REPRODUCTION IN ORGANISMS

1. Life Cycle

The life cycle of an animal or plant is the series of changes or developments that it passes through from the beginning of its life until its death.

2. Lifespan

It is the time period from the birth to the natural death of an organism. It is not necessary that the lifespan of an organism is related to their body size.

3.Reproduction

It is a biological process in which an organism gives rise to young ones or offspring similar to itself. Reproduction is essential for organisms because it

(i) maintains life on earth.

(ii) enables continuity of a species.

(iii) creates variations among populations. It can be categorised as asexual and sexual reproduction.

4. Asexual Reproduction

It is the phenomenon of production of an offspring by a single parent without the formation and fusion of gametes. It involves only mitotic cell division. Thus, the offspring produced by this method are identical and exact copies of their parents. They are called as **clones**.

A. It is the primary means of reproduction among the protists, cnidarians and tunicates. It occurs through following methods

(i) Binary fission is the division of parent body into two equal halves, e.g. Amoeba, Paramecium, etc.

(ii) Budding is the process in which an outgrowth is produced from parent's body that separates to give rise to a new individual, e.g. yeast, Hydra, etc. If bud grows externally on the surface of the body, it is known as external (exogenous) budding, e.g. yeast. If bud grows within the parental body, it is known as internal (endogenous) budding or gemmule formation, e.g. sponges, Marchantia.

(iii) Sporogenesis/Sporulation Spores are the reproductive cells of many multicellular organisms. Spores are capable of producing daughter cells by their growth. Algae and fungi have different types of spores like

(a) Zoospores (motile and flagellated endogenous spores, e.g. Chlamydomonas).

(b) Conidia (non-motile exogenous spores are formed, e.g. Penicillium).

(iv) Fragmentation is the breaking of parent body into several fragments. Each of these fragments develop into mature individuals, e.g. Spirogyra, sea star, etc.

(v) Regeneration is the formation of a whole new body of an organism from a cut or broken part of the parent's body, e.g. Hydra, Planaria, etc.

B. **Asexual Reproduction in Plants** In some plants, vegetative units possess the capability of producing new plant, e.g. roots, stems, leaves and meristematic tissues which grow to form new plants. This method is called **as vegetative propagation or vegetative reproduction**.

(i) **Natural Vegetative Propagation** It is the natural method of propagation. The vegetative propagules of plants develop into new plants under suitable conditions. It is done by **roots** (sweet potato), **underground stems** include rhizomes, e.g. banana, ginger; **bulbs**, e.g. garlic, onion; **tubers**, e.g. potato; **corms**, e.g. Colocasia; **creeping stems** include **suckers**, e.g. Chrysanthemum; **runners**, e.g. lawn grass or Cynodon; **stolons**, e.g. Vallisneria; **offsets**, e.g. Pistia, **aerial stems**, e.g. Opuntia, **leaves** e.g. Bryophyllum, Kalanchoe, Begonia, etc, **bulbils** e.g. Agave, Oxalis, Allium sativum, lily, etc.

(ii) **Artificial Vegetative Propagation** It is of four types, i.e. cutting, layering, grafting and micro propagation.

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Artificial Method	Examples (Plant Name/Plant Part)
Cutting	Leaves (Bryophyllum), roots (tamarind), ste (grapes, sugarcane and rose), etc.
Layering	Jasmine, grapes, litchi, orange, etc.
Grafting	Rose, apple, pear, mango, etc.
Micro propagation	Banana, orchid and ornamental plants
5. Sexual Reproduction	

Plant Parts for Artificial Propagation

The mode of reproduction which involves the formation of male and female gametes either by the same individual or by different individuals of opposite sex is known as **sexual reproduction**.

6. Phases in Life Cycle

All organisms grow and mature in their life, to be able to reproduce sexually. On this basis, their life cycle can be divided into three phases, i.e. juvenile phase, reproductive phase and senescent phase.

Note •Some animals remain reproductively active throughout their reproductive phase; such animals are called **continuous breeders**, e.g. human. On the other hand, some animals become reproductively active only during the favourable seasons; such animals are called **seasonal breeders**, e.g. dog, birds, frog, lizard, etc.

• During the reproductive phase in non-primate animals, oestrous cycle occurs, while in the primates **menstrual cycle** occurs.

7. Events in Sexual Reproduction

The sequential events in sexual reproduction are grouped under three main events. These are pre-fertilisation, fertilisation and post-fertilisation events.

(i) **Pre-fertilisation Events** The events taking place before fertilisation are called prefertilisation events. These include gametogenesis and gamete transfer. **Gametogenesis** is the process of formation of haploid gametes.

When two gametes (i.e. male and female) are morphologically similar, they are called **isogametes** or **homogametes**, while morphologically dissimilar gametes are called **heterogametes**. To facilitate fusion of gametes, they should come in physical association with each other. This phenomenon is called **gamete transfer**.

In flowering plants, male gamete reaches the female gamete, through the process of pollination (transfer of pollen grain to stigma).

(ii) **Fertilisation** The complete and permanent fusion of male and female gametes is known as fertilisation or syngamy or amphimixis. It results in the formation of a diploid structure called zygote.

• The process of fertilisation may occur outside the body of organisms, i.e. external fertilisation (e.g. algae, amphibians, fishes, etc.) or inside the body of organisms, i.e. internal fertilisation (e.g. fungi, reptiles, birds, higher animals and plants).

• Parthenogenesis is the development of an embryo from an unfertilised egg. In organisms like rotifers, honeybees, lizards and some birds, the female gametes form new organisms without fertilisation.

(iii) **Post-fertilisation Events**These are the events which take place after the formation of zygote in all sexually reproducing organisms. These events include the development of zygote and embryo after fertilisation.

Further, the development of zygote depends upon the type of life cycle and the environment of organism. The process of development of embryo from this zygote is called embryogenesis which involves cell division, cell enlargement or growth and cell differentiation. Embryogenesis in animals and plants occurs differently as follows

(a) **Embryogenesis** in Animals It occurs on the basis of whether the development of zygote is taking place outside or inside the body of female parent. Animals are divided into two types

- Oviparous Animals laying eggs, e.g. reptiles.
- Viviparous Animals giving birth to young ones, e.g. mammals.

(b) **Embryogenesis in Plants** In flowering plants, the zygote is formed inside the ovule. Afterwards the sepals, petals and stamens of flower wither and fall off. After fertilisation, the zygote develops into embryo, ovules into seed and ovary into the fruit. The seed after dispersal in favourable condition germinates to produce new plants.