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CONCEPT TUTORIALS



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Life Span:- The duration between birth and death is known as life span. Life span has four stages.

- (1) Juvenility (2) Maturity (3) Ageing (4) Senescence

Juvenility:- The early period of life span from the time of birth upto the stage when an organism develops capacity to reproduce.

Maturity:- The period during which the organism reproduces.

Ageing:- When the body of the organism starts degeneration.

Senescence:- Ageing terminates into senescence when the deteriorating changes become irreversible. Senescence finally leads to death.

Reproduction:- All the organisms have a property to produce more of its own kind by the process called reproduction.

Types:- Reproduction is of two types:-

- (1) Asexual (2) Sexual

Asexual:- Production of offspring by a single parent without the formation and fusion of gametes is known as asexual reproduction.

Clone:- Offspring produced from asexual reproduction similar to their parent morphology and genetically is known as clone.

Types of asexual reproduction

- (1) Binary fission:- It is the division of the parent into small, equal sized daughter cells.

Types of Binary Fission:- Fission is of two types

- (1) Binary fission
- (2) Multiple fission

Binary fission:- It is the division of the parent into two equal daughter cells.

First there is division of nucleus (Karyogamy) then there is division of cytoplasm (Cytokinesis). Binary fission is further of two types:-

- 1) Regular Binary fission:- When the shape of the organism is regular e.g. amoeba.
- 2) Irregular Binary fission:- When organism divides itself into lengthwise e.g. Euglena.
- 3) Transverse Binary fission:- When organism divides itself into transverse section e.g. Paramecium.

Multiple fission:- It is the division of the parent into many daughter cells.

e.g. Plasmodium.

Budding:- Formation of a daughter individual from a small projection, the bud, arising on the parent body is called budding.

e.g. Hydra, yeast.

Spore formation:- Spores are vegetative structures which germinate to produce new individuals.

Types of spores:-

- 1) Zoospores
- 2) Sporangiospores
- 3) Chlamydospores
- 4) Oidia
- 5) Conidia

(4) Vegetative Propagation:- The formation of a new plant from any plant part like stem, roots, leaves etc.

- Types:- Vegetative propagation is of two types
- 1) Natural vegetative propagation
 - 2) Artificial vegetative propagation

Natural Vegetative Propagation:- It takes place by roots, underground stem (suckers, runners, culms, tubers), creeping stems (runners, stolons, offsets), aerial stems, leaves, bulbils etc.

Artificial Vegetative Propagation:- It takes place by cutting, layering, grafting, micropropagation.

(a) Cutting:- The small piece of any plant organ used for propagation is called cutting. Stem cutting is used commonly for artificial vegetative propagation. Some hormones like IBA, NAA etc are used. e.g. in grapes, sugarcane, rose etc.

(b) Layering:- In this method, roots are artificially induced on the stem branches before they are detached from the parent plant.

Types:- Layering is of two types:-

- (1) Tip layering
- (2) Mound / Ground layering

Air layering:- It is used in the plants where stem is woody and cannot bend easily e.g. Citrus, orange, lemon, litchi etc.

Mound / Ground layering:- It is used in the plants where stem is flexible and easily bend e.g. Jasmine,

Strawberry, Cherry etc.

(c) Grafting:- Grafting is done between the two closely related dicots having vascular cambium. The rooted supporting portion of the plant (stock) is joined with a twig of another plant called (scion).

- Types of Grafting:-
- (1) Tongue grafting
 - (2) Wedge grafting
 - (3) Crown grafting
 - (4) Side grafting
 - (5) Bud grafting

(d) Micropropagation:- This method includes propagation of plants by culturing the cells, tissues and organs called tissue culture.

Callus:- The culturing of cells or tissues results in the formation of an undifferentiated mass of cells called callus.

Importance of Vegetative Propagation

1. We can produce disease free plants
2. This is cheap and easy method to grow plants
3. In a short period of time, we can produce large amount of plants
4. We can produce new variety of plants.
5. This is the only method of reproduction in these plants which have lost their capacity to produce seeds
6. Plants with prolonged seed dormancy reproduce mostly by vegetative propagation.

Sexual Reproduction

Sexual reproduction:- This is a kind of reproduction in which two parents produce offspring. Male gamete and female gamete fuse with each other and form zygote by the process of fertilisation.

Events in sexual reproduction:- There are three main events in sexual reproduction.

1. Pre-fertilisation events
2. Fertilisation
3. Post-fertilisation events.

[A] Pre-fertilisation events:- This event further involves two events - (1) Gametogenesis (2) Gamete transfer

[1] Gametogenesis:- Formation of gametes (male and female) inside the gametangia, is called gametogenesis.

Isogametes:- If the gametes (male and female) are similar in shape and size. These are also called homogametes.

Heterogametes:- When the male and female gametes are not similar.

Microgametes:- Male gametes are smaller in size, so they are called microgametes.

Machogametes:- Female gametes are larger in size so they are called machogametes.

Unisexual / dioecious:- When male produces male gametes and female produces female gametes, these animals are known as unisexual or dioecious.

Bisexual / monoecious / hermaphrodite:- When both the gametes produced by a single individual e.g. earthworm, leech etc.

Haploid:- The gamete having half number of chromosomes.

Diploid:- When two haploid gametes fuse with each other. They form zygote. Zygote is diploid, as it contains full number of chromosomes.

[2] Gamete transfer:- Female gamete is non-motile but male gamete is motile. In plants as well as in animals, male gamete transferred to female gamete.

In animals, male gametes are transferred with the help of ~~se~~ fluid called semen. Fusion of male and female gametes is known as fertilisation.

In plants, pollen grains are transferred to the stigma of female, this process is known as pollination.

[B] Fertilisation:- Fusion of male gamete with female gamete is known as fertilisation.

Types of fertilisation:-

(1) External fertilisation:- External Development:- when both (male and female) gametes fuse outside the body, and the development of zygote takes place outside the body. e.g. frog.

(2) Internal fertilisation and External Development:- when fertilisation takes place inside the body of female but development of zygote to occur outside the body of female. e.g. birds.

(3) Internal fertilisation and internal development:- when fertilisation and development both occur inside the body of the female e.g. human beings.

Syngamy and Fertilization:- Syngamy involves close association of gametes and all their acts resulting in the formation of a zygote including the fusion of nuclei.

Parthenogenesis:- Formation of offspring without the act of fertilization.

- Types:- It is of two types -
1. Natural parthenogenesis
 2. Artificial parthenogenesis

Natural Parthenogenesis:- It is of two types:-

- (1) Complete Parthenogenesis:- In this, there is no sexual reproduction, as there are no males at all. e.g. Indian snakes.
- (2) Incomplete Parthenogenesis:- Some animals show both sexual and parthenogenesis. In honey bees, female honey bees sexual produce offsprings with the help of drones (male honey bee) and sometimes female honey bees produce offsprings without the act of fertilization.

Artificial Parthenogenesis:- In this type, artificial stimuli are given to animal, so that it can produce parthenogenetically. Like fish of a newly electric shock, change in temp, addition of steroid.

Post-Fertilization Events:- The result of fertilization is zygote. Zygote is diploid (2n) and it undergoes meiosis. Zygote develops into embryo.

Embryogenesis:- The process of development of embryo from zygote is called embryogenesis.

Gonogenesis:- In sexual reproduction, development of the offspring from reproductive units such as birds or fragments.

Oviparous animals:- Animals lay eggs e.g. birds, lizards, snake etc.

Viviparous animals:- These animals give birth to young ones e.g. human beings, dogs, cats etc.

IMPORTANT DIFFERENCES

Zygote	Embryo
1. Fusion of gametes forms zygote	1. Zygote undergoing embryogenesis forms embryo
2. Zygote is unicellular in nature	2. Embryo is multicellular in nature
3. Zygote is the first stage in development of a new organism	3. Embryo is a second stage in development of a new organism
4. Process of formation of zygote is termed as fertilization	4. Process of formation of embryo is termed as embryogenesis
<u>Sexual Reproduction</u>	<u>Asexual Reproduction</u>
1. It requires two individuals of opposite sex	1. There is no involvement of two sexes
2. Reproduction by fusion of male and female gamete	2. It does not involve fusion of male and female gametes
3. Offsprings show variations	3. Offsprings are exact

Sexual Reproduction

1. This process is longer
2. It does not involve meiosis
3. Zygote is formed

Zoospore

1. It is a motile asexual spore that moves with the help of flagella

2. It is asexual reproduction structure

Gametogenesis

1. Process of formation of haploid male and female gametes
2. Diploid meiocytes undergo meiosis

Monococious

1. It is a bisexual condition
2. Chances of self pollination is greater

Asexual Reproduction

1. It is quicker mode of reproduction
2. It involves meiosis
3. Zygote is not formed

Zygote

1. It is non-motile diploid cell resulting from fertilization

2. It is the result of sexual reproduction

Embryogenesis

1. It is the process of development of an embryo
2. Diploid zygote undergoes asexual mitotic division

Dioecious

1. It is a unisexual condition
2. Chances of self pollination is relatively low

Imp. Questions

(1) Q Why is reproduction essential for organisms?

Ans: Reproduction is essential for organisms because it enables the continuity of the species generation after generation.

(2) Q Why is asexual reproduction better than sexual reproduction?

Ans: Sexual reproduction is a better mode of reproduction because it needs meiosis and fusion of male and female gametes. Such a fusion involving two parents results in the offspring that are not identical to the parents. It also causes variation which is essential for evolution and survival of species under diverse changes in environmental factors.

(3) Q Why is the offspring formed by asexual reproduction superior to as a clone?

Ans: Asexual reproduction results in the production of offsprings which are morphologically and genetically similar. Such individuals are called clones.

(4) Q Offsprings formed due to sexual reproduction have better chances of survival, why?

Ans: Offsprings formed due to sexual reproduction have better chances of survival because they possess the genetic material of two parents and that too shows variation. This is important for survival of the species.

(5) Q How does the progeny formed from asexual reproduction differ from those formed by sexual reproduction?

Ans: The progeny formed from asexual reproduction is different from those as the offsprings are morphologically and genetically similar to that of parents. The progeny formed from sexual reproduction are

different from that of parents.
(6) Q:- Explain why meiosis and gametogenesis are always intertwined?

Ans Gametogenesis is the process of the formation of haploid gametes inside the gametangia. The normal body of organisms is usually diploid but the gametes are haploid. Thus, gametes are formed as a result of meiosis so that their chromosome number becomes haploid.

(7) Q:- Why offspring of oviparous animals are at greater risk as compared to offspring of viviparous animals?

Ans Oviparous animals lay eggs in a safe place. Viviparous animals give birth to young ones. The eggs are at greater risk from their predators. In viviparous if the egg develops into a young one inside the body of the female where it gets proper nourishment, care and protection. Therefore oviparous offspring are at greater risk.

(8) Q:- Give two examples which reproduce asexually by binary fission

Ans Bacteria and amoeba

(9) Q:- Name a unicellular fungus which reproduces asexually by budding.

Ans yeast

(10) Q:- Name a multicellular invertebrate which reproduces asexually by budding.

Ans Hydra

(11) Q:- What is clone?

Ans Morphologically and genetically similar individuals produced as a result of asexual reproduction.

what are vegetative propagules?
(12) Q:- In plants, the roots of vegetative propagation such as tubers, bulb etc.

(13) Q:- Name the phenomenon and one bird where the female gamete directly develops into a new organism.

Ans Phenomenon - Parthenogenesis

(14) Q:- Diff. between Parthenocarpy and Parthenogenesis

Ans Parthenocarpy is the formation of fruits without fertilization whereas parthenogenesis is the formation of embryo from unfertilized egg.

(15) Q:- Diff. between Syngamy and fertilization

Ans Syngamy is actual fusion of male and female gametes whereas fertilization includes all the associated events that ultimately lead to syngamy.

(16) Q:- Although potato tuber is an underground part, it is considered as a stem.

Ans On potato, we find eyes in the depression of scaly leaves which grow out to form the plants and help in vegetative propagation.

(17) Q:- Why are the plants raised through micropropagation termed as Somaclones?

Ans Plants that are raised through micropropagation are genetically identical to the original plant from which they have grown. So they are called Somaclones.