

UNIT-VI

Reproduction

CHAPTER

1

REPRODUCTION IN ORGANISMS

Syllabus

- **Reproduction in Organisms** : Reproduction, a characteristic feature of all living organisms for continuation of their species; modes of reproduction—aseexual and sexual reproduction; asexual reproduction—binary fission, sporogenesis, budding, gemmule formation, fragmentation; vegetative propagation in plants.

Chapter Analysis

List of Topics		2016		2017		2018
		D	OD	D	OD	D/OD
Asexual reproduction	<ul style="list-style-type: none"> • Vegetative propagule • Three stages in life cycle of plants 			1 Q (3 M)		
Sexual reproduction	<ul style="list-style-type: none"> • Significance of meiocyte • Sexuality in plants • Difference between parthenogenesis and parthenocarp 	1 Q (2 M)	1 Q (2 M)			1 Q (3 M)

- On the basis of above analysis, it can be concluded that vegetative propagule in angiosperms, concept of meiocyte, sexuality in plants and concept of parthenogenesis and parthenocarp are the most important topics of the chapter.



TOPIC-1

Asexual Reproduction

TOPIC - 1
Asexual Reproduction P. 01

TOPIC - 2
Sexual Reproduction P. 05

Revision Notes

- **Life Span** : It is the period from birth to the natural death of an organism.
- **Reproduction** : It is a process in which an organism gives rise to young ones (offspring) through which cycle of life is maintained.
- **Types of Reproduction** : Asexual reproduction and Sexual reproduction.
- **Asexual Reproduction** : The production of offspring by a single parent is known as asexual reproduction. The offspring produced asexually are identical to one another and also to their parent. Such morphologically and genetically similar individuals are known as clones. It is usually seen in unicellular organisms and in plants and animals which has simple body organization.
- **Different Methods of Asexual reproduction**
 - Fission** : In this, the parent cell divides into two or more individuals. Examples - Protists and Monerans.
Fission is of two types :
 - Binary fission** : It is the division of parent cell into two individuals. Examples - *Amoeba*, *Paramecium*.
 - Multiple fission** : It is the division of parent cell into many individuals. Example – Plasmodium.
 - Budding** : The formation of a daughter individual from a small projection, the bud, arising on the parent body is called budding. It occurs in Yeasts (Fig: 1.1), sponges and *Hydra* (Fig: 1.3).
 - Other Reproductive Structures** :
 - Zoospores** (motile spores)—Found in some algae, fungi and protists.

- (b) Conidia (non-motile spores)—*Penicillium*.
 (c) Gemmules (internal buds of sponges)—Sponges (*Spongilla*).
 (iv) **Vegetative Propagation** : In certain plants, vegetative propagules (the units of vegetative propagation such as runner, rhizome, sucker, tuber, offset and bulb) arise from the nodes of modified stems. When the nodes come in contact with damp soil or water, they produce roots and new plants. Examples,
 (a) Eyes in potato—Emergence of small plants from the buds ('eyes') of the potato tuber.
 (b) Rhizomes of banana and ginger.
 (c) Adventitious buds—Arise from the notches present at margins of leaves of *Bryophyllum*.
 (d) Bulbil—Fleshy bulb in *Agaves* which function as vegetative propagules.
 (v) **Sporulation** : During unfavourable conditions, some organisms get surrounded by a resistant, three layered, hard covering called cyst. The cyst consists of number of spores. These spores get liberated during favourable conditions and this process is called sporulation. *e.g.*, *Amoeba* (Fig. 1.2).
 (vi) **Fragmentation** : A type of asexual reproduction, where an organism splits into fragments and each fragment develops into a new organism *e.g.*, *Spirogyra*, sponges, etc.
 ➤ **Terror of Bengal** : Water hyacinth is known as terror of Bengal because it grows rapidly and enormously and hampers the growth of the native species and eliminates them. It is also known as "blue devil".

IMPORTANT DIAGRAMS:

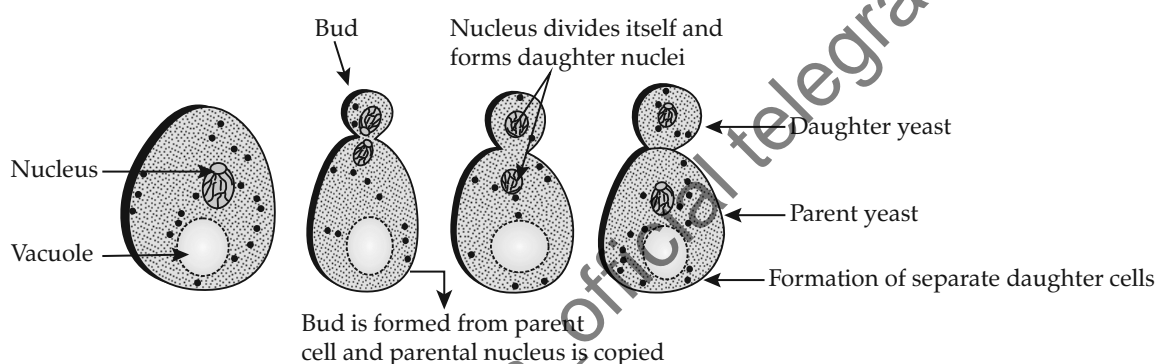


Fig 1.1: Budding in Yeast

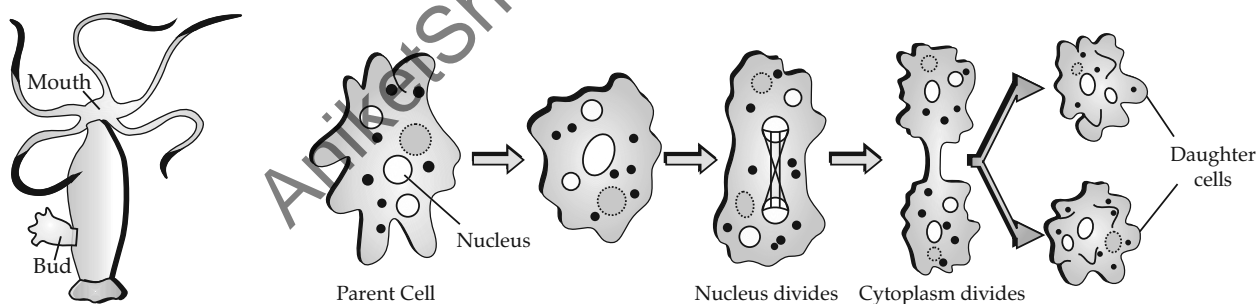


Fig 1.2: Budding Hydra

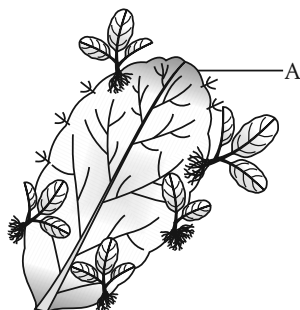
Fig 1.3: Binary fission in Amoeba



Very Short Answer Type Questions

(1 mark each)

Q.1. Identify 'A' in the given diagram and state its function.
 [Delhi Set-I, Comptt. 2016]



Ans. 'A'—Adventitious buds

Function — Vegetative propagation $\frac{1}{2} + \frac{1}{2}$
 [CBSE Marking Scheme, 2016]

Q.2. Identify 'A' in the given diagram and state its function.
 [Delhi Set-II, Comptt. 2016]

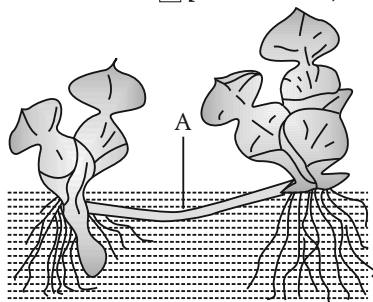


Ans. 'A'—Nodes

Function — Vegetative propagation $\frac{1}{2} + \frac{1}{2}$

[CBSE Marking Scheme, 2016]

Q. 3. Identify 'A' in the diagram and mention its function. [R] [Delhi Set-III, Comptt. 2016]



Ans. 'A'—Offset

Function — Vegetative propagation $\frac{1}{2} + \frac{1}{2}$

[CBSE Marking Scheme, 2016]

Q. 4. Name an alga that reproduces asexually through zoospores. Why are these reproductive units so called? [A] [CBSE, All India, 2013]

Ans. Asexual reproduction by zoospore formation takes place in *Chlamydomonas*. These reproductive units are called as zoospores because they are motile. 1

AI Q. 5. Give an example each of a fungus which reproduces by :

(i) budding

(ii) conidia. [U] [Outside Delhi, Comptt. 2014]

Ans. Budding : Yeast (*Saccharomyces*)

Conidia : *Penicillium*

Q. 6. Name the units of vegetative propagation in grasses and water hyacinth. $\frac{1}{2} + \frac{1}{2}$

[R] [Outside Delhi Set-III, Comptt. 2012]

Ans. Grasses : Runner.

Water hyacinth : Offset. $\frac{1}{2} + \frac{1}{2}$

Q. 7. Name the vegetative propagules in the following :

(i) *Agave*

(ii) *Bryophyllum* [R] [Outside Delhi Set-III, 2014]

Ans. (i) *Agave* : Bulbil

(ii) *Bryophyllum* : Leaf buds/adventitious buds 1

[CBSE Marking Scheme, 2014]

Answering Tip

- Use charts to learn the examples of various vegetative propagules.

Q. 8. Write the name of the organism that is referred to as the 'Terror of Bengal'. [U] [Delhi Set-I, 2014]

Ans. *Eichhornia crassipes* put "water hyacinth under bracket remove slash. (water hyacinth). 1

[CBSE Marking Scheme, 2014]

Answering Tip

- Stress upon writing scientific names correctly according to Binomial Nomenclature.

Q. 9. Which of the following statements is true for Yeast?

(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. [U] [Delhi Set-I, Comptt. 2013]

Ans. (ii) The cell divides unequally. The smaller cell develops into a bud. 1

Answering Tip

- Students are advised to read the statements carefully and understand it properly before writing the answer.

Q. 10. Which of the following statements is true for *Bryophyllum*?

(i) Germinating bud appears from the eye of the stem tuber.

(ii) Germinating bud appears from the node of the rhizome.

(iii) Germinating bud appears from the notch of the leaf margin. [U] [Delhi Set-II, Comptt. 2013]

Ans. (iii) Germinating bud appears from the notch of the leaf margin. 1

Q. 11. Which of the following statements is true for *Hydra*?

(i) It produces asexual gemmules.

(ii) It produces unicellular bud.

(iii) It produces multicellular bud.

[U] [Outside Delhi Set-II, Comptt. 2013]

Ans. (iii) It produces multicellular bud. 1

Q. 12. Why are living plant cells said to be totipotent? [U] [Outside Delhi Set-I, Comptt. 2013]

Ans. The living plant cells are said to be totipotent because the whole plant can be regenerated from a single cell. 1

Q. 13. Which of the following statements is true for ginger?

(i) Germinating bud appears from the eye of the stem tuber.

(ii) Germinating bud appears from the node of the rhizome.

(iii) Germinating bud appears from the notch of the leaf margin.

[U] [Outside Delhi Set-II, Comptt. 2013]

Ans. (ii) Germinating bud appears from the node of the rhizome. 1

Q. 14. Name the mode of reproduction that helps in producing genetically identical offsprings.

[U] [Delhi Set-I, Comptt. 2012]

Ans. Asexual reproduction. 1

Q. 15. Name an organism where cell division in itself is a mode of reproduction.

[U] [Outside Delhi Set-I, II, Comptt. 2013]

Ans. *Amoeba*, a unicellular organism which reproduces asexually by binary fission. 1

Q. 16. Which of the following organisms exhibit binary fission?

Bacillus, *Penicillium*, Yeast, *Amoeba*.

[R] [Outside Delhi Set-I, Comptt. 2012]

Ans. *Bacillus*, Yeast and *Amoeba*. 1

Q. 17. Name the respective asexual reproductive structures of yeast and sponge.

[R] [Outside Delhi Set-II, Comptt. 2012]

Ans. Yeast : Bud (outgrowth of yeast cell)

Sponge : Gemmule. $\frac{1}{2} + \frac{1}{2}$

Q. 18. How does *Penicillium* reproduce asexually ?

[R] [Delhi Set-I, II, III, 2011]

Ans. *Penicillium* reproduces asexually through conidia formation. 1

Answering Tip

- Use charts to learn the name of the organisms with their mode of reproduction.

[AI] Q. 19. Offsprings derived by asexual reproduction are called clones. Justify giving two reasons.

[U] [Outside Delhi Set-II, 2010]

Ans. As they are morphologically (structurally) similar, and genetically identical (exact replica of parental DNA). [CBSE Marking Scheme, 2010] 1

Q. 20. Name the vegetative propagules in (i) Potato, and (ii) *Pistia*. [R] [Foreign set-I, II, III, 2017]

Ans. (i) Auxillary buds/Eye buds (ii) Offset $\frac{1}{2} + \frac{1}{2}$

Q. 21. Name the type of asexual reproduction where the parent cell ceases to exist.

[U] [Delhi Set-I Comptt. 2017]

Ans. Fission / Binary fission / Longitudinal fission / multiple fission.

[CBSE Marking scheme-2017] 1

[AI] Q. 22. Write one difference between binary fission and budding. [U] [Delhi Set-I, III Comptt. 2017]

Ans. Differences between binary fission and budding :

Binary Fission	Budding
Cell divides into two equal halves.	The division is unequal.
Each of the two equal halves rapidly grows into an adult.	The smaller part (bud) remains attached initially to the parent cell which eventually gets separated and matures into a new organism.
Parent cell loses its identity.	The parent cell maintains its identity and forms a separate bud. 1

(Any one) [CBSE Marking Scheme, 2017]

Answering Tip

- Differences when asked should be compatible.
- Answers should be specific and precise. Answers like present and not present are not acceptable.

Q. 23. Banana produces fruits but is propagated only by vegetative means. Why does it do so ?

[E & A] [CBSE Foreign, 2012]

Ans. Seeds are not produced in banana. So, they are propagated only by vegetative methods. 1



Short Answer Type Questions-I

(2 marks each)

Q. 1. Why is banana considered a good example of parthenocarpy?

[U] [Delhi & Outside Delhi Set-I, 2012]

Or

Why is banana referred to as a parthenocarpic fruit? [U] [Outside Delhi, Set-I, Comptt. 2013]

Ans. Parthenocarpy can be induced through the application of growth hormones and such fruits are seedless. Since, banana produces fruit without fertilisation, it is considered a good example of parthenocarpy. 1

[AI] Q. 2. Banana fruit is said to be parthenocarpic whereas turkey is said to be parthenogenetic. Why? [U] [Delhi Set-I, 2015]

Ans. **Banana** : The fruit develops without fertilization from an unfertilized ovary.

Turkey : The ovum/female gamete develop into a new chick without fertilization. 1+1

[CBSE Marking Scheme, 2015]

Commonly Made Error

- Students often get confused between Parthenogenesis and Parthenocarpy.

Answering Tip

- Carefully understand the differences between the two with the help of diagrams.

Q. 3. Identify the picture and mention the vegetative part that helps it to propagate.



[R] [Outside Delhi Set-I, 2015]

Ans. Rhizome of ginger are modified underground stem, axillary bud grows from the node.

[CBSE Marking Scheme, 2015] 2

Detailed Answer :

The given picture is of Ginger.

In ginger, vegetative propagation occurs through the underground stem called rhizome. A rhizome is a modified underground horizontal stem. 1 + 1

Q. 4. Which statement is true for *Hydra* ?

(i) It produces asexual gemmules.

- (ii) It produces unicellular bud.
 (iii) It produces multicellular bud.

[A] [CBSE All India Comptt. 2013]

Ans. Statement (iii) is correct. *Hydra* is a multicellular organism. It reproduces asexually by budding.

Answering Tip

- Be careful while answering True and false questions. Even if part of answer is True the option can be false. Hence, reread the options before answering.

Q.5. Name the units of vegetative propagation in water hyacinth. Explain giving reasons why it has become the most invasive aquatic weed ?

[A] [Foreign, 2013; Delhi Set-I Comptt. 2013]

Ans. Water hyacinth reproduces vegetatively by offsets. It propagate, at an enormous and alarming rate. Therefore it spreads all over the water body and fully covers it within a short period of time. Thus, it has become the most invasive aquatic weed.

1 + 1



Short Answer Type Questions-II

(3 marks each)

Q.1. Banana crop is cultivated by farmers without sowing of seeds. Explain how the plant is propagated ?

[C] [Delhi Set-I, Comptt. 2014]

Ans. In banana, the seeds are not produced because the fruits are parthenocarpic. Therefore these plants are propagated vegetatively with the help of horizontally growing underground rhizome which is a modified underground stem. The axillary buds present at the nodes of the rhizome gives rise to new plants of banana.

3

Commonly Made Error

- Students forget to mention the term parthenocarpic. It seems they are not aware of the term.

Answering Tip

- Understand the question properly before answering.

Q.2. Plants like potato, sugarcane do not require seeds for producing new plants. How do they produce new plants? Give two other examples where new plants are produced in the same way.

[U] [Outside Delhi Set-I Comptt. 2017]

Ans. New plants arise from nodes present in the modified stems of these plants, through vegetative propagation. When the nodes come in contact with damp soil or water, they produce roots and new plants e.g., Banana, Ginger, Dahlia, *Bryophyllum*

1 + 1 + 1

[CBSE Marking Scheme 2017]



TOPIC-2 Sexual Reproduction

Revision Notes

- The sexual reproduction involves formation of the male and female gametes, either by the same individual or by different individuals of the opposite sex. It results in production of offsprings that are non identical, genetically different from the parents or amongst themselves.
- All living organisms pass through three stages : Juvenile phase, Reproductive phase and Senescent phase.
 - Juvenile phase** : It is period of growth of an individual organism after its birth and before it reaches its reproductive maturity. It is known as vegetative phase in plants. It is the early phase of life cycle.
 - Reproductive phase** : It is the phase of life cycle where the growth of the individual is slowed down but it develops the potentiality to reproduce.
 - Senescent phase** : It is the period when an organism grows old and loses its ability to reproduce.
- In higher plants, flowering indicates the end of vegetative phase and the beginning of the reproductive phase.
- Annual and biennial plants show clear cut vegetative, reproductive and senescent phases, but in perennial species it is very difficult to identify these phases.
- Some plants exhibit unusual flowering phenomenon. They flower only once in their life time and are called monocarpic. Examples,
 - Bamboo species flower only once in their lifetime (after 50-100 years), produce large number of fruits and die.
 - Strobilanthes kunthianus* (vern. Neelakurinji) flowers once in 12 years.
- In animals, juvenile phase is followed by morphological and physiological changes prior to active reproductive behaviour.
- Birds living in nature lay eggs only seasonally. However, birds in captivity (e. g. poultry) can be made to lay eggs throughout the year.

- **Oestrus cycle** : The females of placental mammals exhibit cyclic changes in the activities of ovaries, accessory ducts and hormones during the reproductive phase. These cyclic changes are called oestrus cycle in non-primates such as cow, sheep, rat, deer, dog, tiger etc. It is called as menstrual cycle in primates such as monkeys, apes and humans.
- **Seasonal breeders** : The mammals which live in natural conditions exhibit reproductive cycles only during favourable seasons and are called seasonal breeders.
- **Continuous breeders** : The mammals that are reproductively active throughout their reproductive phase are called continuous breeders.
- **Senescence (Old age)** : It is the last phase of life span and the end of reproductive phase. During this stage, the metabolism slows down which ultimately leads to death.
- In plants and animals, hormones are responsible for transition between juvenile, reproductive and senescence phases.

Events in Sexual Reproduction

(i) PRE-FERTILISATION EVENTS

- This includes all events prior to the fusion of gametes.
- It comprises : (a) Gametogenesis and (b) Gamete transfer.

(a) Gametogenesis

- It is the process of formation of male and female gametes (haploid sex cells).
- **Homogametes/Isogametes** : In this type, all gametes are similar *i.e.*, gametes cannot be categorized into male and female gametes. The fusion of two such gametes is called isogamy *i.e.*, Algae.
- **Heterogametes** : In this type, the male and female gametes can be distinguished. Male gamete is called the antherozoids or sperm and the female gamete is called the egg (ovum or oosphere) *e.g.* Humans.
- Union between non-motile egg or ovum or oosphere and motile sperm or antherozoid is called oogamy.

Sexuality in Organisms

- **Bisexual plants** : In these plants, male and female reproductive structures are found on the same flower. *e.g.*, Sweet Potato.
- **Unisexual/Dioecious plants** : In these plants, the male and female reproductive structures are found on different plants. *e.g.*, Date Palm and Papaya.
- In unisexual/monoecious/flowering plants, the male and female flowers are present on the same plant. *e.g.*, Cucurbits & coconuts.
- Fungi may be homothallic (bisexual) or heterothallic (unisexual).
- Bisexual animals (hermaphrodites) : Earthworms, leech, sponge, tapeworm, etc.
- Unisexual animals : Cockroach, higher animals, etc.

Cell Division during Formation of Gametes

- Haploid parental body produces haploid gametes by mitosis. It is seen in monera, fungi, algae and bryophytes.
- Diploid parental body produces haploid gametes by meiosis of meiocytes (gamete mother cell). It is seen in pteridophytes, gymnosperms, angiosperms & animals.

(b) Gamete Transfer

- Male gametes need a medium to move towards female gametes for fertilisation.
- In simple plants such as algae, bryophytes and pteridophytes, the transfer of gamete takes place through water medium.
- To compensate the loss of male gametes during transport, a large number of male gametes are produced.
- In seed plants, pollen grains containing male gametes are transferred from anthers to stigma where they germinate to form pollen tube. Pollen tube carries male gamete to the egg or female gamete for fertilization.
- In bisexual or self-fertilizing plants, the transfer of pollen grains to the stigma is easy as anthers and stigma are located close to each other. Example – pea.
- In unisexual or cross pollinating plants, the pollinating agencies help in transfer of pollen grains to the stigma. Pollen grains germinate on the stigma and the pollen tube carrying the male gametes reaches the ovule and discharge male gametes near the egg.
- In Dioecious animals, male and female gametes are formed in different individuals, organisms usually bear a specific method for gamete transfer.

(ii) FERTILISATION EVENTS

- It is the fusion of gametes to form a diploid zygote. It is also known as syngamy.
- **Parthenogenesis** : It is the phenomenon where individual formation takes place from the egg without fertilization. The adults produced by parthenogenesis are often haploid and their cells do not undergo meiosis to forming new gametes. *E.g.* Rotifers, honeybees, some lizards and birds (turkey).

Types of Fertilisation :

- Depending upon the site of syngamy, fertilization is of the following two types :

(1) External fertilisation

- In this type, fertilisation or syngamy occurs in the external medium (water), *i.e.* outside the body of the organism. Examples - Aquatic organisms like algae, bony fishes and amphibians.
- Disadvantage : The offspring are extremely vulnerable to predators, threatening their survival up to adulthood.

(2) Internal fertilisation

- In this type, fertilisation or syngamy occurs inside the body. *e.g.*, terrestrial organisms, belonging to fungi, animals like reptiles, birds, mammals and plants like bryophytes, pteridophytes, gymnosperms & angiosperms. Large number of sperms are produced but the number of eggs are very low.

(iii) POST-FERTILISATION EVENTS

- It includes the events after the formation of zygote.

Zygote

- Every sexually reproducing organism begins its life as a zygote.
- It is the vital link between organisms of one generation to the next.
- The development of zygote depends on the type of life cycle of the organism and the nature of environment.
- In fungi and algae, zygote secretes a thick wall around itself which makes it resistant against desiccation and damage. It undergoes a period of rest before germination.
- In organisms with haplontic life cycle, zygote divides by meiosis into haploid spores that grows into haploid individuals. In organisms with diplontic cycle, zygote divides by mitosis and develops into diploid embryo.

Embryogenesis

- It is the process of the development of embryo from the zygote.
- The zygote undergoes cell division (mitosis) and cell differentiation.
- The cell division increases the number of cells in the embryo.
- Cell differentiation causes the modifications of groups of cells into various tissues and organs to form an organism.

Types of Animals based on site of development of embryo :

- (i) **Oviparous** : Here, animals lay fertilized/unfertilized eggs. Examples – In reptiles & birds, the fertilized eggs covered by hard calcareous shell are laid in a safe place. After incubation, young ones hatch out. In most amphibians, unfertilized eggs are laid in water by female where they are fertilized by sperms produced by male.
- (ii) **Viviparous** : Here, the zygote develops into a young one inside the female body. Later, the young ones are delivered out from the body. Example - mammals. Because of proper care and protection, the chances of survival of young ones are greater in viviparous animals.
- In flowering plants, zygote is formed inside the ovule. After fertilisation, sepals, petals and stamens of flower wither and fall off. The zygote develops into embryo and ovules develop into seeds. The ovary develops into fruits which develop a thick wall called pericarp, which is protective in function. After dispersal, seeds germinate under favourable condition to produce new plants.

**Very Short Answer Type Questions**

(1 mark each)

Q. 1. Write the two pre-fertilization events from the list given below :

Syngamy, gametogenesis, embryogenesis, pollination.

[U] [Delhi Set-I Comptt. 2014]

Ans. Gametogenesis and pollination.

1

Commonly Made Error

- Students often get confused between the technical terms of pre-and post fertilisation events.

Answering Tip

- Familiarise students with above given technical terms like syngamy, gametogenesis etc.
- The concept of pre and post fertilisation events should be clearly discussed for proper understanding.

Q. 2. In which two of the following organisms is the fertilization external ?

Bony fishes, ferns, frog, birds.

[R] [Delhi Set-III, Comptt. 2014]

Ans. Bony fishes and frogs.

1

Q. 3. Mention any two conditions that enhance the chances of syngamy in organisms exhibiting external fertilization.

[A] [Outside Delhi Set-I, Comptt. 2017]

Ans. Organisms exhibiting external fertilisation show great synchrony between the sexes, release a large number of gametes into the surrounding medium. [CBSE Marking Scheme 2017] 1

Q. 4. Which of the following statements is true for date palm.

- (i) It is monoecious producing both staminate and pistillate flowers in the same plant.
- (ii) It is monoecious producing staminate flowers in one and pistillate flowers in another tree.
- (iii) It is dioecious producing staminate flowers in one tree and pistillate flowers in another tree.

[R] [Outside Delhi Set-III Comptt. 2014]

Ans. Statement (iii) is true. Date palm is a dioecious plant. 1

Answering Tip

- Students should have good knowledge about staminate and pistillate flowers.

[AI] Q. 5. Name the common phenomenon with reference to reproduction in rotifers, honey bees and turkey.

[U] [Delhi Set-I, Comptt. 2013]

Ans. The common phenomenon with reference to reproduction in rotifers, honey bees and turkey is parthenogenesis. It is the process in which the female gamete undergoes development to form new organism without fertilization. 1

Q. 6. Name the mode of reproduction that ensures the creation of new variants.

[U] [Delhi Set-I, Comptt. 2012]

Ans. **Sexual reproduction** : It is a kind of reproduction where male and female gametes fuse together to form the diploid zygote. Zygote germinates and gives rise to new individual showing some variations. 1

Answering Tip

- Understand the topics - Sexual and Asexual reproduction separately with relevant examples.

[AI] Q. 7. Cucurbits and papaya plants bear staminate and pistillate flowers. Mention the categories they are put under separately on the basis of type of flowers they bear.

[R] [Delhi Set-II, 2012]

Ans. Cucurbits are monoecious plants because they bear both staminate and pistillate flowers on the same plant.

Papaya plants are dioecious because staminate and pistillate flowers are borne on different plants. 1

Q. 8. Mention the unique flowering phenomenon exhibited by *Strobilanthes kunthianus* (Neelakurinji) [R] [Outside Delhi Set-II, 2012]

Ans. *Strobilanthes kunthianus* is a monocarpic plant. It flowers once in a life span of 12 years after which it dies. 1

Q. 9. Name the type of cell division that takes place in the zygote of an organism exhibiting haplontic life cycle. [R] [Delhi Set-I, II, III, 2011]

Ans. Meiotic division. 1

Q. 10. Name the phase all organisms have to pass through before they can reproduce sexually.

[R] [Outside Delhi Set-I, II, III, 2011]

Ans. Juvenile phase. In plants it is called as vegetative phase. Infact, it is the pre-reproductive period in the life cycle of an individual. 1

Q. 11. Which of the following statements is true for cucurbits ?

- (i) It is monoecious producing both staminate and pistillate flowers in the same plant.
- (ii) It is monoecious producing staminate and pistillate flowers in two different plants.
- (iii) It is dioecious producing staminate flowers in one plant and pistillate flowers in another.

[R] [Delhi, Set-I, Comptt. 2013]

Ans. (i) Statement (i) is correct. i.e., The plants are monoecious because both male and female flowers are borne on the same plants. 1

Q. 12. Name two animals that exhibit oestrous cycle.

[R] [Foreign Set-I, 2016, Outside Delhi Set-I, Comptt. 2014]

Ans. Cow, sheep, rat, deer, dog, tiger, etc. 1
(Any two) [CBSE Marking Scheme, 2016]

Commonly Made Error

- Students often get confused between oestrous cycle and menstrual cycle.

Answering Tip

- Learn the differences between oestrous cycle and menstrual cycle in a tabular form, emphasizing key words like 'in primates and non-primate mammals', duration, names of the phases, shedding/reabsorption of uterine endometrium, etc. Students should understand that menstrual cycle occurs only in monkeys, apes and human beings whereas oestrous occurs in non-primates, i.e., cats and dogs.



Short Answer Type Questions-I

(2 marks each)

Q. 1. (a) Why do organisms like algae and fungi shift from asexual mode of reproduction to sexual mode ?
(b) What is a juvenile phase in organisms ?

[K] [Comptt, Set-1,2,3, 2018]

Ans. (a) To tide over adverse conditions. 1

(b) A phase of growth and maturity, before organisms can reproduce sexually. $\frac{1}{2} + \frac{1}{2}$

[CBSE Marking Scheme, 2018]

Q. 2. Explain the significance of meocytes in a diploid organism. [U] [Delhi Set-I, 2016]

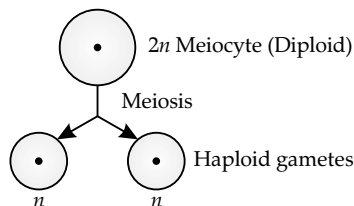
Ans. Undergo meiosis/undergo gametogenesis/form haploid gametes, help to restore $2n$ (diploidy) through zygote formation or syngamy/help to restore chromosome number. 2

[CBSE Marking Scheme, 2016]

Detailed Answer :

Meiocytes or gamete mother cells are diploid cell which undergoes meiotic division to produce ($2n$) male and female gametes that carry only one set of chromosomes thus making the gametes haploid (n).

Gamete mother cell :



Q. 3. Explain the importance of syngamy and meiosis in sexual life cycle of an organism.

[Delhi Set-II, 2016]

Ans. Syngamy : Restoration of ($2n$) chromosome number/diploidy/zygote formation/variations (due to syngamy).

Meiosis : Gamete formation/reduction of (n) chromosome number/haploidy/variation (due to crossing over) 1 + 1 = 2

[CBSE Marking Scheme, 2016]

Detailed Answer :

Meiosis and syngamy maintain the fixed chromosome number of the species. In a sexual life cycle of an organism, meiosis leads to formation of gametes which are haploid.

Syngamy is the process that leads to fusion of haploid gametes and formation of diploid zygote.

1 + 1 = 2

Q. 4. Why do moss plants produce very large number of male gametes? Provide one reason. What are these gametes called? [Outside Delhi Set-I, 2015]

Ans. In moss plants, water is the medium through which male gametes reach the female gamete. Hence, a large number of male gametes fail to reach the female gamete. This results in a great loss of male gametes. Therefore, to compensate for this loss the male gametes in moss plants are produced in very large number.

The male gametes in moss plant are called as the antherozoids. 2

Q. 5. Why do algae and fungi shift to sexual mode of reproductions just before the onset of adverse conditions? [Delhi Set, I, 2014]

Ans. Most of the algae and fungi are unable to survive under adverse environmental conditions. Therefore, in order to tide over these unfavourable conditions, these organisms shift to the sexual mode of reproduction during which they produce male/female gametes that fuse to form the zygote. The zygote secretes a thick wall around itself and undergoes a period of rest for passing

the unfavourable conditions. Gradually, on the approach of favourable conditions, the zygote germinates to produce the new thalli of algae and mycelium of fungi. 2

Q. 6. Coconut plant is monoecious, while date palm is dioecious. Why are they called so?

[Delhi Set-I, 2014]

Ans. In coconut plant, both male and female flowers are present on the same plant whereas in date palm, both male and female flowers are present on the separate plants species. 2

Answering Tip

- Carefully learn the differences between monoecious and dioecious flowers with examples in tabular form for proper understanding and retention.

Q. 7. (i) Why is a whiptail lizard referred to as parthenogenetic?

(ii) State the difference between meiocyte and gamete with respect to chromosome number.

[Delhi Set-I 2012]

Ans. (i) Whiptail lizards are referred to as parthenogenetic because they develop from unfertilized egg *i.e.*, the egg produces the new individual without fertilization.

(ii) Meiocytes have diploid number ($2n$) of chromosomes whereas gametes contain haploid number (n) of chromosomes. 1 + 1 = 2

Answering Tip

- Read the question properly. Do not overlook any part of a question and avoid being in a hurry to conclude the answer.

Q. 8. Angiosperms bearing unisexual flowers are said to be either monoecious or dioecious. Explain with the help of one example each.

[Delhi Set-III, 2016]

Ans. Monoecious Angiosperms : Plants bear both male and female unisexual flowers on the same plant. *e.g.*, Cucurbits/coconut/maize. (Any one) 1

Dioecious Angiosperms : Plants bear either male or female unisexual flowers on different plants. *e.g.*, Papaya/date palms. (Any one) 1

[CBSE Marking Scheme, 2016]

Detailed Answer :

The plants are said to be monoecious if both male and female unisexual flowers are present on the same plant and if the unisexual male and female flowers are present on separate plants then they are called as dioecious.

Q. 9. Out of many papaya plants growing in your garden, only a few bear fruits. Give reasons.

[Outside Delhi Set-III, 2016]

Ans. Unisexual/Dioecious/male and female flowers are borne on separate plants, only plants bearing female flowers will bear fruits. Monoecious (hermophrodite) Papaya plants bear fruit too. 1 + 1 = 2

[CBSE Marking Scheme, 2016]

Detailed Answer :

Papaya has both dioecious and monoecious plants bearing unisexual or bisexual flowers. They can occur in three sexual forms-male, female and hermaphrodites. A fruit is formed when fertilization occurs in the ovary of the female flower. So, if a male or a female plant is growing alone, it will produce flowers but not fruits as both male and female is required for fruit formation. However, hermaphrodite papaya plant will always bear fruits, as their flowers contain both male and female parts.

2

Commonly Made Error

- Students are often confuse among dioecious and monoecious plants. They consider them as same.

Q. 10. A single pea plant in your kitchen garden produces pods with viable seeds, but the individual papaya plant does not. Explain.

[A] [Outside Delhi Set-I, 2016]

Ans. Pea : Flowers of pea plants are bisexual, monoecious / self pollinated (to produce pods with viable seeds). $\frac{1}{2} + \frac{1}{2} = 1$

Papaya : Refer to S.A.T.Q.-I (Q. No. 9.) 1

[CBSE Marking Scheme, 2016]

Detailed Answer :

Pea plant bears bisexual flowers. Therefore, the single pea plant can produce viable seeds after self-pollination. Papaya, on the other hand is a dioecious plant, bearing unisexual flowers that requires cross-pollination for viable seed production. Thus, they cannot produce viable seeds.

2

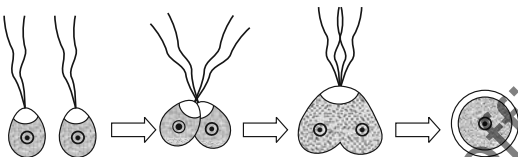
Answering Tip

- If you are writing the scientific name of plant/ animal. Always remember to italicize the name.

**Short Answer Type Questions-II**

(3 marks each)

[AI] Q.1.



- State the type of gametes shown in the diagram above.
- Identify the process taking place and the resultant structure.
- Name an organism that reproduces in this manner.

[R] [CBSE SQP 2016-17]

Ans. (i) Isogametes**(ii)** Syngamy or fertilization and zygote**(iii)** *Cladophora/Chlamydomonas*. $1+1+1=3$

[CBSE Marking Scheme, 2016]

Q. 2. Meiosis is an essential event in the sexual life cycle of any organism. Give two reasons.

[U] [Foreign 2015]

Ans. Meiosis is an essential event in the sexual cycle of any organism because :

- It maintains the number of chromosomes fixed ($2n$) from generation to generation. Haploid gametes are formed as a result of meiosis. Diploid ($2n$) condition is restored during fertilization.
- It increases the genetic diversity and variation due to crossing over between homologous chromosomes and their random segregation.

 $1\frac{1}{2} + 1\frac{1}{2} = 3$

Q. 3. A moss plant is unable to complete its life cycle in dry environment. State two reasons.

[U] [Outside Delhi, Set-III 2015]

Ans. A moss plant can not complete its life cycle in dry condition because of following two main reasons :

- It requires water for the dehiscence of antheridium-the male sex organ and the opening of the archegonium-the female sex organ.

- It requires the presence of water for the flagellated antherozoids (the male gametes) to swim and reach the female gamete (egg or ovum) situated deep in the archegonium under the influence of a chemical (maleic acid), accomplishing fertilization.

3

Q. 4. Name any two organisms and the phenomenon involved where the female gamete undergoes development to form new organisms without fertilisation. [R] [Outside Delhi Set-II, 2014]

Ans. (i) Rotifers/honeybees/some lizards/turkey.**(Any two)****(ii)** Parthenogenesis. $1\frac{1}{2} + 1\frac{1}{2} = 3$

[CBSE Marking Scheme, 2014]

[AI] Q. 5. Differentiate between parthenocary and parthenogenesis. Give one example of each.

[U] [Outside Delhi/Delhi, 2018]

Or

How is parthenocary different from parthenogenesis ? Give an example of each.

[U] [Delhi Set-I, Comptt. 2013]

Ans.

Parthenogenesis	Parthenocrapy
New organism develops without fertilization. =1	Formation of fruit without fertilization. =1
e.g. Drones / male honey bee / turkey / rotifers / some lizards / any other correct example. = $\frac{1}{2}$	e.g. banana / grapes / any other correct example. = $\frac{1}{2}$

 $1\frac{1}{2} + 1\frac{1}{2} = 3$

[CBSE Marking Scheme, 2018]

Detailed Answer:

The phenomenon of development of fruit from the ovary in the flowering plants without the stimulus of fertilization is called parthenocary and the

fruits so formed are called parthenocarpic fruits. e.g., banana. Whereas the phenomenon in which the egg or ovum develops into an embryo and then into a new organism without the act of fertilization is called parthenogenesis e.g., male honeybee, rotifers and green algae like *Ulothrix*.

Q. 6. Why is a whiptail lizard referred to as parthenogenetic ? [U] [Delhi Set-I, 2012]

Ans. Whiptail lizard is referred to as parthenogenetic because the embryos of whiptail lizards are developed from egg without undergoing the process of fertilization. The unfertilized embryos give rise to new organism. 3

Q. 7. Some animals like honey bees are called parthenogenetic animals. Why?

[U] [Delhi Set-I, 2012; Delhi Comptt. 2010]

Ans. Male honey bees are formed from unfertilised egg. Therefore, these animals are called as parthenogenetic animals. 3

Q. 8. The turkey usually produces females for several generations. How is this possible ?

[U] [CBSE SQP 2012]

Ans. This is possible due to parthenogenesis. In birds like turkey, only the female gamete undergoes

development to form new organisms without fertilisation. This phenomenon is called parthenogenesis. 3

Q. 9. Write two major adaptations in animals exhibiting external fertilization.

[E & A] [Outside Delhi, Set-I, 2012]

- Ans.** (i) There is a great tendency of synchronization between male and female sexes i.e., they release the mature gamete simultaneously in water.
- (ii) They release a large number of gametes in the surrounding medium (water) so that there may be greater chances of syngamy i.e., the fusion of male and female gametes. $1\frac{1}{2} + 1\frac{1}{2} = 3$

Commonly Made Error


- Students often get confused between technical terms like external and internal fertilisation. They often write opposite advantages.

Answering Tip

- Learn the differences between external and internal fertilisation in tabular form with proper examples for better retention and understanding. Also, learn the adaptation of organism exhibiting it.

Know the Terms

- **Reproduction** : Reproduction is the process of formation of new individuals of a species from the pre-existing ones.
- **Clone** : Morphologically and genetically similar individuals are called clone.
- **Juvenile phase** : It is the period of growth of an individual organism after its birth and before it reaches its reproductive maturity.
- **Reproductive phase** : It is the phase in which an individual can give maximum number of births.
- **Ageing or senescent phase** : It is the period when an organism grows old and loses the ability to reproduce.
- **Gametogenesis** : Process of formation of gametes is gametogenesis.
- **Pollination** : Transfer of pollen grains from anther to stigma is pollination.
- **Meiocytes** : These are specialized cells of diploid organisms which undergo meiosis to produce gametes.


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