

SHRI KRISHNA ACADEMY

NEET, JEE & BOARD EXAM(10th, +1, +2) COACHING CENTRE

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XII - ZOOLOGY

MATERIAL

2019 – 2020

DEPARTMENT OF ZOOLOGY

CHAPTER-I REPRODUCTION IN ORGANISMS

BOOK BACK ONE MARKS :

- In which type of parthenogenesis are only males produced?
a) **Arrhenotoky** b) Thelytoky c) Amphitoky d) Both a and b
- Animals giving birth to young ones and laying eggs:
a) Oviparous **b) Ovoviviparous** c) Viviparous d) Both a and b
- The mode of reproduction in bacteria is by
a) Formation of gametes b) Endospore formation **c) Conjugation** d) Zoospore formation
- In which mode of reproduction variations are seen
a) Parthenogenesis **b) Sexual** c) Asexual d) Both a and b
- Assertion:** In bee society, all the members are diploid except drones.
Reason: Drones are produced by parthenogenesis.
A. If both A and R are true and R is correct explanation for A
B If both A and R are true but R is not the correct explanation for A
C. If A is true but R is false
D. If both A and R are false.
- Assertion:** Offsprings produced by asexual reproduction are genetically identical to the parent.
Reason: Asexual reproduction involves only mitosis and no meiosis.
a) If both A and R are true and R is correct explanation for A
b) If both A and R are true but R is not the correct explanation for A
c) If A is true but R is false
d) If both A and R are false.
- Assertion:** Viviparous animals give better protection to their off springs.
Reason: They lay their eggs in the safe places of the environment.
a) If both A and R are true and R is correct explanation for A
b) If both A and R are true but R is not the correct explanation for A
c) If A is true but R is false
d) If both A and R are false.

INTERIOR ONE MARKS :

- Match the following

(A) Simple irregular binary fission	-	(i) Planaria
(B) Transverse binary fission	-	(ii) Ceratium
(C) Longitudinal binary fission	-	(iii) Amoeba
(D) Oblique binary fission	-	(iv) Vorticella

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(c) iv	ii	iii	I																							
A	B	C	D																							
(b) ii	i	iv	iii																							
(d) iii	iv	i	ii																							
- Identify the correct pair :

(a) Budding	-	Sea anemone
(b) Gemmules	-	Taenia Solium
(c) Sporulation	-	Amoeba
(d) Fragmentation	-	Star fish
- Fill in the blank :
Secondary host of Tapeworm is -----
(a) Mosquito (b) Rabbit (c) Frog **(d) Pig**
- In which type of Parthenogenesis only females are produced?
(a) Arrhenotoky **(b) Thelytoky** (c) Amphitoky (d) Both a and b

5. Identify the wrong pair :

- | | | |
|--------------------------|---|----------------|
| (a) Formation of gametes | - | Paramecium |
| (b) Conjugation | - | sponges |
| (c) Formation of spores | - | Amoeba |
| (d) Apolysis | - | Tapeworm |

6. Match the following

- | | | |
|---------------|---|--------------------------|
| (A) Autogamy | - | (i) Higher invertebrates |
| (B) Exogamy | - | (ii) Monocystis |
| (C) Isogamy | - | (iii) Actinosphaerium |
| (D) Anisogamy | - | (iv) Human |

- | | | | | | | | | | |
|-----|-----|----|-----|----|------------|------------|-----------|-----------|----------|
| | A | B | C | D | | A | B | C | D |
| (a) | iii | i | iv | ii | (b) | ii | i | iv | iii |
| (c) | iv | ii | iii | i | (d) | iii | iv | ii | i |

7. Fill in the blank :

Regeneration was first studied in Hydra by -----

- | | |
|-----------------------------|--------------------|
| (a) William Harvey | (b) Charles Bonnet |
| (c) Abraham Trembley | (d) Charles Darwin |

8. Find the odd one out :

- | | | | |
|---------------------|----------------|-----------------|-------------------------|
| a) Multiple fission | b) sporulation | c) Strobilation | d) Fragmentation |
|---------------------|----------------|-----------------|-------------------------|

9. In which type of reproduction Ephyra are produced?

- | | | | |
|--------------------|---------------------|------------|------------------------|
| (a) Binary fission | b) Multiple fission | c) Budding | d) strobilation |
|--------------------|---------------------|------------|------------------------|

10. In which mode of reproduction variations are not seen?

- | | | | |
|---------------------|-----------|------------|------------------------|
| (a) Parthenogenesis | b) sexual | c) Asexual | d) Both a and c |
|---------------------|-----------|------------|------------------------|

NEET MODEL ONE MARKS:

1. Identify the correct Statements :

- (i) Budding is seen in leucosolenia
- (ii) In paramecium multiple fission occurs
- (iii) In autogamy, the male and female gametes are produced by the same cell.
- (iv) Internal fertilization occurs in frogs

- | | | | |
|----------------------|--------------|----------------|---------------|
| (a) i and iii | (b) i and iv | (c) ii and iii | (d) ii and iv |
|----------------------|--------------|----------------|---------------|

2. Identify the correct Statements :

- (i) Lizard is a continuous breeder.
- (ii) Asexual reproduction is also known as somatogenic reproduction
- (iii) In repeated fission, young ones do not separate till fission process is completed.
- (iv) strobilation is a kind of longitudinal fission.

- | | | | |
|---------------|--------------|-----------------------|---------------|
| (a) i and iii | (b) i and iv | (c) ii and iii | (d) ii and iv |
|---------------|--------------|-----------------------|---------------|

3. Match the following

- | | | |
|------------------------|---|-------------------------------|
| 1. Strobilation | - | (a) Hydra |
| 2. Regeneration | - | (b) Noctiluca |
| 3. Conjugation | - | (c) Bacteria |
| 4. Endogenous budding | - | (d) Aurelia |
| A) 1-b, 2 -c, 3-a, 4-d | | B) 1-d, 2 -a, 3-c, 4-b |
| C) 1-d, 2 -a, 3-b, 4-c | | D) 1-a, 2 -d, 3-c, 4-b |

4. Match the following

- | | | |
|----------------------|---|--------------|
| 1. Archaeocytes | - | (a) Gall fly |
| 2. Buds | - | (b) Gemmules |
| 3. Pseudopodiospores | - | (c) Hydra |
| 4. Parthenogenesis | - | (d) Amoeba |

- A) 1-d, 2 -b, 3-a, 4-c B) 1-d, 2 -c, 3-a, 4-b
C) 1-c, 2 -b, 3-d, 4-a **D) 1-b, 2 -c, 3-d, 4-a**

5. **Assertion :** In paramecium, the macronucleus divides by amitosis and the micronucleus divides by mitosis.

Reason : Paramecium shows transverse binary fission

A. If both A and R are true and R is correct explanation for A

B. If both A and R are true but R is not the correct explanation for A

C. If A is true but R is false

D. If both A and R are false.

6. **Assertion :** Ovoviviparity is seen in shark

Reason : Placenta is formed to transfer nutrients to the embryo

A. If both A and R are true and R is correct explanation for A

B. If both A and R are true but R is not the correct explanation for A

C. If A is true but R is false

D. If both A and R are false.

7. **Assertion :** The embryos of ovoviviparous animals have no placental connection with their mothers.

Reason : Embryos receive nourishment from the egg yolk.

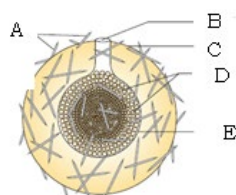
A. If both A and R are true and R is correct explanation for A

B. If both A and R are true but R is not the correct explanation for A

C. If A is true but R is false

D. If both A and R are false.

8. Identify the correct options for the parts of the Diagram.



1 – Archaeocytes

2 – Inner membrane

3 – Micropyle

4 – Outer membrane

5 – Monaxon spicules

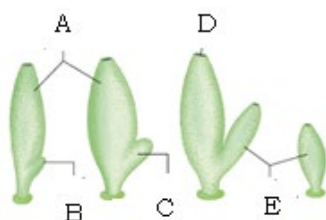
(a) 1-A, 2-D, 3-B, 4-C, 5-E

(b) 1-C, 2-B, 3-A, 4-E, 5-D

(c) 1-D, 2-E, 3-B, 4-C, 5-A

(d) 1-A, 2-E, 3-D, 4-B, 5-C

9. Identify the correct options for the parts of the Diagram.



1 – Bud forming

2 – Osculum

3 – Bud growing

4 – Daughter individual

5 – Individual parent

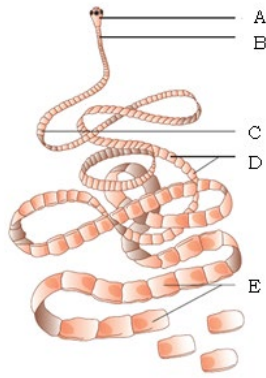
(a) 1-A, 2-D, 3-B, 4-C, 5-E

(b) 1-B, 2-D, 3-C, 4-E, 5-A

(c) 1-D, 2-E, 3-B, 4-C, 5-A

(d) 1-A, 2-E, 3-D, 4-B, 5-C

10. Identify the correct options for the parts of the Diagram.



1 – Immature proglottids

2 – Gravid proglottids

3 – Scolex

4 – Mature proglottids

5 – Neck

(a) 1-C, 2-E, 3-A, 4-D, 5-B

(b) 1-B, 2-D, 3-C, 4-E, 5-A

(c) 1-D, 2-E, 3-B, 4-C, 5-A

(d) 1-A, 2-E, 3-D, 4-B, 5-C

10. Identify the correct pair

i) Shark - placenta

ii) Taenia solium - Regeneration

iii) Frog - Continuous breeder

iv) Plasmotomy - Pelomyxa

(a) i and iii

(b) ii and iii

(c) i and iv

(d) i, ii, and iv

11. Identify the correct pair

i) Sporogony - Paramecium

ii) Bacteria - Uniparental inheritance

iii) Amoeba - Multiple fission

iv) Birds - External fertilization

(a) i, ii, and iv

(b) iii and iv

(c) ii and iv

(d) ii and iii

12. Identify the incorrect pair

i) Starfish - Gemmule

ii) Exogamy - Amoeba

iii) Tapeworm - Pig

iv) Continuous breeder - Poultry

(a) i, ii and iii

(b) ii, iii and iv

(c) i and iv

(d) i and ii

13. Identify the incorrect pair

i) Planaria - Morphallaxis

ii) Conjugation - Amoeba

iii) Autogamy - Paramecium

iv) Apolysis - Sea anemones

(a) i and iii

(b) ii and iv

(c) ii and iii

(d) i, iii and iv

14. Identify the incorrect pair

i) Hologamy - Fusion of mature individuals

ii) Merogamy - Fusion of small sized, morphologically different gametes.

iii) Paedogamy - Fusion of young individuals

iv) Isogamy - Fusion of dissimilar gametes

(a) i and iii

(b) ii and iv

(c) ii and iii

(d) iv

15. Identify the Odd-Man Out :

- a) Amoeba b) Paramecium c) Vorticella **d) Hydra**

Reason : It reproduces, asexually by budding whereas the others reproduce asexually by fission.

16. Identify the Odd-Man Out :

- a) Hydra b) Noctiluca **c) Sea anemones** d) Leucosolenia

Reason : It reproduces asexually by fragmentation whereas the others reproduce a sexually by Budding.

17. Identify the Odd-Man Out :

- a) Conjugation b) Hologamy c) Paedogamy **d) Regeneration**

Reason : It is associated with asexual reproduction whereas the others are associated with sexual reproduction.

18. Identify the Odd-Man Out :

- a) Honey bees** b) Shark c) Human being d) Cow

Reason : It shows sexual reproduction and parthenogenesis in its life cycle, whereas the other show sexual reproduction only

EXTRA ONE MARKS:

1. Transverse binary fission occurs in

- (a) Euglena (b) Amoeba (c) Hydra **(d) Paramecium**

2. Which of the following animal is having longitudinal binary fission?

- (a) Euglena** (b) Plasmodium (c) Planaria (d) Paramecium (e) Hydra

3. External fertilization occurs in majority of

- (a) Algae** (b) Fungi (c) Liverworts (d) Mosses

4. Offspring formed by sexual reproduction exhibit more variation than those formed by asexual reproduction because:

- (a) Sexual reproduction is a lengthy process
(b) Gametes of parents have qualitatively different genetic composition
 (c) Genetic material comes from parents of two different species
 (d) Greater amount of DNA is involved in sexual reproduction.

5. There is no natural death in single celled organisms like Amoeba and bacteria because :

- (a) They cannot reproduce sexually
 (b) They reproduce by binary fission
(c) Parental body is distributed among the offspring
 (d) They are microscopic

6. There are various types of reproduction. The type of reproduction adopted by an organism depends on:

- (a) The habitat and morphology of the organism
 (b) Morphology of the organism
 (c) Morphology and physiology of the organism
(d) The organism's habitat, physiology and genetic makeup

7. Which one of the following processes results in the formation of clone of bacteria?

- (a) Transformation (b) Transduction **(c) Binary Fission** (d) Conjugation

8. A few statements describing certain features of reproduction are given below:

- (i) Gametic fusion takes place
 (ii) Transfer of genetic material takes place
 (iii) Reduction division takes place
 (iv) Progeny have some resemblance with parents

Select the options that are true for both asexual and sexual reproduction from the options given below:

- (a) (i) and (ii) (b) (ii) and (iii) **(c) (ii) and (iv)** (d) (i) and (iii)

9. The term 'clone' cannot be applied to offspring formed by sexual reproduction because:

- (a) Offspring do not possess exact copies of parental DNA**
 (b) DNA of only one parent is copied and passed on to the offspring
 (c) Offspring are formed at different times
 (d) DNA of parent and offspring are completely different

10. Amoeba and Yeast reproduce asexually by fission and budding respectively, because they are:

- (a) Microscopic organisms (b) Heterotrophic organisms
(c) Unicellular organisms (d) Uninucleate organisms

11. A few statements with regard to sexual reproduction are given below:

- (i) Sexual reproduction does not always require two individuals
 (ii) Sexual reproduction generally involves gametic fusion
 (iii) Meiosis never occurs during sexual reproduction
 (iv) External fertilization is a rule during sexual reproduction

Choose the correct statements from the options below:

- (a) (i) and (iv) **(b) (i) and (ii)** (c) (ii) and (iii) (d) (i) and (iv)

12. Given below are a few statements related to external fertilization. Choose the correct statements.

- (i) The male and female gametes are formed and released simultaneously
 (ii) Only a few gametes are released into the medium
 (iii) Water is the medium in a majority of organisms exhibiting external fertilization
 (iv) Offspring formed as a result of external fertilization have better chance of survival than those formed inside an organism

- (a) (iii) and (iv) **(b) (i) and (iii)** (c) (ii) and (iv) (d) (i) and (iv)

13. Offspring formed by sexual reproduction exhibit more variation than those formed by Asexual reproduction because:

- (a) Sexual reproduction is a lengthy process
(b) Gametes of parents have qualitatively different genetic composition
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- (a) The habitat and morphology of the organism
 (b) Morphology of the organism
 (c) Morphology and physiology of the organism
(d) The organism's habitat, physiology and genetic make up

16. Identify the incorrect statement:

- (a) In asexual reproduction, the offspring produced are morphologically and genetically identical to the parent **(b) Zoospores are sexual reproductive structures**
 (c) In asexual reproduction, a single parent produces offspring with or without the formation of gametes (d) Conidia are asexual structures in Penicillium

17. Syngamy means:
 (a) Fusion of similar spores (b) Fusion of dissimilar spores
 (c) Fusion of cytoplasm (d) **Fusion of gametes**
18. During favourable conditions, Amoeba reproduces by:
 (a) **Binary fission** (b) Multiple fission (c) Both of these (d) None of these
19. Internal buds of spongia are:
 (a) Spores (b) **Gemmules** (c) Planula (d) Blastos
20. Animals giving birth to young ones are:
 (a) Oviparous (b) Ovoviviparous (c) **Viviparous** (d) Both b and c
21. Animals laying eggs:
 (a) **Oviparous** (b) Viviparous (c) Ovoviviparous (d) Both a and b
22. In which mode of reproduction variations are not seen
 (a) Asexual (b) Parthenogenesis (c) Sexual (d) **Both a and b**
23. The fragmentation type of asexual reproduction seen in tapeworms -----
 (a) **Apolysis** (b) sporulation (c) strobilation (d) pedal laceration
24. During encystment amoeba produces -----
 (a) Merozoites (b) sporozoites (c) **pseudopodiospores** (d) Azoospores
25. The fusion of similar gametes
 (a) Hologamy (b) Paedogamy (c) **Isogamy,** (d) Anisogamy
26. The external fertilization occurs in ----- medium
 (a) soils (b) **water** (c) Air (d) Both a and b

BOOK BACK TWO MARKS :

- Name an organism where cell division is itself a mode of reproduction.**
 Amoeba, a unicellular organism which reproduces asexually by binary fission.
- Name the phenomenon where the female gamete directly develops into a new organism with an avian example.**
 Parthenogenesis , e.g. turkey.
- What is parthenogenesis? Give two examples from animals**
 Development of an egg into a complete individual without fertilization is known as parthenogenesis. e.g. Honey bees, Solenobia
- Which type of reproduction is effective - Sexual or asexual. Why?**
 - Reproduction is a biological process by which organisms produce their young ones.
 Reproduction results in continuation of species and introduces variations in organisms which are essential for adaptation and evolution of their own kind.
 - Sexual Reproduction can only bring about variation in the organism since it involves fusion of gametes from two different individuals, (parents). A sexual reproduction involves uniparental inheritance and cannot bring about variation.
 - Thus, sexual & asexual reproduction can help to create the next generation but only sexual reproduction is said to be more effective than asexual reproduction.
- The unicellular organisms which reproduce by binary fission are considered immortal. Justify.**
 - In binary fission (asexual reproduction), the parental organism divides into two halves and each half forms a daughter individual. This is seen in unicellular organism like bacteria, Amoeba etc.
 - At maturity the single parent cell divides, to form the daughter cells. The parent cell does not die but it becomes a part of the daughter cells formed.
 - Thus the unicellular organisms which reproduce by binary fission are considered immortal.

- (iv) In other cases of asexual reproduction, the parent produces special structures like buds, spores etc for reproduction but the parent organism continues to live and grow. It dies a natural death.

6. Why is the offspring formed by asexual reproduction referred as a clone?

Clones refers to the group of genetically identical cells or organisms asexually produced from a single progenitor cell or organisms asexually produced from a single progenitor cell or organism. Asexual reproduction involves a single parent. Offsprings produced by asexual reproduction are morphologically and genetically similar to their parents and are hence called clones.

7. Why are the offsprings of oviparous animal at a greater risk as compared to offsprings of viviparous organisms?

Oviparous animals lay eggs outside their body. These eggs are exposed to various environmental conditions and may be eaten by predators also. They face lot of risks until the young ones hatch. But the offsprings of viviparous animals are more safe and protected in the maternal womb until they are born.

8. Give reasons for the following:

(a) Some organisms like honey bees are called parthenogenetic animals

Development of an egg into a complete individual without fertilization is known as parthenogenesis. It is of two types. Natural parthenogenesis occurs in Nature in many animals such as honey bees. Artificially it can be induced in animals by physical or chemical stimuli which is called artificial parthenogenesis.

(b) A male honey bee has 16 chromosomes where as its female has 32 chromosomes.

In honey bees both sexual reproduction and parthenogenesis occurs, and it is described as incomplete parthenogenesis. It is a kind of natural parthenogenesis.

During sexual reproduction, the fertilized eggs (zygotes) develop into queen bee and workers (females). The unfertilized egg develop into drones (males). This honey bees are called parthenogenesis animals.

In honey bees the normal chromosomal number in a cell is $2n = 32$. Gametes (sperms & egg) will have only $n = 16$ chromosomes since they are haploid. The female bees are formed by fertilization of gametes.

$$\text{sperm } (n) + \text{egg } (n) = 2n$$

Therefore they have 32 chromosomes. Since the drones (males) are formed from unfertilized eggs (n) they have only 16 chromosomes. Honey bees show incomplete parthenogenesis.

9. Differentiate between the following:

(a) Binary fission in amoeba and multiple fission in *Plasmodium*

Binary fission in amoeba	Multiple fission in plasmodium
The nucleus divides mitotically only once.	The nucleus divides repeatedly
The cell constricts in the middle after nuclear division to form the daughter cells.	The cytoplasm divides into as many parts as that of nuclei and each part encircles a daughter nucleus.
Two daughter cells are formed.	Many daughter cells are formed.

(b) Budding in yeast and budding in *Hydra*

Budding in Yeast	Budding in Hydra
Yeast is a unicellular organism. The single cell produces an outgrowth to form a bud. Nucleus of the parent cell divides and a daughter nuclei enters the bud which is unicellular.	The Bud is developed by mitotic divisions of its cells and is multicellular.
A Chain of buds may be formed in the parent cell at times.	Chain of buds are not formed.

In both cases, the buds separate and lead an independent life.

(c) Regeneration in lizard and *Planaria*

Regeneration in Planaria	Regeneration in lizard
It shows the morphallaxis type of regeneration in which the whole body grows from a small fragment	Lizard shows the epimorphosis type of regeneration in which replacement of lost body parts occur.
The whole body can be got by regeneration	It shows the restorative type of regeneration in which several body parts can only develop but the whole body cannot develop.

10. How is juvenile phase different from reproductive phase?

Juvenile phase	Reproductive phase
Juvenile phase/ vegetative phase is the period of growth between the birth of the individual upto reproductive maturity.	During reproductive phase/ maturity phase the organisms reproduce and their offsprings reach maturity period.

11. What is the difference between syngamy and fertilization?

The entire process involved in fusion of male and female gamete in sexual reproduction is called fertilization. It includes the entry of sperm into the egg followed by fusion of nuclei to form a zygote. Syngamy refers to the process of fusion of the male & female gametes. (fusion of cytoplasm and nuclei)

INTERIOR TWO MARKS :

1. Write the modes of reproduction.

(i) Asexual reproduction (ii) Sexual reproduction

2. All modes of reproduction have some basic features what are they?

All modes of reproduction have some basic features such as synthesis of RNA and proteins, replication of DNA, cell division and growth, formation of reproductive units and their fertilization to form new individuals.

3. Reproduction is essential. Why?

Living organisms show a life cycle involving birth, growth, development, maturation, reproduction and death. Reproduction is the fundamental feature of all living organisms. It is a biological process by which organisms produce their young ones. The young ones grow and mature to repeat the process. Thus reproduction results in continuation of species and introduces variations in organisms, which are essential for adaptation and evolution of their own kind.

4. Write the different modes of asexual reproduction.

The different modes of asexual reproduction seen in animals are
fission,
sporulation,
budding, gemmule formation,
fragmentation regeneration.

5. What is fission? Write its types.

Fission is the division of the parent body into two or more identical daughter individuals. Four types of fission are seen in animals. They are
binary fission,
multiple fission,
sporulation
strobilation.

6. What is binary fission?

In binary fission, the parent organism divides into two halves and each half forms a daughter individual. The nucleus divides first amitotically or mitotically (karyokinesis), followed by the division of the cytoplasm (cytokinesis). The resultant offsprings are genetically identical to the parent.

7. What is karyokinesis?

The division of the nucleus is called karyokinesis.

8. What is cytokinesis?

The division of the cytoplasm is called cytokinesis.

9. Write the types of binary fission.

Depending on the plane of fission, binary fission is of the following types

- i) Simple irregular binary fission
- ii) Transverse binary fission
- iii) Longitudinal binary fission
- iv) Oblique binary fission

10. Define oblique binary fission.

In oblique binary fission the plane of division is oblique. It is seen in dinoflagellates.
e.g. *Ceratium*

11. What is repeated fission? Give example.

If multiple fission produces four or many daughter individuals by equal cell division and the young ones do not separate until the process is complete, then this division is called **repeated fission**
e.g. *Vorticella*.

12. What is schizogony?

In *Plasmodium*, multiple fission occurs in the schizont and in the oocyte stages. When multiple fission occurs in the schizont, the process is called schizogony and the daughter individuals are called merozoites

13. What is sporogony?

In *Plasmodium*, multiple fission occurs in the schizont and in the oocyte stages. When multiple fission occurs in the oocyte, it is called sporogony and the daughter individuals are called sporozoites.

14. What is encystment?

During unfavorable conditions (increase or decrease in temperature, scarcity of food) *Amoeba* withdraws its pseudopodia and secretes a three-layered, protective, chitinous cyst wall around it and becomes inactive. This phenomenon is called encystment.

15. What are Pseudopodiospores?

When conditions become favourable, the encysted *Amoeba* divides by multiple fission and produces many minute amoebae called pseudopodiospore or amoebulae.

16. What is strobilation?

In some metazoan animals, a special type of transverse fission called strobilation occurs. In the process of strobilation, several transverse fissions occur simultaneously giving rise to a number of individuals which often do not separate immediately from each other e.g. *Aurelia*.

17. Define plasmotomy?

Plasmotomy is the division of multinucleated parent into many multinucleate daughter individuals with the division of nuclei. Nuclear division occurs later to maintain normal number of nuclei. Plasmotomy occurs in *Opalina* and *Pelomyxa* (Giant *Amoeba*).

18. What is budding?

In budding, the parent body produces one or more buds and each bud grows into a young one. The buds separate from the parent to lead a normal life. In sponges, the buds constrict and detach from the parent body and the bud develops into a new sponge.

19. Write about exogenous budding.

When buds are formed on the outer surface of the parent body, it is known as exogenous budding e.g. *Hydra*.

20. Write about endogenous budding.

In *Noctiluca*, hundreds of buds are formed inside the cytoplasm and many remain within the body of the parent. This is called endogenous budding.

21. What are gemmules?

In freshwater sponges and in some marine sponges a regular and peculiar mode of asexual reproduction occurs by internal buds called gemmules.

22. What is fragmentation?

In fragmentation, the parent body breaks into fragments (pieces) and each of the fragment has the potential to develop into a new individual.

23. What is apolysis?

In the tapeworm, *Taenia solium* the gravid (ripe) proglottids are the oldest at the posterior end of the strobila. The gravid proglottids are regularly cut off either singly or in groups from the posterior end by a process called apolysis.

24. Explain the terms Morphallaxis, Epimorphosis.

Regeneration is of two types, morphallaxis and epimorphosis.

In **morphallaxis** the whole body grows from a small fragment e.g. *Hydra* and *Planaria*.

Epimorphosis is the replacement of lost body parts.

25. Write the types of Epimorphosis.

It is of two types, namely

Reparative and

Restorative regeneration.

26. What is syngamy?

In syngamy, the fusion of two haploid gametes takes place to produce a diploid zygote.

27. What is internal fertilization?

In internal fertilization, the fusion of male and female gametes takes place within the body of female organisms. e.g. reptiles, aves and mammals.

28. What is autogamy?

In autogamy, the male and female gametes are produced by the same cell or same organism and both the gametes fuse together to form a zygote e.g. *Actinosphaerium* and *Paramecium*.

29. What is exogamy?

In exogamy, the male and female gametes are produced by different parents and they fuse to form a zygote. So it is biparental. e.g. Human – dioecious or unisexual animal.

30. What is Hologamy?

In lower organisms, sometimes the entire mature organisms do not form gametes but they themselves behave as gametes and the fusion of such mature individuals is known as **hologamy** e.g. *Trichonympha*.

31. What is Paedogamy?

Paedogamy is the sexual union of young individuals produced immediately after the division of the adult parent cell by mitosis.

32. What is merogamy?

In merogamy, the fusion of small sized and morphologically different gametes (merogametes) takes place.

33. What is isogamy?

The fusion of morphological and physiological identical gametes (isogametes) is called **isogamy**. e.g. *Monocystis*,

34. Define Anisogamy.

The fusion of dissimilar gametes is called **anisogamy** (Gr. *An*-without; *iso*-equal; *gam*-marriage). Anisogamy occurs in higher animals but it is customary to use the term fertilization instead of anisogamy or syngamy. e.g. higher invertebrates and all vertebrates.

35. Write about Conjugation.

Conjugation is the temporary union of the two individuals of the same species. During their union both individuals, called the conjugants exchange certain amount of nuclear material (DNA) and then get separated. Conjugation is common among ciliates, e.g. *Paramecium*, *Vorticella* and bacteria (Prokaryotes).

36. Define Parthenogenesis.

Development of an egg into a complete individual without fertilization is known as parthenogenesis. It was first discovered by Charles Bonnet in 1745.

37. Write about the types of Parthenogenesis.

Parthenogenesis is of two main types namely, Natural Parthenogenesis and Artificial Parthenogenesis. In certain animals, parthenogenesis occurs regularly, constantly and naturally in their life cycle and is known as **natural parthenogenesis**. In **artificial parthenogenesis**, the unfertilized egg (ovum) is induced to develop into a complete individual by physical or chemical stimuli. e.g., Annelid and searuch in eggs.

38. How is natural parthenogenesis classified?

Natural parthenogenesis may be of two types, viz.,

Complete parthenogenesis

Incomplete parthenogenesis

39. What is arrhenotoky?

In this type only males are produced by parthenogenesis. eg: honey bees

40. What is thelytoky?

In this type of parthenogenesis only females are produced by parthenogenesis.eg: Solenobia

41. What is Amphitoky?

In this type parthenogenetic egg may develop into individuals of any sex. Eg: *Aphis*.

42. Write about incomplete parthenogenesis.

Incomplete parthenogenesis is found in some animals in which both sexual reproduction and parthenogenesis occurs. e.g. In honeybees; fertilized eggs (zygotes) develop into queen and workers, whereas unfertilized eggs develop into drones (male).

43. What are ovoviviparous animals?

In **Ovoviviparous** animals, the embryo develops inside the egg and remains in the mother's body until they are ready to hatch. This method of reproduction is similar to viviparity but the embryos have no placental connection with the mother and receive their nourishment from the egg yolk. Ovoviviparity is seen in fishes like shark.

44. What are viviparous animals?

Viviparous (*L., Vivus* - alive, *Parere* - to produce) animals give rise to young ones. Viviparity is a type of development in which the young ones are born alive after being nourished in the uterus through the placenta. Majority of mammals including human beings are viviparous.

45. Write notes on ovoviviparous animals.

In Ovoviviparous animals, the embryo develops inside the egg and remains in the mother's body until they are ready to hatch. This method of reproduction is similar to viviparity but the embryos have no placental connection with the mother and receive their nourishment from the egg yolk. Ovoviviparity is seen in fishes like shark.

EXTRA TWO MARKS :**1. Why is reproduction essential for organisms?**

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

2. Off springs formed due to sexual reproduction have better changes of survival why? Is this statement always true?

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

The variation is usually advantageous and helps of offsprings to survive under changing environmental conditions. Sometimes the variations are not fit for the survival of the species. Therefore, we can not say that this statement is always true.

3. How does the progeny formed from asexual reproduction differ from those formed by sexual reproduction?

Since asexual reproduction does not involve meiosis and fusion of gametes, the progeny formed from asexual reproduction are genetically similar to parents and they do not show variation. The individuals produced as a result of meiosis and gametic fusion exhibit genetic variation and difference from either of the two parents as well as among themselves.

4. Define:

(i) Juvenile phase (ii) reproductive phase (iii) senescent phase

(i) Juvenile phase : is the period of growth between the birth of an individual upto reproductive maturity.

(ii) Reproductive phase : starts after juvenile phase and remains upto the stage when an organism is capable of reproduction.

(iii) Senescent phase : is the phase of ageing when an organism loses its capacity of reproduction. In plants, it is characterized by yellowing and leaf fall.

5. Define external fertilization. Mention its disadvantages.

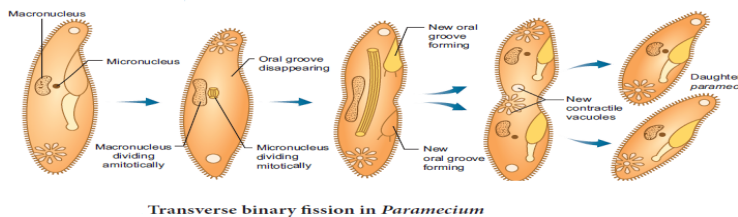
External fertilization occurs outside the body of the organisms. During this process, the parents release sperms and eggs into surrounding water (example, frog) where fertilization occurs. The major disadvantages of this type of fertilization are: (i) the fertilization of egg is not always sure, (ii) the offsprings are not protected from the predators, and (iii) a large number of gametes are wasted.

INTERIOR THREE MARKS :**1. Distinguish between asexual and sexual reproduction.**

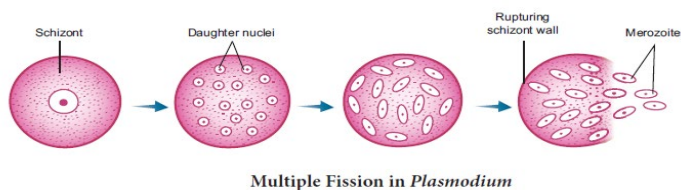
Asexual Reproduction	Sexual Reproduction
1. Asexual reproduction involves the participation of single individual parent.	1. Sexual reproduction involves participation of two separate parents.
2. It generally occurs without the formation of sex organs.	2. It usually requires the formation of sex organs.
3. It does not involve meiosis or reduction division.	3. It involves meiosis which occurs at the time of sporogenesis in flowering plants.
4. Asexual reproduction does not involve sexual fusion or fusion of two gametes. Zygotes are not formed.	4. The sexual reproduction requires fertilization to take place between two opposite gametes leading to the production of a zygote.
5. Since asexual reproduction does not involve meiosis and fusion of gametes, the offsprings are genetically similar to parents and they do not show variations.	5. The individuals produced as a result of meiosis and gametic fusion exhibit genetic variation and difference from either of the two parents.

2. Write about transverse binary fission.

In **transverse binary fission**, the plane of the division runs along the transverse axis of the individual. e.g. *Paramecium* and *Planaria*. In *Paramecium* (Fig. 1.2) the macronucleus divides by amitosis and the micronucleus divides by mitosis.

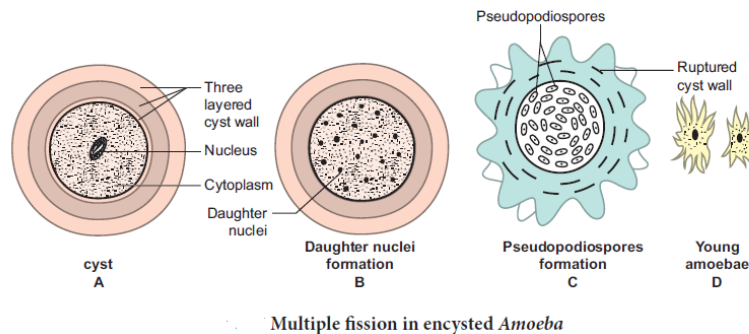
**3. Write notes on multiple fission.**

In multiple fission the parent body divides into many similar daughter cells simultaneously. First, the nucleus divides repeatedly without the division of the cytoplasm, later the cytoplasm divides into as many parts as that of nuclei. Each cytoplasmic part encircles one daughter nucleus. This results in the formation of many smaller individuals from a single parent organism. If multiple fission produces four or many daughter individuals by equal cell division and the young ones do not separate until the process is complete, then this division is called **repeated fission** e.g. *Vorticella*.

4. Draw the diagram of multiple fission in Schizont stage of plasmodium.**5. Write notes on the type of multiple fission seen in Amoeba.**

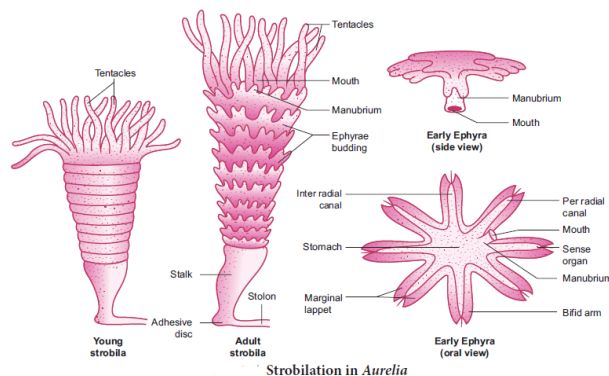
During unfavorable conditions (increase or decrease in temperature, scarcity of food) *Amoeba* withdraws its pseudopodia and secretes a three-layered, protective, chitinous cyst wall around it and becomes inactive. This phenomenon is called encystment. When conditions become favourable, the

encysted *Amoeba* divides by multiple fission and produces many minute amoebae called pseudopodiospore or amoebulae. The cyst wall absorbs water and breaks off liberating the young pseudopodiospores, each with a fine pseudopodia. They feed and grow rapidly to lead an independent life.



6. Explain strobilation with Example

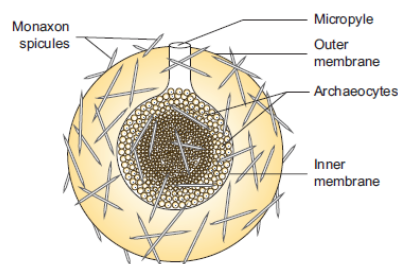
In some metazoan animals, a special type of transverse fission called **strobilation** occurs. In the process of strobilation, several transverse fissions occur simultaneously giving rise to a number of individuals which often do not separate immediately from each other e.g. *Aurelia*.



7. Write notes on Gemmules.

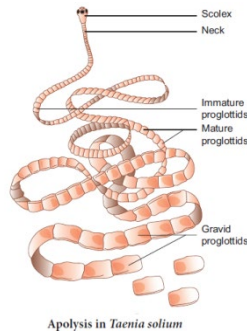
In freshwater sponges and in some marine sponges a regular and peculiar mode of asexual reproduction occurs by internal buds called **gemmules** is seen. A completely grown gemmule is a hard ball, consisting of an internal mass of food-laden archaeocytes. During unfavourable conditions, the sponge disintegrates but the gemmule can withstand adverse conditions. When conditions become favourable, the gemmules begin to hatch.

Gemmule in sponges



8. Explain the process of fragmentation in *Taenia solium*.

In the tapeworm, *Taenia solium* the gravid (ripe) proglottids are the oldest at the posterior end of the strobila. The gravid proglottids are regularly cut off either singly or in groups from the posterior end by a process called apolysis. This is very significant since it helps in transferring the developed embryos from the primary host (man) to find a secondary host (pig).



9. Write notes on regeneration.

Regeneration is regrowth in the injured region. Regeneration was first studied in *Hydra* by Abraham Trembley in 1740. Regeneration is of two types, **morphallaxis** and **epimorphosis**. In morphallaxis the whole body grows from a small fragment e.g. *Hydra* and *Planaria*. When *Hydra* is accidentally cut into several pieces, each piece can regenerate the lost parts and develop into a whole new individual. The parts usually retain their original polarity, with oral ends, by developing tentacles and aboral ends, by producing basal discs. **Epimorphosis** is the replacement of lost body parts. It is of two types, namely **reparative** and **restorative** regeneration. In reparative regeneration, only certain damaged tissue can be regenerated, whereas in restorative regeneration severed body parts can develop. e.g. star fish, tail of wall lizard.

10. Explain the terms: syngamy, conjugation

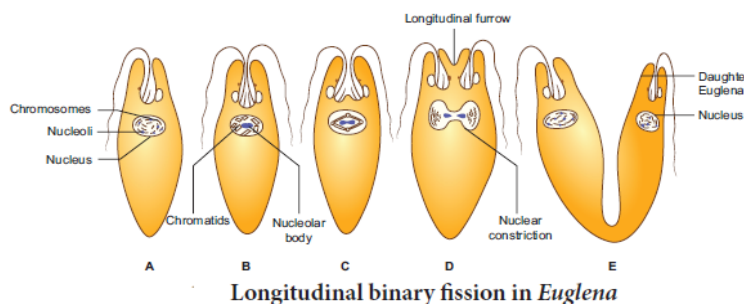
In **syngamy**, the fusion of two haploid gametes takes place to produce a diploid zygote.

Conjugation is the temporary union of the two individuals of the same species. During their union both individuals, called the conjugants exchange certain amount of nuclear material (DNA) and then get separated. Conjugation is common among ciliates, e.g. *Paramecium*, *Vorticella* and bacteria (Prokaryotes).

11. How animals are classified based on breeding time?

On the basis of time, breeding animals are of two types: **seasonal breeders** and **continuous breeders**. Seasonal breeders reproduce at particular period of the year such as frogs, lizards, most birds, deers etc., Continuous breeders continue to breed throughout their sexual maturity e.g. honey bees, poultry, rabbit etc.,

12. Draw the diagram of binary in fission in *Euglena*.



13. How oviparous animals different from Ovoviviparous animals?

Oviparous animals	Ovoviviparous animals
In Oviparous (<i>L., Ovum</i> -egg-, <i>Parere</i> - to produce) animals (egg laying animals), the young hatch from eggs laid outside the mother's body. e.g. reptiles and birds (their eggs are covered by hard calcareous shells), invertebrates, fishes and amphibians (eggs are not covered by hard calcareous shells but covered by a membrane).	In Ovoviviparous animals, the embryo develops inside the egg and remains in the mother's body until they are ready to hatch. This method of reproduction is similar to viviparity but the embryos have no placental connection with the mother and receive their nourishment from the egg yolk. Ovoviviparity is seen in fishes like shark.

14. Distinguish between Oviparous the Viviparous animals.

Oviparous animals	Viviparous animals
In Oviparous (<i>L., Ovum</i> -egg-, <i>Parere</i> - to produce) animals (egg laying animals), the young hatch from eggs laid outside the mother's body. e.g. reptiles and birds (their eggs are covered by hard calcareous shells), invertebrates, fishes and amphibians (eggs are not covered by hard calcareous shells but covered by a membrane).	Viviparous (<i>L., Vivus</i> - alive, <i>Parere</i> - to produce) animals give rise to young ones. Viviparity is a type of development in which the young ones are born alive after being nourished in the uterus through the placenta. Majority of mammals including human beings are viviparous.

15. Name the modes of asexual reproduction in the following organisms.

- (a) Amoeba b) Paramoecium c) Euglena (d) Plasmodium e) Aurelia f) Hydra
- (a) Sporulation
 (b) Transverse Binary fission
 (c) Longitudinal Binary fission
 (d) Multiple fission
 (e) Strobilation
 (f) Budding

16. Write a short note on sporulation and budding.

During unfavourable conditions *Amoeba* multiplies by **sporulation** without encystment. Nucleus breaks into several small fragments or chromatin blocks. Each fragment develops a nuclear membrane, becomes surrounded by cytoplasm and develops a spore-case around it. When conditions become favourable, the parent body disintegrates and the spores are liberated, each hatching into a young amoeba. In **budding**, the parent body produces one or more buds and each bud grows into a young one. The buds separate from the parent to lead a normal life. In sponges, the buds constrict and detach from the parent body and the bud develops into a new sponge.

17. Which one is advance, external fertilization (or) internal fertilization? Give reasons in support of your answer.

External fertilization is primitive and internal fertilization is advance. External fertilization is not advanced because it occurs outside the body of the organisms, mostly in water in most aquatic organisms so that a large number of gametes are wasted. Moreover, the offsprings are not protected and their survival is threatened.

18. Write notes on the fragmentation occur in sea anemone.

Fragmentation or pedal laceration occurs in many genera of sea anemones. Lobes are constricted off from the pedal disc and each of the lobe grows mesenteries and tentacles to form a new sea anemone.

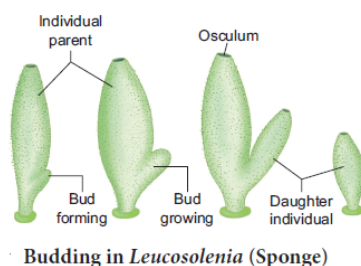
19. Write notes on senescent phase.

Senescent phase begins at the end of reproductive phase when degeneration sets in the structure and functioning of the body.

20. Explain about artificial parthenogenesis

In artificial parthenogenesis, the unfertilized egg (ovum) is induced to develop into a complete individual by physical or chemical stimuli. e.g., Annelid and seurchin eggs.

21. Draw the Diagram of Budding in Leucosolenia.



Budding in *Leucosolenia* (Sponge)

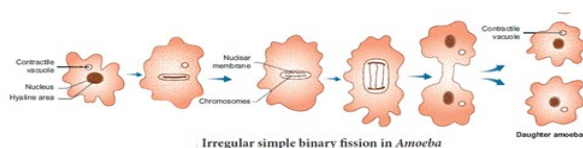
INTERIOR FIVE MARKS :

1. Explain the types of binary fission with examples.

In **binary fission**, the parent organism divides into two halves and each half forms a daughter individual. The nucleus divides first amitotically or mitotically (karyokinesis), followed by the division of the cytoplasm (cytokinesis). The resultant offsprings are genetically identical to the parent. Depending on the plane of fission, binary fission is of the following types

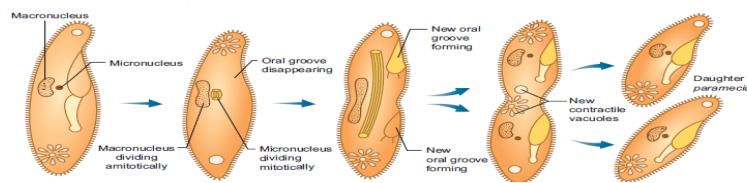
- i) Simple irregular binary fission
- ii) Transverse binary fission
- iii) Longitudinal binary fission
- iv) Oblique binary fission

Simple binary fission is seen in *Amoeba* like irregular shaped organisms, where the plane of division is hard to observe. The contractile vacuoles cease to function and disappear. The nucleoli disintegrate and the nucleus divides mitotically. The cell then constricts in the middle, so the cytoplasm divides and forms two daughter cells.



Irregular simple binary fission in *Amoeba*

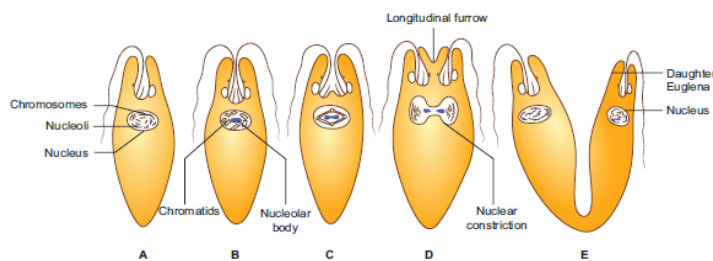
In **transverse binary fission**, the plane of the division runs along the transverse axis of the individual. e.g. *Paramecium* and *Planaria*. In *Paramecium* the macronucleus divides by amitosis and the micronucleus divides by mitosis.



Transverse binary fission in *Paramecium*

In **longitudinal binary fission**, the nucleus and the cytoplasm divide in the longitudinal axis of the organism. In flagellates, the flagellum is retained usually by one daughter cell.

The basal granule is divided into two and the new basal granule forms a flagellum in the other daughter individual. e.g. *Vorticella* and *Euglena*.



Longitudinal binary fission in *Euglena*

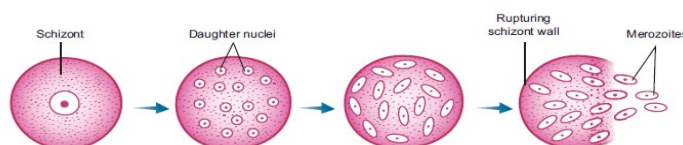
In **oblique binary fission** the plane of division is oblique. It is seen in dinoflagellates. e.g. *Ceratium*

2. Write notes on multiple fission

In multiple fission the parent body divides into many similar daughter cells simultaneously. First, the nucleus divides repeatedly without the division of the cytoplasm, later the cytoplasm divides into as many parts as that of nuclei. Each cytoplasmic part encircles one daughter nucleus. This results in the formation of many smaller individuals from a single parent organism. If multiple fission produces four or many daughter individuals by equal cell division and the young ones do not separate until the process is complete, then this division is called **repeated fission** e.g. *Vorticella*.

3. Explain the process of multiple fission in plasmodium.

In *Plasmodium*, multiple fission occurs in the schizont and in the oocyte stages. When multiple fission occurs in the schizont, the process is called schizogony and the daughter individuals are called merozoites. When multiple fission occurs in the oocyte, it is called sporogony and the daughter individuals are called sporozoites.

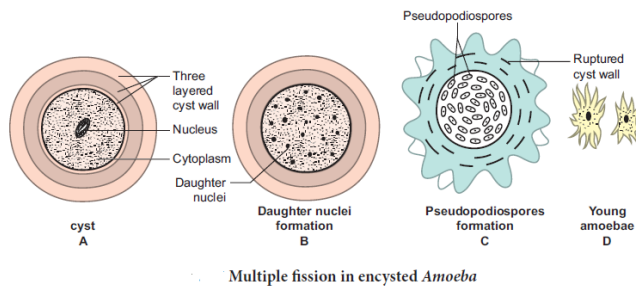


Multiple Fission in *Plasmodium*

4. How does Amoeba reproduce during unfavourable conditions?

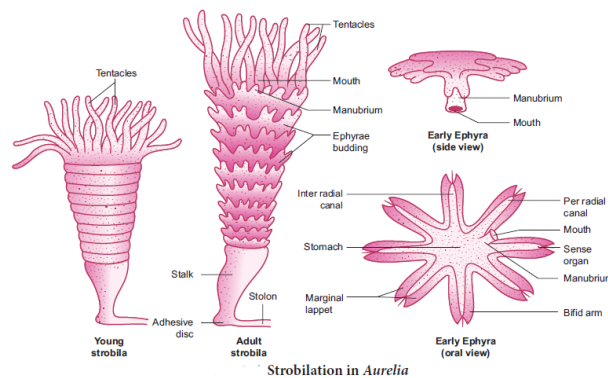
During unfavorable conditions (increase or decrease in temperature, scarcity of food) *Amoeba* withdraws its pseudopodia and secretes a three-layered, protective, chitinous cyst wall around it and becomes inactive. This phenomenon is called encystment. When conditions become favourable, the encysted *Amoeba* divides by multiple fission and produces many minute amoebae called

pseudopodiospore or amoebulae. The cyst wall absorbs water and breaks off liberating the young pseudopodiospores, each with a fine pseudopodia. They feed and grow rapidly to lead an independent life.



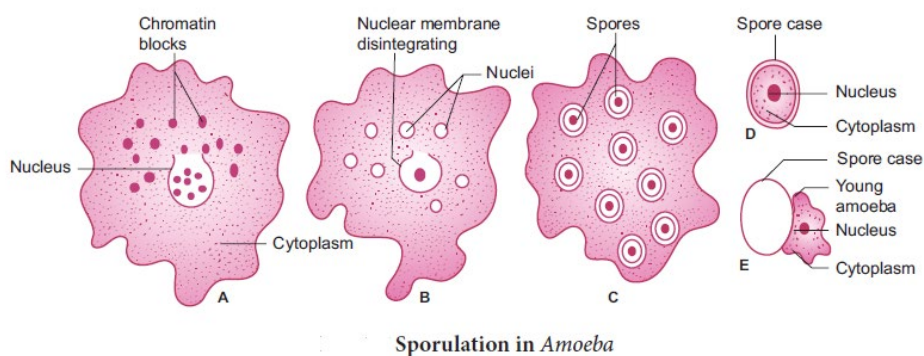
5. In some metazoan animals, a special type of transverse fission occurs. Write notes on it.

In some metazoan animals, a special type of transverse fission called **strobilation** occurs. In the process of strobilation, several transverse fissions occur simultaneously giving rise to a number of individuals which often do not separate immediately from each other e.g. *Aurelia*.



6. How Amoeba multiplies without encystment?

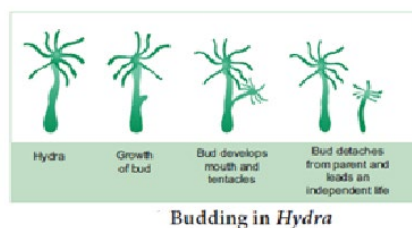
During unfavourable conditions *Amoeba* multiplies by **sporulation** without encystment. Nucleus breaks into several small fragments or chromatin blocks. Each fragment develops a nuclear membrane, becomes surrounded by cytoplasm and develops a spore-case around it. When conditions become favourable, the parent body disintegrates and the spores are liberated, each hatching into a young amoeba.



7. Explain the process of Budding occurs in Hydra with diagram.

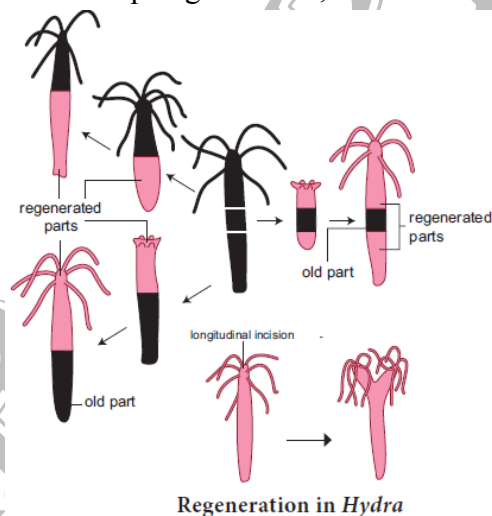
When buds are formed on the outer surface of the parent body, it is known as **exogenous budding** e.g. *Hydra*. In *Hydra* when food is plenty, the ectoderm cells increase and form a small elevation on the body surface. Ectoderm and endoderm are pushed out to form the bud. The

bud contains an interior lumen in continuation with parent's gastro-vascular cavity. The bud enlarges, develops a mouth and a circle of tentacles at its free end. When fully grown, the bud constricts at the base and finally separates from the parent body and leads an independent life.



8. Write notes on Regeneration and its types

Regeneration is regrowth in the injured region. Regeneration was first studied in *Hydra* by Abraham Trembley in 1740. Regeneration is of two types, **morphallaxis** and **epimorphosis**. In morphallaxis the whole body grows from a small fragment e.g. *Hydra* and *Planaria*. When *Hydra* is accidentally cut into several pieces, each piece can regenerate the lost parts and develop into a whole new individual. The parts usually retain their original polarity, with oral ends, by developing tentacles and aboral ends, by producing basal discs. **Epimorphosis** is the replacement of lost body parts. It is of two types, namely **reparative** and **restorative** regeneration. In reparative regeneration, only certain damaged tissue can be regenerated, whereas in restorative regeneration severed body parts can develop. e.g. star fish, tail of wall lizard.



9. Define syngamy. Write notes on its types.

In **syngamy**, the fusion of two haploid gametes takes place to produce a diploid zygote. Depending upon the place where the fertilization takes place, it is of two types. In **external fertilization**, the fusion of male and female gametes takes place outside the body of female organisms in the water medium. e.g. sponges, fishes and amphibians. In **internal fertilization**, the fusion of male and female gametes takes place within the body of female organisms. e.g. reptiles, aves and mammals.

Different kinds of syngamy (fertilization) are prevalent among living organisms. In **autogamy**, the male and female gametes are produced by the same cell or same organism and both the gametes fuse together to form a zygote e.g. *Actinosphaerium* and *Paramecium*. In **exogamy**, the male and female gametes are produced by different parents and they fuse to form a zygote. So it is biparental. e.g. Human – dioecious or unisexual animal.

In lower organisms, sometimes the entire mature organisms do not form gametes but they themselves behave as gametes and the fusion of such mature individuals is known as **hologamy** e.g. *Trichonympha*. **Paedogamy** is the sexual union of young individuals produced immediately after the division of the adult parent cell by mitosis. In **merogamy**, the fusion of small sized and morphologically different gametes (merogametes) takes place. The fusion of morphological and physiological identical gametes (isogametes) is called **isogamy**. e.g. *Monocystis*, whereas the fusion of dissimilar gametes is called **anisogamy** (Gr. *An*-without; *iso*-equal; *gam*-marriage). Anisogamy occurs in higher animals but it is customary to use the term fertilization instead of anisogamy or syngamy. e.g. higher invertebrates and all vertebrates.

10. Explain about the different phases of life cycle of organisms.

Organisms have three phases – Juvenile phase, reproductive phase and senescent phase. **Juvenile phase/ vegetative phase** is the period of growth between the birth of the individual upto reproductive maturity. During **reproductive phase/ maturity phase** the organisms reproduce and their offsprings reach maturity period. On the basis of time, breeding animals are of two types: **seasonal breeders** and **continuous breeders**. Seasonal breeders reproduce at particular period of the year such as frogs, lizards, most birds, deers etc., Continuous breeders continue to breed throughout their sexual maturity e.g. honey bees, poultry, rabbit etc., Senescent phase begins at the end of reproductive phase when degeneration sets in the structure and functioning of the body.

11. Briefly explain about parthenogenesis with its type.

Development of an egg into a complete individual without fertilization is known as parthenogenesis. It was first discovered by Charles Bonnet in 1745. Parthenogenesis is of two main types namely, Natural Parthenogenesis and Artificial Parthenogenesis. In certain animals, parthenogenesis occurs regularly, constantly and naturally in their life cycle and is known as **natural parthenogenesis**.

Natural parthenogenesis may be of two types, viz., complete and incomplete. **Complete parthenogenesis** is the only form of reproduction in certain animals and there is no biparental sexual reproduction. These are no male organisms and so, such individuals are represented by females only.

Incomplete parthenogenesis is found in some animals in which both sexual reproduction and parthenogenesis occurs. e.g. In honeybees; fertilized eggs (zygotes) develop into queen and workers, whereas unfertilized eggs develop into drones (male).

In **paedogenetic parthenogenesis (paedogenesis)** the larvae produce a new generation of larvae by parthenogenesis. It occurs in the sporocysts and Redia larvae of liver fluke. It is also seen in the larvae of some insects. e.g. Gall fly.

In **artificial parthenogenesis**, the unfertilized egg (ovum) is induced to develop into a complete individual by physical or chemical stimuli. e.g., Annelid and seurchin eggs.

12. Explain the following terms Oviparous, Viviparous, and Ovoviviparous.

Animals are classified mainly into three groups namely – Oviparous, Viviparous and Ovoviviparous depends on the site of development of embryo and whether they lay eggs (unfertilized or fertilized) or give birth to young ones.

In **Oviparous** (L., *Ovum*-egg-, *Parere*- to produce) animals (egg laying animals), the young hatch from eggs laid outside the mother's body. e.g. reptiles and birds (their eggs are

covered by hard calcareous shells), invertebrates, fishes and amphibians (eggs are not covered by hard calcareous shells but covered by a membrane).

Viviparous (*L.*, *Vivus* - alive, *Parere* - to produce) animals give rise to young ones. Viviparity is a type of development in which the young ones are born alive after being nourished in the uterus through the placenta. Majority of mammals including human beings are viviparous.

In **Ovoviviparous** animals, the embryo develops inside the egg and remains in the mother's body until they are ready to hatch. This method of reproduction is similar to viviparity but the embryos have no placental connection with the mother and receive their nourishment from the egg yolk. Ovoviviparity is seen in fishes like shark.

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