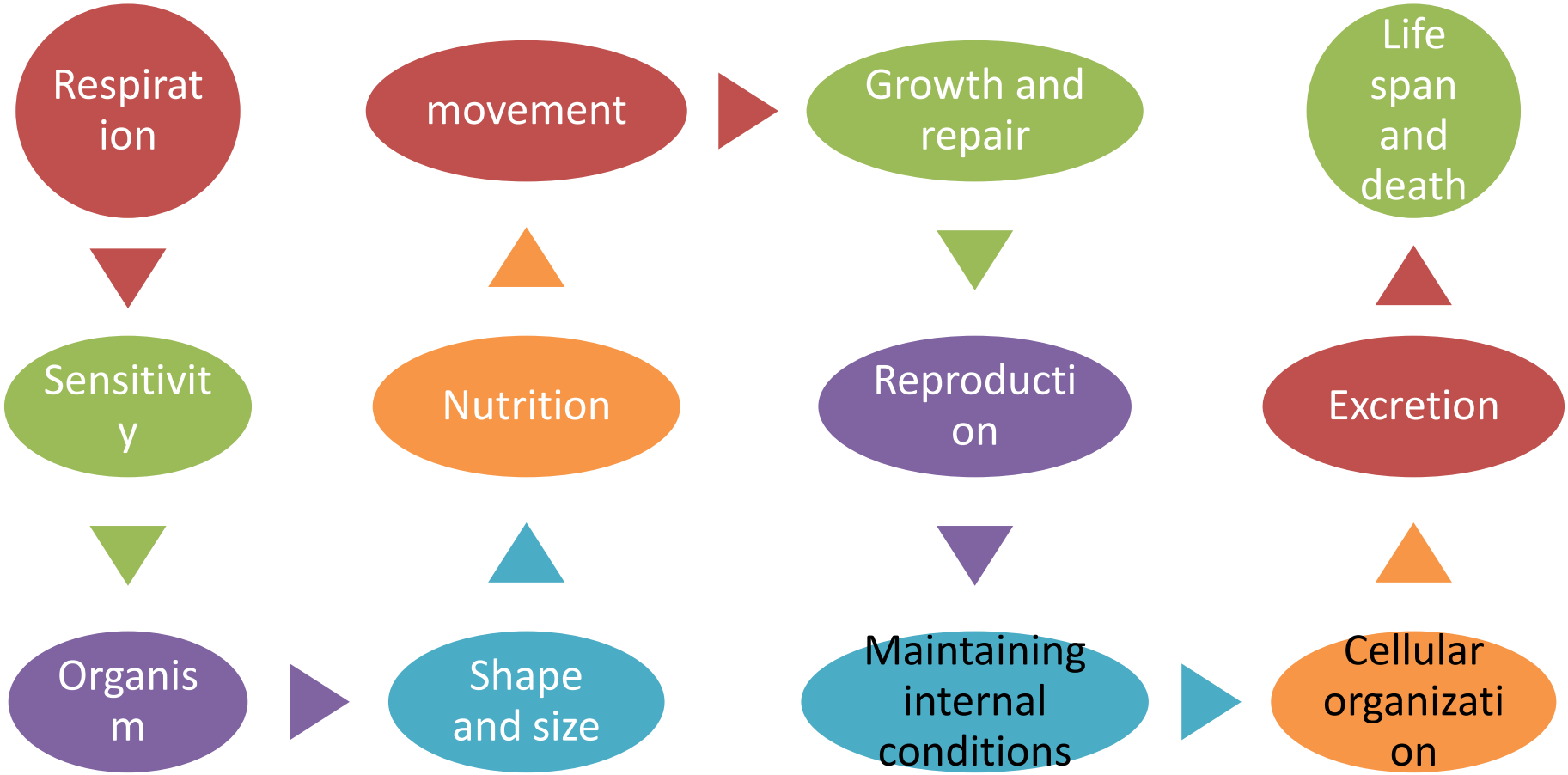
Applied Biology



Matching branches of Biology with area of study

No.	Branch	Area of study
1.	Ecology	Environment
2.	Pathology	Diseases
3	Palaeontology	Fossils
4	Ornithology	Birds
5	Ichthyology	Fishes
6	Herpetology	Snakes
7	Cytology	Cells
8	Virology	Viruses

Characteristics of living organism



Growth in Living Organisms

Internal Growth

- Cellular organisation is internal
- Cells increase in size and number to cause internal growth

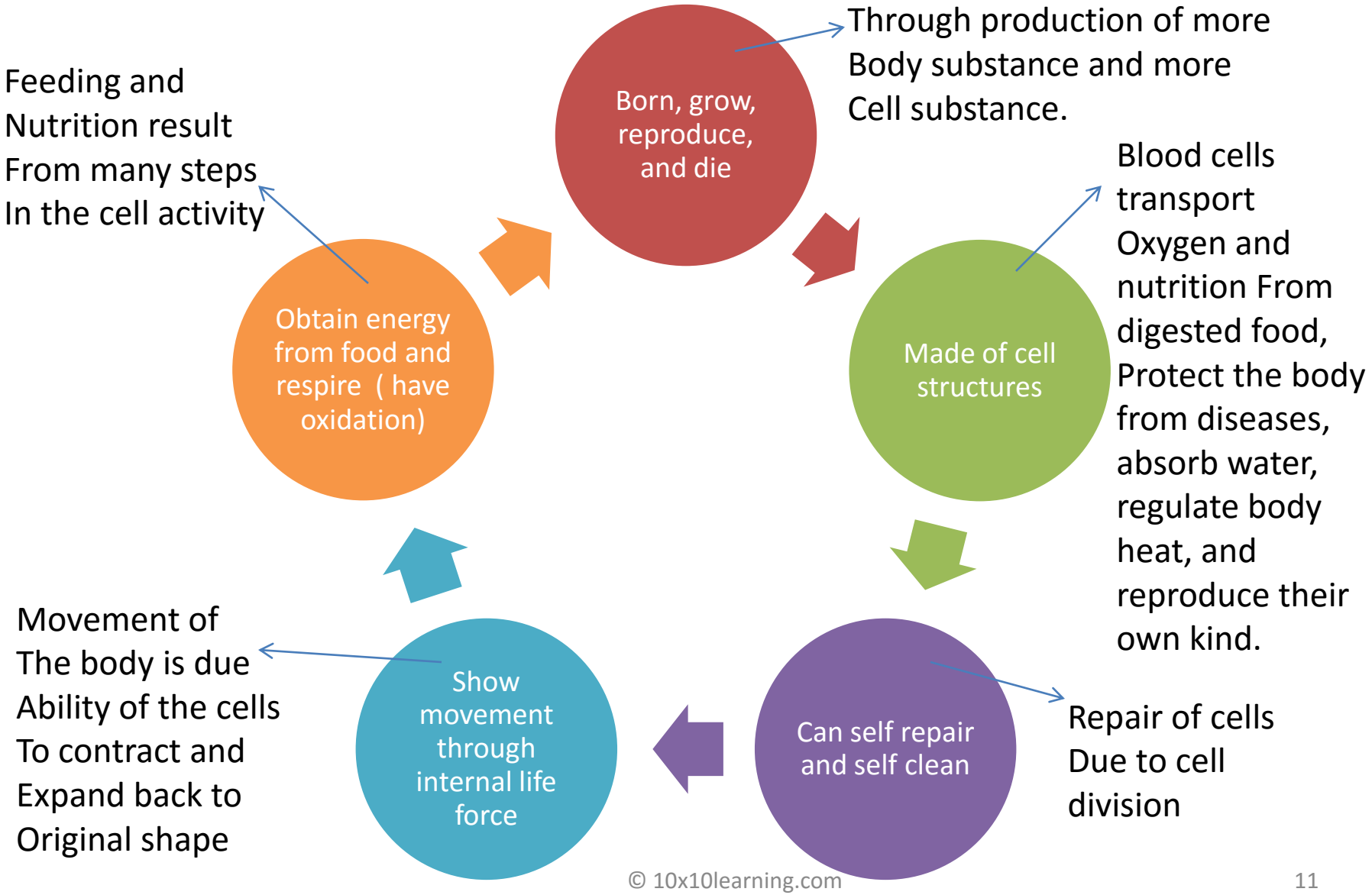
Differential Growth

- Substances in food causes different parts of the body to grow in different proportions
- Food is converted into protoplasm to enable cells to absorb it easily

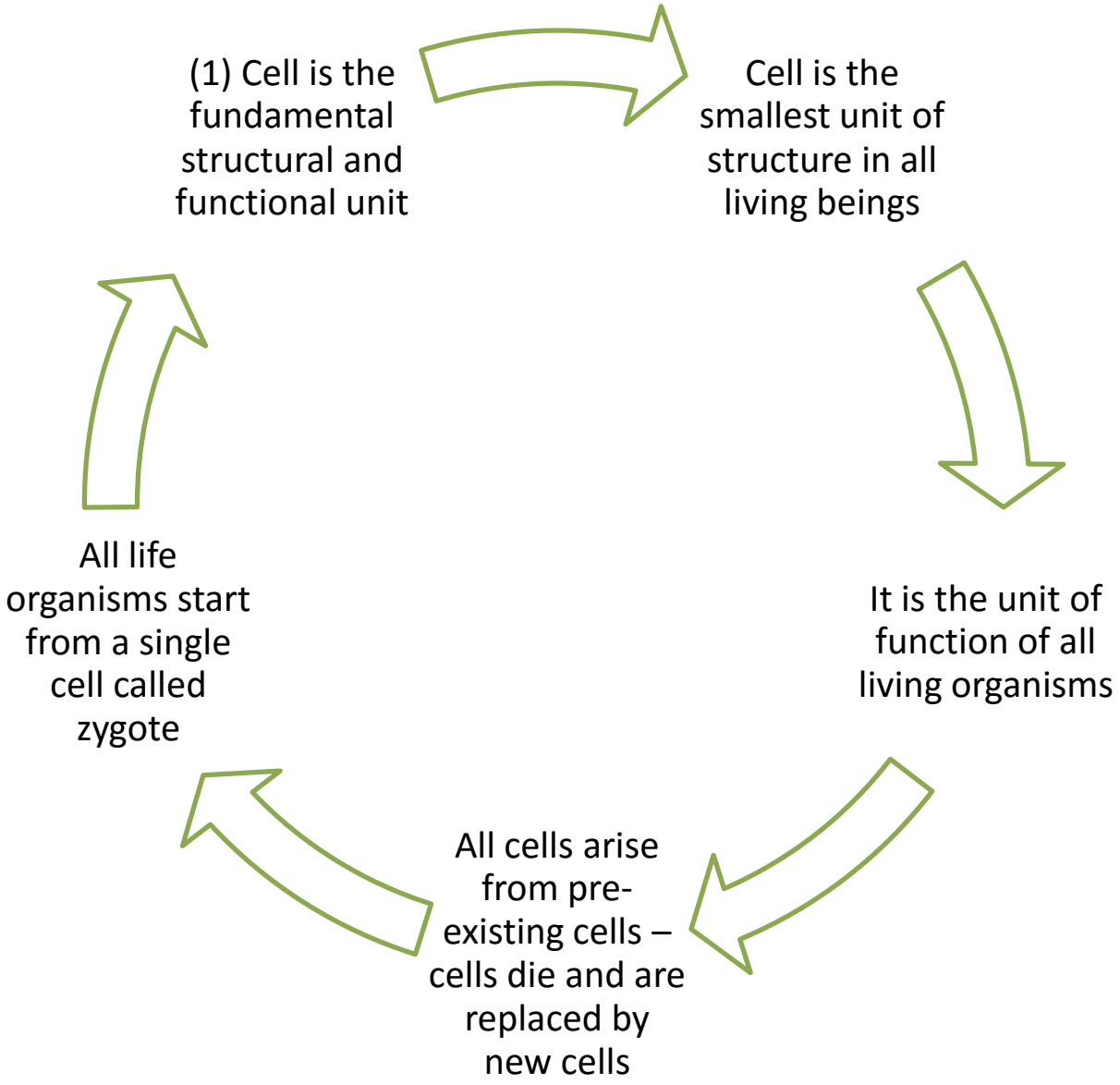
Growth is Irreversible

- Growth in living organism cannot be reversed.
- The movement of growth is always forward and never backward.

Living organisms are bundles of cells carrying out specialized functions



A Living Cell – The basic unit of life



Range and variety of Cells

Smallest cells

Bacteria

(0.3 to 0.5 micrometre)

Red Blood Cell in Humans

(about 7 mm)

Longest cells

Nerve cells in humans – from different parts of body to the spine

Size of cell as a unit gives it great efficiency in functioning

Largest Cells

The yellow sphere in the bird's eggs

Egg of an Ostrich is the largest single living cell in the world.

Structure of a living Cell

(a)Nucleus, (b)Cell Membrane, (c)Cytoplasm, with Cell Organelles (little organs) that are the living part, and give the cell its shape, structure, and a definite function.

(a) Cell Nucleus : Membrane, Nucleoli, an chromatin fibres. The membrane is semi permeable and has fine pores. It is made up of Lipoprotein. It regulates entry and maintains shape.

(b) Cell Membrane is the plasma membrane in humans and animals In Plants , in addition to the membrane, there is a thicker outer covering called the Cell Wall.

(c) Cytoplasm is a colourless , transparent, semi-liquid substance , that is always in a state of movement. Excluding the nucleus it has all organelles.

Many chemical reactions take place in the cytoplasm, such as synthesis of proteins by ribosome , respiration, secretion of enzymes, hormones , digestion

(d) Protoplasm , includes Cytoplasm and the Nucleus , and is the total substance of a living cell.

Membrane has fine pores through which substances are exchanged

- Nucleus regulates and coordinates various processes of the cell.
- It has an important role in division of cell.
- Nucleus determines heredity through genes.

Types of Cell

1) Prokaryotic cell

contain a single length of DNA;
- Small ribosomes;
- No other cell Orgenelles
- No well defined nucleus

Examples : bacteria, blue-green algae.

2) Eukaryotic cell

- Have a well defined Nucleus
- Several DNA strands that are wound around some proteins;
- Larger Ribosomes
- Several organelles

Examples : amoeba, all plant cells, all animal cells.

Thank you