

CLASS 12

CBSE

BIOLOGY

- ▶ Specially designed eBook for complete CBSE syllabus
- ▶ CBSE preparation strategy & direction, speedy revision
- ▶ Chapter-wise important Problem-Solving
- ▶ Theory, Formulas & Diagrams to crack CBSE
- ▶ Updated New Pattern Objective questions
- ▶ Detailed high quality video lectures by experienced faculties
- ▶ CBSE full preparation for Class XI & XII



misostudy
connect smart learning

JEE·NEET·AIIMS·CBSE·FOUNDATION
www.misostudy.com

☎ 8929803804 (MON-FRI: 9am-6pm) support@misostudy.com

MISO STUDY INDIA PVT. LTD.
2ND FLOOR 65-A, OMPRO TOWER, KALU SARAI, NEW DELHI, DELHI 110016

Class 12 | Biology

03 Reproduction in Organism

has both unicellular

? When is a fungus

unicellular → Protista

Multi cellular → Penicillium

Misostudy.com



Scientific eBook

This is a sample eBook. The eBook provides chapter-wise theories and examples, formulas, diagrams, and Exam pattern Problem-Solving of the full syllabus.



Complete video lectures

The theory and Problem-Solving in this eBook provide specially designed the video lectures by experienced faculties. Get Free trial and preview on Misostudy.com.

01. Introduction

A vast number of plant and animal species have existed on the earth for several thousand of years. The process in living organisms that ensures this continuity is Reproduction. Reproduction is one of the most characteristic feature of living organisms. Life will not exist on the earth if plants and animals do not reproduce to make offsprings.

02. Life span

Life span can be defined as the period from birth to the natural death of an organism. It can vary from as short as few days to as long as a number of years.

Maximum Life Span : Maximum life span is the maximum number of years survived or the greatest age reached by any member of a species. The average life span refers to the average number of years survived or age reached by the members of a population. The maximum life span of a domestic dog is about 20 years and that of a laboratory mouse is 4.5 years. The maximum life span of humans has been estimated to be about 121 years.

03. Reproduction

Reproduction is the means of self perpetuation of a race in which new, young, similar looking individuals are formed by the grown up or adult individuals. The adults which give rise to young ones are called parents.

Functions of Reproduction :

- (i) It replaces the individuals dying due to senescence or ageing.
- (ii) Individuals removed from population due to predation or disease are replaced through reproduction.
- (iii) It introduces variations essential for adaptability and struggle for existence.

Basic Features of Reproduction :

- (i) Replication of DNA.
- (ii) Division of cells. It may or may not involve meiosis.
- (iii) Growth due to synthesis of more protoplasm.

- (iv) Formation of reproductive units.
- (v) Elaboration and development of reproductive units to form new young individuals.

Types of Reproduction

Broadly speaking, there are two types of reproduction, asexual and sexual. Asexual reproduction does not involve gamete formation and fusion. It is uniparental. On the other hand, sexual reproduction consists of formation and fusion of gametes of opposite sexes. It is mostly biparental with two types of parents of different sexes but can be single/uniparental also, as in case of bisexual or hermaphrodite animals.

I. Asexual Reproduction

It is the mode of reproduction in which new individuals develop directly from specialised or unspecialised parts of a single parent without involving fusion of gametes or sex cells.

Asexual reproduction occurs in both single celled and multicelled individuals. The parent individual splits, buds or fragments to form identical daughter cells or individuals, e.g., Amoeba, Paramecium, Euglena (acellular protists), Sycon, Hydra, Tubularia, Planaria, Ascidia (metazoans). Asexual reproduction is also called agamogenesis or agamogeny. In this mode of reproduction, somatic cells undergo mitosis during the formation of a new individual. Therefore, it is also called somatogenic reproduction. Young ones resulting from asexual reproduction are exactly identical with the parent except in size and are called clones. Each individual of a clone is referred to as a ramet.

Asexual reproduction occurs by fission, budding and fragmentation.

(A) Fission : It is a mode of asexual reproduction in which the body of a mature individual divides into two or more similar and equal sized daughter individuals. Fission can be binary fission or multiple fission.

- (a) **Binary Fission** : It is the division of the body of an individual into two equal halves, each of which functions as an independent daughter individual. In unicellular organisms, binary fission is accompanied by mitotic division of nucleus followed by cytokinesis. In metazoans. The organisms which undergo binary fission seldom die of senescence or old age because as soon as they mature, they divide into two daughters. They are, therefore, nearly immortal. Depending on the plane of division, binary fission is of the following types:
 - (i) **Simple Binary Fission (Irregular Binary Fission)** : Division can occur through any plane e.g., Amoeba.
 - (ii) **Longitudinal Binary Fission** : The plane of fission passes along the longitudinal axis of the organism, e.g., Euglena, Vorticella.
 - (iii) **Oblique Binary Fission** : The plane of binary fission lies at an angle to the transverse axis e.g., Ceratium, Gonyaulax.
 - (iv) **Transverse Binary Fission** : The plane of binary fission runs along the transverse axis of the individual, e.g., Paramecium, diatoms, bacteria. In Paramecium, transverse binary fission is preceded by a mitotic division of meganucleus and mitotic division of micronucleus. In it, binary fission produces two dissimilar daughters, one proter (anterior) and the other opisthe (posterior). Both develop the deficient components and become similar.

- (b) **Multiple Fission** : The nucleus divides several times by amitosis to produce many nuclei, without involving any cytokinesis. Later, each nucleus gathers a small amount of cytoplasm around it and the mother individual splits into many tiny daughter cells (e.g., Amoeba, Plasmodium, Monocystis, etc). In course of time, each of these daughter cells starts a free life and transforms into an adult individual. This kind of fission is called multiple fission.
- (c) **Cyst formation** : In response to unfavourable living conditions, an Amoeba withdrawn its pseudopodia and secretes a three-layered hard covering or cyst around itself.

This phenomenon is termed as **encystation**. During favourable conditions, the encysted Amoeba divides by multiple fission and produces many minute amoubae or pseudopodiospores; the cyst wall bursts out and the spores are liberated in the surrounding medium to grow up into many Amoebae. This phenomenon is known as sporulation. Acellular protists like sporozoans (e.g., Monocystis, Plasmodium, etc.) typically exhibit sporulation in their life cycles.

- (B) **Budding** : In budding, new individuals are formed by mitosis. Initially, a small outgrowth of the parent's body develops into a miniature individual. It then separates from the mother to lead a free life (e.g., Hydra). This type of budding is known as exogenous budding. Sometimes, the buds do not get separated from the mother individual and form a colony. For example, in Obelia, the colony consists of a number of individuals jor zooids that perform different functions. In all fresh water sponges (e.g., Spongilla) and some marine sponges (e.g., Sycon), the parent individual releases a specialized mass of cells enclosed in a common opaque envelope, called the gemmule. On germination, each gemmule gives rise to offspring and the archeocytes present in it give rise to various cells of the body of sponge as they are **totipotent**. Gemmules are thought to be **internal buds**.
- (C) **Fragmentation** : The body of the parent breaks into distinct pieces, each of which can produce an offspring (e.g., Hydra, some marine worms, sea-stars).

Advantages of Asexual Reproduction :

- It is uniparental.
- It is a rapid mode of reproduction.
- The young ones are exact replicas of their parent.
- Asexual reproduction is simpler than sexual reproduction.

Disadvantages of Asexual Reproduction :

- As there is rapid multiplication, a large number of young ones are formed which causes overcrowding.
- There is no mixing of genetic material, so no new combination or variation takes place.
- There is no crossing over, hence new linkages are not formed.
- It has no role in evolution.
- Adaptability to changes in environment is low due to absence of new variations.

II. Sexual Reproduction

Sexual reproduction involves formation and fusion of gametes to form the zygote which develops to form a new organism.

Characteristics :

- (a) Two fusing gametes can be produced by same individual or different individuals.
- (b) Offsprings produced are not identical to parents.
- (c) It involves meiosis and syngamy (fusion of gametes).
- (d) It is a slow, elaborate or complex process, so multiplication is not so rapid.

Phases in Life Cycle

- (a) **Juvenile phase**
- (b) **Reproductive phase**
- (c) **Senescent phase**

- (a) **Juvenile phase/Pre-reproductive phase** : During this phase organism will show growth so that it can attain certain maturity to perform the sexual reproduction. This phase is known as vegetative phase in plants. It is of variable durations in different organisms.
- (b) **Reproductive phase** : Reproductive organs develop and mature during this phase. In the higher plants (Angiosperms). end of juvenile phase or onset of reproductive phase is easily marked. In the higher plants during this phase, there is formation of reproductive structures i.e., flowers.
- (c) **Senescent phase** : It is a post-reproductive phase. It involves structural and functional deterioration of body by accumulation of waste metabolites which ultimately leads to death.

Events in Sexual Reproduction

After attainment of maturity, all sexually reproducing organisms exhibit events and processes that have remarkable fundamental similarity, even though the structures associated with sexual reproduction are indeed very different. These sequential events may be grouped into three distinct stages, namely, the pre-fertilization, fertilization and the post-fertilization events.

A. Pre-fertilization Events

These are events in sexual reproduction which occur prior to the process of fertilization. The two main pre-fertilization events are **gametogenesis** and **gamete transfer**.

- (a) **Gametogenesis** : It refers to the process of formation of gametes – male and female.

Categories of Gametes :

- (i) **Isogametes** : When the fusing gametes are morphologically similar they are known as isogametes or homogametes. They are produced in some algae and fungi.
 - Algae : Cladophora, Chlamydomonas debaryana, Ulothrix
 - Fungi : Synchytrium, Rhizopus
- (ii) **Heterogametes** : When the fusing gametes are morphologically distinct types, they are known as heterogametes. It is the feature of majority of sexually reproducing organisms. e.g.
 - (a) Algae : Fucus, Volvox, Chara
 - (b) All Bryophytes, Pteridophytes, Gymnosperms and Angiosperms.
In such organisms, male gamete is called antherozoid or sperm and the female gamete is called egg or ovum

03 Reproduction in Organism

Cell Division During Gamete Formation : Gametes are always haploid i.e., they possess only one set of chromosomes or genome though the parent body producing gametes may be either haploid or diploid. As gametes are always haploid so surely in haploid parent, gametes are produced by mitotic division. In plants belonging to group pteridophytes, gymnosperms and angiosperms and animals the parental body is diploid. Here reductional division occurs before or at the time of gamete formation. The cells which undergo meiosis are called meiocyte. If meiocyte is indulged in gamete formation, then it is called gamete mother cell. In haploid organisms, gametes are produced through mitosis but you must not think that meiosis never occurs in life cycle of haploid organisms.

This could be made clear from what you have learnt in previous classes. In these organisms like haploid algae and some fungi, meiosis occurs in zygote or zygospore which is called zygotic meiosis.

04. Sexuality in Organisms :

Lower Organisms : In most of the lower sexually reproducing organisms, two fusing gametes are morphologically similar. If these gametes belong to the same parent then such organisms are called homothallic, e.g., fungi (*Mucor mucedo*). When these gametes belong to different parents then these organisms are called heterothallic.

Higher Organisms : In higher plants there are well-developed sex organs and there is clear distinction between male and female sex organs. Angiosperms possess flowers as reproductive structures. The male sex organ is called stamen and female sex organ is carpel or pistil. If male and female sex organs occur in the same flower then these plants are called bisexual, e.g., China rose. If flowers possess only stamen or carpel then these plants are called unisexual. When male flower (staminate) and female flower (pistillate) are present on same plant body such plants are monoecious, e.g., cucurbits, coconut and maize. However, if they are present on separate plant body then these plants are known as dioecious, e.g., date palm and papaya.

05. Gamete Transfer :

After the formation of male and female gametes, compatible gametes must be physically brought together to facilitate fusion (fertilisation or syngamy). In few fungi and algae, both types of gametes are motile. But in majority of organisms male gamete is motile and the female gamete is non-motile. So there is a need of a medium through which the male gametes move.

In seed plants both male and female gametes are non-motile. Here pollen grains are the carrier of male gametes and ovule has the egg. As the male gamete is non-motile so it cannot swim through water medium to reach female gamete rather pollen tube serve this purpose. For this pollen grain produced in anther (σ part) are transferred to the stigma of female organ i.e., carpel through the process of pollination.

03 Reproduction in Organism

Pollination is of two type i.e., self pollination and cross pollination. Self pollination is the transfer of the pollen grains from anther of a flower to the stigma of same flower or different flower of the same plant. Cross pollination is transfer of the pollen grain from anther of one flower to the stigma of different flower of other plant.

06. Fertilization

The most vital event of sexual reproduction is the fusion of gametes. This process is called syngamy or fertilization which results in the formation of a diploid zygote.

- (a) **External fertilization** : Syngamy occurs outside the body of organism in external medium (water). It is shown by majority of aquatic organisms like most of algae, fishes as well as amphibians.
- (b) **Internal fertilization** : Syngamy occurs inside the body of organisms. It is present in majority of plants like bryophytes, pteridophytes, gymnosperms and angiosperms. It occurs in few algae like spirogyra. In all these organisms egg is formed inside the female body where syngamy occurs.

07. Post-Fertilization Events

Events in sexual reproduction after the formation of zygote are called post-fertilization events.

Zygote : It is the first cell of the new generation in all sexually reproducing organisms. Zygote is always diploid. It is formed in the external aquatic medium in those organisms which perform external fertilization. Zygote is produced inside the body in cases where fertilization is internal.

In many algae and fungi, the zygote secretes a thick wall that is resistant to desiccation and damage, which help organisms to tide over unfavourable conditions. During unfavourable conditions it undergoes a period of rest until a swing back to sustainability occurs.

Embryogenesis : Embryogenesis is the process of development of embryo from zygote.

Embryo is a multicellular stage in the life cycle of a plant or animal prior to formation of an independent individual. In embryogenesis, the zygote undergoes repeated cell divisions through mitosis. Cell differentiation occurs at specific locations resulting in production of different tissues, organs and organ systems. Development of different external and internal structures is called morphogenesis. Embryo formation is present in all plant groups, except algae. In flowering plants, zygote develops into embryo. The food for development of embryo comes from a special tissue known as endosperm. Ultimately, the fertilized ovule matures into a seed. Inside the mature seed is the progenitor of the next generation, the embryo. A number of seeds develop in an ovary depending upon the number of ovules. Meanwhile, wall of the ovary also proliferates. It produces pericarp or fruit wall. The pericarp can be dry or fleshy. The ripened ovary with pericarp and seeds is called fruit.

Differences between Asexual and Sexual Reproduction	
Asexual Reproduction	Sexual Reproduction
i. New individuals are formed from a single parent.	i. Commonly two parents are involved in the formation of new individuals through sexual reproduction.
ii. Asexual reproduction does not require the production of sex organs.	ii. Formation of sex organs is a pre-requisite for sexual reproduction.
iii. It does not involve meiosis. All divisions are mitotic.	iii. Sexual reproduction involves meiosis at one or the other stage. In higher plants, it occurs at the time of spore formation or sporogenesis.
iv. Asexual reproduction does not involve fusion of cells or gametes.	iv. It involves fusion of gametes.
v. New individual develops from one cell or a part of one parent.	v. New individual develops from zygote i.e., fusion product of two gametes.
vi. New individuals are genetically similar to the parents.	vi. Offspring or new individuals are genetically different from either of the two parents.
vii. It does not introduce variability. Hence, asexual reproduction has no evolutionary importance.	vii. It introduces variability and is, hence of evolutionary importance.
viii. It is quick method of multiplication.	viii. Sexual reproduction is a slower method of multiplication.
ix. It is simple process.	ix. It is elaborate or complex process.

CBSE Exam Pattern Exercise

Subjective Questions (1)

(Q 1 to 3) One Mark

1. Write the name of the organism that is referred to as 'Terror of Bengal'.
2. Give one example each of a fungus which reproduces by
 - (i) budding
 - (ii) conidia

3. Name an organisms, where cell division is itself a mode of reproduction.

(Q 4 to 6) Two Marks

4. Name an alga that reproduces asexually through zoospores. Why are these reproductive units so called?
5. Offsprings produced by asexual reproduction are called clones. Justify
6. Unicellular organisms are immortal, whereas multicellular organisms are not. justify.
 - (i) Name the organism that reproduce. through the following reproductive structures:
 - (a) Conidia
 - (b) Zoospores
 - (ii) Mention similarity and one difference between these two reproductive units.

(Q 7 to 8) Three Marks

7. Which one of the following statements is true for years?
 - (i) The cell divides by binary fission. One of them develops into a bud.
 - (ii) The cell divides unequally. The smaller cell develops into a bud.
 - (iii) The cell produces conidia, Which develop into a bud.
8. Coconut palm is monoecious, while date palm is dioecious. Why are they so called?

(Q 9 to 10) Five Marks

9.
 - (i) List the three states the annual and biennial angiosperms have to pass through during their life cycle.
 - (ii) List and describe any two vegetative propagules in flowering plants.
10. Differentiate between an annual and biennial plant. Provide one example of each.



Answer & Solution

Q1

Water hyacinth is referred to as the 'Terror of Bengal'

Q2

Fungus that reproduces by

- (i) budding–Yest
- (ii) conidia–*penicillium*

Q3

In unicellular organisms like *Amoeba*, bacteria, etc, cell division itself is a mode of reproduction

Q4

Chlamydomonas in an alga that reproduces asexually through zoospores. Due to mobility (motile), these reproductive units are referred to as zoospores.

Q5

Offsprings produced by asexual reproduction are called clones. because

- (i) they are morphologically similar to their parent.
- (ii) they have same genetic composition as their parent.

Q6

Unicellular organism are considered immortal mainly because, in them the parent body as a whole

03 Reproduction in Organism

constitutes the reproductive unit and after reproductive continues to live as daughter cells. The multicellular organisms produce their reproductive structures in specialised organs and their whole body dies due to ageing and senescence.

Q7

Statement (ii) is true for yeast. The cell division unequally. The smaller cell develops into a bud.

Q8

Papaya and date palm plants are said to be dioecious because male and female flowers are borne on separate plants. whereas cucurbits and coconut palms are monoecious because male and female flowers are borne on the same plant.

Q9

Water hyacinth is referred to as the Terror of Bengal'

Q10

Annual plants	Biennial plants
These plants complete their life cycle in one year.	These plants complete their life cycle in two years.
The vegetative and reproductive phases occur within a year only.	Flowering occurs during second year, after a year of vegetative growth.
Since, these plants require less time, they	Due to more required time in growing, these plants are of high maintenance type.
E.g cereals, legumes, marigold, gerberas, etc.	E.g trees, shrubs and some grasses, poppy foxglove, etc

CBSE Exam Pattern Exercise

Objective Questions (2)

1. Stock and scion are used in

- (a) cutting
- (b) grafting
- (c) layering
- (d) micropropagation

2. In ginger, vegetative propagation occurs through.

- (a) rhizome
- (b) offsets
- (c) bulbils
- (d) runners

3. Which of the following pairs is not correctly match?

Mode of reproduction	Example
(a) Offset	— Water hyacinth
(b) Rhizome	— Banana
(c) Binary	— Sargassum
(d) Conidia	— Penicillium

4. Which of the following processes ensures the continuity of life on earth?

- (a) Reproduction
- (b) Respiration
- (c) Digestion
- (d) Growth and development

5. Budding is found in

- (a) Sycon
- (b) Hydra
- (c) Fasciola
- (d) Obelia



Answer & Solution

Q1. (b)

Stock and scion are used in grafting. Grafting is a horticulture technique wherein tissues from one plant are inserted into those of another, so that the two sets of vascular tissues join together. This technique is most commonly used in asexual propagation of commercially grown plants. In this technique, one plant is selected for its roots and is called the **stock** or **root stock**.

The other plant is selected for its stems, leaves, flowers or fruits and is called the **Scion**. The scion and stock contains the desired genes to be duplicated in future production by the stock and scion plant.

Q2. (a)

In ginger, vegetative propagation occurs through rhizome. Rhizomes are stems which grow horizontally under the ground.

In ginger, the underground stems are swollen with food reserves. The terminal bud grows upward to produce the flowering shoot and the lateral buds grow out to form new plant.

Q3. (c)

The plant body of Sargassum is a diploid sporophyte. It does not multiply asexually by means of spores instead, it the only known method of vegetative means, i.e. fragmentation, which is the only known method of vegetative reproduction in the free-floating species of Sargassum.

Q4. (a)

Reproduction is the process of formation of new individuals of a species from the pre-existing one. It is meant for perpetuation of a species because the older individuals of each species undergo senescence and die.

Q5. (b)

Hydra reproduces asexually by exogenous budding, a type of vegetative propagation and sexually by formation of gametes. Hydra reproduces by budding, when plenty of food is available.