



# Padalsalai's Telegram Groups!

( தலைப்பிற்கு கீழே உள்ள லிங்கை கிளிக் செய்து குழுவில் இணையவும்! )

- **Padalsalai's NEWS - Group**  
[https://t.me/joinchat/NIfCqVRBNj9hhV4wu6\\_NqA](https://t.me/joinchat/NIfCqVRBNj9hhV4wu6_NqA)
- **Padalsalai's Channel - Group**  
<https://t.me/padasalaichannel>
- **Lesson Plan - Group**  
<https://t.me/joinchat/NIfCqVWwo5iL-21gpzrXLw>
- **12th Standard - Group**  
[https://t.me/Padalsalai\\_12th](https://t.me/Padalsalai_12th)
- **11th Standard - Group**  
[https://t.me/Padalsalai\\_11th](https://t.me/Padalsalai_11th)
- **10th Standard - Group**  
[https://t.me/Padalsalai\\_10th](https://t.me/Padalsalai_10th)
- **9th Standard - Group**  
[https://t.me/Padalsalai\\_9th](https://t.me/Padalsalai_9th)
- **6th to 8th Standard - Group**  
[https://t.me/Padalsalai\\_6to8](https://t.me/Padalsalai_6to8)
- **1st to 5th Standard - Group**  
[https://t.me/Padalsalai\\_1to5](https://t.me/Padalsalai_1to5)
- **TET - Group**  
[https://t.me/Padalsalai\\_TET](https://t.me/Padalsalai_TET)
- **PGTRB - Group**  
[https://t.me/Padalsalai\\_PGTRB](https://t.me/Padalsalai_PGTRB)
- **TNPSC - Group**  
[https://t.me/Padalsalai\\_TNPSC](https://t.me/Padalsalai_TNPSC)



# WAY TO SUCCESS

*Leads to Success* 

## 12

# BIO - ZOOLOGY

## UNIT - I : CHAPTER - 1 REPRODUCTION IN ORGANISMS

**Dear Teachers! & Students!**

We publish this study material on the request of many teachers and students. This study material contains only Book back exercise questions for June month Units. Way to success – 12th Bio-Zoology guide will be published very shortly. Way to success is preparing 12th Bio-Zoology guide based on Govt. New Pattern with the help of expert cum experienced teachers to give an assurance for you to score high marks in your public examination.

**Best Wishes to All.....**

*Way to Success team*

**UNIT –I :Chapter - 1****REPRODUCTION IN ORGANISMS****POINTS TO REMEMBER**

<b>Paramecium</b>	Capable of both sexual and asexual reproduction.
<b>Asexual reproduction</b>	Reproduction by a single parent without the involvement of gamete formation. <b>Eg:</b> Protista, Bacteria, Archaea.
<b>Somatogenic</b>	Mitotic division of the somatic (body) cell.
<b>Sexual reproduction</b>	The reproductive process involving two types of gametes (ova and sperm). It leads to genetic variation that syngamy (fertilization) and conjugation.
<b>Cytokinesis</b>	Division of the cytoplasm.
<b>Karyokinesis</b>	Division of the nucleus.
<b>Binary fission</b>	The parent organism divides into two halves.
<b>Simple irregular</b>	Simple irregular binary fission - <b>E.g.</b> Amoeba.
<b>Transverse</b>	Transverse binary fission - <b>E.g.</b> Paramecium and Planaria.
<b>Longitudinal</b>	Longitudinal binary fission - <b>E.g.</b> Vorticella and Euglena.
<b>Oblique</b>	Oblique binary fission - <b>E.g.</b> dinoflagellates, Ceratium.
<b>Multiple fission</b>	Multiple fission - <b>E.g.</b> Vorticella.
<b>Schizogony</b>	In Plasmodium, multiple fission occurs in the schizont.
<b>Sporogony</b>	In Plasmodium multiple fission occurs in the oocyte.
<b>Pelomyxa</b>	Pelomyxa - Giant Amoeba.
<b>Encystment</b>	It occurs in Amoeba.
<b>Plasmotomy</b>	It occurs in Opalina and Pelomyxa.
<b>Strobilation</b>	A special type of transverse fission. <b>E.g.</b> Aurelia.
<b>Budding</b>	Budding <b>E.g.</b> Sponges, Hydra. Exogenous budding <b>E.g.</b> Hydra. Endogenous budding <b>E.g.</b> Noctiluca.
<b>Gemmules</b>	<b>E.g.</b> freshwater sponges, marine sponges.
<b>Regeneration</b>	It was first studied in Hydra by Abraham Trembley in 1740.
<b>Morphallaxis</b>	The whole body grows from a small fragment. <b>E.g.</b> Hydra and Planaria.
<b>Epimorphosis</b>	The replacement of lost body parts. <b>E.g.</b> star fish, tail of wall lizard.
<b>External fertilization</b>	The fusion of male and female gametes takes place outside the body of female organisms in the water medium. <b>E.g.</b> sponges, fishes and amphibians.
<b>Internal fertilization</b>	The fusion of male and female gametes takes place within the body of female organisms. <b>E.g.</b> reptiles, aves and mammals.
<b>Syngamy</b>	The fusion of two haploid gametes.

## 1. Reproduction in Organisms

3

<b>Autogamy</b>	The male and female gametes are produced by the same cell or same organism and both the gametes fuse together to form a zygote <b>E.g.</b> Actinosphaerium and Paramecium.
<b>Exogamy</b>	The different parents and they fuse to form a zygote. <b>E.g.</b> Human -dioecious or unisexual animal.
<b>Hologamy</b>	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. <b>E.g.</b> Trichonympha.
<b>Isogamy</b>	The fusion of identical gametes. <b>E.g.</b> Monocystis.
<b>Anisogamy</b>	The fusion of dissimilar gametes. <b>E.g.</b> higher invertebrates and all vertebrates.
<b>Parthenogenesis</b>	It is without fertilization that first discovered by Charles Bonnet in 1745.
<b>Natural parthenogenesis</b>	In certain animals, parthenogenesis occurs regularly, constantly and naturally in their life cycle.
<b>Artificial parthenogenesis</b>	The unfertilized egg (ovum) is induced to develop into a complete individual by physical or chemical Stimuli. <b>E.g.</b> Annelid and sea urchin eggs.
<b>Fertilized eggs</b>	It develops into queen and workers honey bee.
<b>Unfertilized eggs</b>	It develops into drones (male) honey bee.
<b>Placental cord</b>	The viviparous lemon shark gives birth to a young one, which is still attached by its placental cord.
<b>Arrhenotoky</b>	In this type only males are produced by parthenogenesis. <b>E.g.</b> honey bees.
<b>Paedogenetic parthenogenesis</b>	The larvae produce a new generation of larvae by parthenogenesis. <b>E.g.</b> sporocysts and Redia larvae of liver fluke, Gall fly.
<b>Ovoviviparity</b>	The embryo develops inside the egg - no placental connection with the mother and nourishment from the egg yolk. <b>E.g.</b> fishes like shark.

## TEXTBOOK QUESTIONS

## EVALUATION :

- 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  
a) Oviparous      b) Ovoviviparous      c) Viviparous      d) Both a and b
- The modes of asexual 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) Asexual      b) Parthenogenesis      c) Sexual      d) Both a and b
- Assertion and reasoning questions:  
**I. Assertion (A) :** In bee society, all the members are diploid except drones.  
**Reason (R) :** Drones are produced by parthenogenesis.  
a. A and R are true and R is correct explanation for A.  
b. A and R are true but R is not the correct explanation for A.  
c. A is true but R is false.  
d. Both A and R are false.

**II.Assertion (A)** :Offsprings produced by asexual reproduction are genetically identical to the parent.

**Reason (R)** :Asexual reproduction involves only mitosis and no meiosis.

- A and R are true and R is correct explanation for A**
- A and R are true but R is not the correct explanation for A
- A is true but R is false
- Both A and R are false.

**III.Assertion (A)** :Viviparous animals give better protection to their offsprings.

**Reason (R)**:They lay their eggs in the safe places of the environment.

- A and R are true and R is correct explanation for A
- A and R are true but R is not the correct explanation for A
- A is true but R is false**
- Both A and R are false.

**6. Name an organism where cell division is itself a mode of reproduction.**

Bacteria, Vorticella and Amoeba.

**7. Name the phenomenon where the female gamete directly develops into a new organism with an avian example.**

- ❖ Parthenogenesis (Thelytoky)
- ❖ In this type of parthenogenesis only females are produced by parthenogenesis.
- ❖ **E.g:**Solenobia, Chicken, Pigeon and Turkey.

**8. 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, Gall fly.

**9. Which type of reproduction is effective -Asexual or sexual and why?**

- ❖ Sexual reproduction is effective.
- ❖ Because genetical variation occurs.
- ❖ It leads to evolution.
- ❖ A sexual reproduction involves uniparental inheritance and cannot bring about variation.

**10. The unicellular organisms which reproduce by binary fission are considered immortal. Justify.**

- ❖ Actually, single celled organisms are considered to be biologically immortal.
- ❖ This is because they don't die as they grow old.
- ❖ Binary fission is seen in unicellular organism like bacteria, Amoeba etc.
- ❖ They usually undergo mitosis to reproduce, in which the organism itself gets divided into two.

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

- ❖ Asexual reproduction produces offspring that are genetically identical to the parent because the offspring are all clones of the original parent.
- ❖ Offsprings produced by asexual reproduction are morphologically and genetically similar to their parents and so it is called clone.

**12. 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.
- ❖ As a result, the eggs of these animals are under continuous threat from various factors.
- ❖ Hence, the offspring of an egg-laying or oviparous animal is at greater risk as compared to the offspring of a viviparous animal, which gives birth to its young ones.



## 1. Reproduction in Organisms

5

### 13. Give reasons for the following:

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

- ❖ The organisms produced without fertilization of the egg are called parthenogenetic organisms.
- ❖ The male honey bees are formed from unfertilized eggs.

(b) A male honey bee has 16 chromosomes whereas its female has 32 chromosomes. Because

- ❖ Males develop from unfertilized eggs and are haploid (16 chromosomes)
- ❖ Females develop from fertilized eggs and are diploid (32 chromosomes)

### 14. Differentiate between the following:

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

S.No	Binary fission in amoeba	Multiple fission in Plasmodium
1	The nucleus divides only once.	The nucleus divides repeatedly
2	Two daughter cells are formed	Many daughter cells are formed.
3	Schizont and oocyte stages are not found.	Schizont and oocyte stages are found.

(b) Budding in yeast and budding in Hydra

S.No	Budding in yeast	Budding in Hydra
1	Bud appears as an outgrowth from the parent body.	Buds are formed on the outer surface of the parent body
2	Asymmetrical type	Exogenous budding
3	A Chain of buds may be formed	Chain of buds are not formed.

(c) Regeneration in lizard and Planaria

S.No	Regeneration in lizard	Regeneration in Planaria
1	Epimorphosis type	Morphallaxis type
2	The replacement of lost body parts occurs	The whole body grows from a small fragment.

### 15. 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.

### 16. What is the difference between syngamy and fertilization?

Syngamy	Fertilization
It is the process of fusion of two haploid gametes takes place to produce a diploid zygote	The entire process involved in fusion of male and female gamete

## ADDITIONAL QUESTIONS

### PART - A

#### Type I. Choose the best answer :

- Reproduction by a single parent without the involvement of gamete formation
  - Sexual Reproduction
  - Asexual Reproduction**
  - Binary Fission
  - Multiple Fission
- When two parents participate in the reproductive process involving two types of gametes
  - Multiple Fission
  - Binary Fission
  - Sexual Reproduction**
  - Asexual Reproduction
- Protista, Bacteria, Archaea are example for

- a) Sexual Reproduction  
**c) Asexual reproduction**
- b) Regeneration  
 d) Simple Binary Fission
4. Division of the parent body into two or more identical daughter individuals  
 a) Budding                      b) Fragmentation                      c) Regeneration                      **d) Fission**
5. Simple binary fission is seen in  
 a) Paramecium                      b) Plasmodium                      c) Euglena                      **d) Amoeba**
6. Transverse binary fission is seen in  
 a) Ceratium                      b) Euglena  
 c) Plasmodium                      **d) Paramecium and Planaria**
7. Longitudinal binary fission is seen in  
 a) Plasmodium                      b) Amoeba  
 c) Hydra                      **d) Vorticella and Euglena**
8. Oblique binary fission is seen in  
 a) Hydra                      b) Euglena                      **c) Ceratium**                      d) Amoeba
9. Multiple fission is seen in  
 a) **Plasmodium**                      b) Hydra                      c) Star Fish                      d) Euglena
10. When multiple fission occurs in the schizont, the process is called .....and the daughter individuals are called .....  
 a) **Schizogony and Merozoites**                      b) Sporozoites and Strobilization  
 c) Strobilization and Sporozoites                      d) Merozoites and Schizogony
11. When multiple fission occurs in the oocyte, it is called .....and the daughter individuals are called.....  
 a) Sporozoites and Sporogony                      b) Merozoites and Sporozoites  
 c) **Sporogony and Sporozoites**                      d) Gametozoites and Sporozoites
12. In some metazoan animals, a special type of transverse fission called  
 a) Protozoan                      **b) Strobilation**                      c) Budding                      d) Fragmentation
13. Plasmotomy occurs in  
 a) Hydra                      b) Euglena                      c) Paramecium                      **d) Opalina and Pelomyxa**
14. The gravid proglottids are regularly cut off either singly or in groups from the posterior end by a process called  
 a) **Apolysis**                      b) Morphohysis                      c) Plasmotomy                      d) Anatomy
15. The division of multinucleated parent into many multinucleate daughter individuals with the division of nuclei  
 a) Apolysis                      b) Morphohysis                      **c) Plasmotomy**                      d) Anatomy
16. During unfavourable conditions Amoeba multiplies by sporulation without encystment.  
 a) Budding                      b) Dividing                      **c) Sporulation**                      d) Gastrulation
17. The parent body produces one or more buds and each bud grows into a young one is  
 a) Splitting                      b) Coiling                      c) Moulding                      **d) Budding**
18. When buds are formed on the outer surface of the parent body, it is known as  
 a) Endogeneous budding                      b) Mesogeneous budding  
 c) Daughter body                      **d) Exogenous budding**
19. In some animals, hundreds of buds are formed inside the cytoplasm and many remain within the body of the parent. This is called  
 a) **Endogeneous budding**                      b) Mesogeneous budding  
 c) Daughter body                      d) Exogenous budding
20. Noctiluca is example for

## 1. Reproduction in Organisms

7

- a) Exogeneous budding  
c) Mesogeneous budding
- b) Homogeneous budding  
**d) Endogeneuos budding**
21. Hydra is example for  
a) Homogeneous budding  
**c) Exogeneous budding**  
b) Endogeneous budding  
d) Gametogeneous budding
22. In freshwater sponges and in some marine sponges a regular and peculiar mode of asexual reproduction occurs by internal buds called  
**a) Gemmules**      b) Budding      c) Fission      d) Conjugation
23. The parent body breaks into fragments (pieces) and each of the fragment has the potential to develop into a new individual.  
**a) Fragmentation**      b) Destruction      c) Formation      d) Occassion
24. Regeneration was first studied in Hydra by  
a) Charles Bonnet      b) Lamark      c) Charles Darwin      **d) Abraham Trembley**
25. Regeneration was first studied in  
a) 1640      b) 1840      c) 1940      **d) 1740**
26. Morphallaxis and Epimorphosis are the types of.....  
**a) Regeneration**      b) Reproduction      c) Reformation      d) Refragmentation
27. The replacement of lost body parts.  
a) Exomorphosis      b) Endmorphosis      **c) Epimorphosis**      d) Mesomorphosis
28. Star fish is an example for  
a) Restorative generation      b) Fertilization  
**c) Reparative regeneration**      d) Degeneration
29. Power of regeneration is used in .....  
a) Formation of sponges      b) Growth of sponges  
**c) Cultivation of sponges**      d) Production of sponges
30. The fusion of two haploid gametes takes place to produce a diploid zygote  
a) Monogamy      **b) Syngamy**      c) Exogamy      d) Isogamy
31. External fertilization is seen in  
a) Hydra      b) Amoeba      **c) Sponges**      d) Star fish
32. The fusion of male and female gametes takes place outside the body of female organisms in the water medium.  
a) Normal fertilization      **b) External fertilization**  
c) Central fertilization      d) Internal fertilization
33. The male and female gametes are produced by different parents and they fuse to form azygote.  
a) Merogamy      b) Isogamy      **c) Exogamy**      d) hologamy
34. The fusion of male and female gametes takes place within the body of female organisms.  
a) Both Internal and External fertilization      b) External fertilization  
c) None of these      **d) internal fertilization**
35. Reptiles, aves and mammals are the examples of.....  
a) External fertilization      **b) Internal fertilization**  
c) Both A and B      d) None of the above
36. The male and female gametes are produced by the same cell or same organism and both the gametes fuse together to form a zygote  
**a) Autogamy**      b) Hologamy      c) Isogamy      d) Merogamy
37. .... are the examples of Autogamy.



- a) Unisexual animal  
**c) Actinosphaerium and Paramecium**
- b) Trichonympha and Paramecium  
 d) Monocystis
38. Trichonympha is an example for.....  
 a) Merogamy                      **b) Hologamy**                      c) Exogamy                      d) Isogamy
39. The fusion of small sized and morphologically different gametes (merogametes) takes place.  
**a) Merogamy**                      b) Helogamy                      c) Isogamy                      d) Exogamy
40. The fusion of morphological and physiological identical gametes (isogametes) is  
 a) Exogamy                      **b) Isogamy**                      c) Hologamy                      d) Merogamy
41. The fusion of dissimilar gametes  
 a) Isogamy                      b) Hologamy                      c) exogamy                      **d) Anisogamy**
42. The examples of Conjugation  
 a) Reptiles                      **b) Vorticella and Bacteria**  
 c) Paramecium                      d) None of the above
43. Honey bee is an example of  
 a) Winter Breeders                      **b) Continuous Breeders**  
 c) Summer Breeders                      d) Seasonal Breeders
44. frogs, lizards, most birds, deers etc., are the  
**a) Seasonal Breedors**                      b) Continuous Breedors  
 c) Winter Breedors                      d) Summer Breedors
45. Development of an egg into a complete individual without fertilization is known as  
 a) Fertilization                      b) Zygoteformation  
**c) Parthenogenesis**                      d) Cleavage
46. Parthenogenesis was first discovered by  
**a) Charles Bonnet**                      b) Charles Darwin                      c) Lamark                      d) None of these
47. In certain animals, parthenogenesis occurs regularly, constantly and naturally in their lifecycle and is known as  
 a) Artificial Parthenogenesis                      **b) Natural Parthenogenesis**  
 c) Both A and B                      d) None of the above
48. In this type only males are produced by parthenogenesis is  
 a) Thelytoky                      b) Amphitoky                      **c) Arrhenotoky**                      d) None of the above
49. In this type of parthenogenesis only females are produced by parthenogenesis  
 a) Amphitoky                      **b) Thelytoky**                      c) Arrhenotoky                      d) None of the above
50. In this type parthenogenetic egg may develop into individuals of any sex.  
**a) Amphitoky**                      b) Thelytoky                      c) Arrhenotoky                      d) None of the above
51. In paedogenetic parthenogenesis is called.....  
 a) Parthenogenesis                      b) Heterogenesis                      c) Merogenesis                      **d) Paedogenesis**
52. Hen is an example of  
 a) Viviparous                      **b) Oviparous**                      c) Ovoviviparous                      d) None of the above
53. Cow is an example of  
 a) Oviparaous                      **b) Viviparaous**                      c) Oviviviparous                      d) None of the above
54. Shark is an example of  
 a) Oviparaous                      b) Viviparaous                      **c) Ovoviviparous**                      d) None of the above

## 1. Reproduction in Organisms

9

## Type II. Match the following :

LIST I		LIST II	
<b>p</b>	Sexual reproduction	<b>i</b>	Division of the nucleus
<b>q</b>	Asexual reproduction	<b>ii</b>	Ova and sperm
<b>r</b>	Karyokinesis	<b>iii</b>	Division of the cytoplasm
<b>s</b>	Cytokinesis	<b>iv</b>	Single parent

a) p-ii, q-i, r-iii, s-iv

b) p-iii, q-iv, r-ii, s-i

c) **p-ii, q-iv, r-i, s-iii**

d) p-iv, q-iii, r-ii, s-i

LIST I		LIST II	
<b>p</b>	Simple irregular binary fission	<b>i</b>	Ceratium
<b>q</b>	Transverse binary fission	<b>ii</b>	Vorticella
<b>r</b>	Longitudinal binary fission	<b>iii</b>	Amoeba
<b>s</b>	Oblique binary fission	<b>iv</b>	Planaria

a) p-ii, q-i, r-iii, s-iv

b) **p-iii, q-iv, r-ii, s-i**

c) p-ii, q-iv, r-i, s-iii

d) p-iv, q-iii, r-ii, s-i

LIST I		LIST II	
<b>p</b>	Schizogony	<b>i</b>	Aurelia
<b>q</b>	Sporogony	<b>ii</b>	Plasmodium
<b>r</b>	Multiple fission	<b>iii</b>	Oocyte
<b>s</b>	Strobilation	<b>iv</b>	Schizont

a) p-ii, q-i, r-iii, s-iv

b) p-iii, q-iv, r-ii, s-i

c) p- ii, q-iv, r-i, s-iii

d) **p-iv, q-iii, r-ii, s-i**

LIST I		LIST II	
<b>p</b>	Strobilation	<b>i</b>	Leucosolenia
<b>q</b>	Plasmotomy	<b>ii</b>	Amoeba
<b>r</b>	Sporulation	<b>iii</b>	Opalina
<b>s</b>	Budding	<b>iv</b>	Aurelia

a) p-ii, q-i, r-iii, s-iv

b) p-iii, q-iv, r-ii, s-i

c) p-ii, q-iv, r-i, s-iii

d) **p-iv, q-iii, r-ii, s-i**

LIST I		LIST II	
<b>p</b>	Pelomyxa	<b>i</b>	Sponge
<b>q</b>	Exogenous budding	<b>ii</b>	Noctiluca
<b>r</b>	Endogenous budding	<b>iii</b>	Hydra
<b>s</b>	Gemmule	<b>iv</b>	Giant Amoeba

a) **p-iv, q-iii, r-ii, s-i**

b) p-iii, q-iv, r-ii, s-i

c) p-ii, q-iv, r-i, s-iii

d) p-ii, q-i, r-iii, s-iv

LIST I		LIST II	
<b>p</b>	Fragmentation	<b>i</b>	Daughter individuals
<b>q</b>	Plasmotomy	<b>ii</b>	Amoeba
<b>r</b>	Multiple fission	<b>iii</b>	Pelomyxa
<b>s</b>	Sporozoite	<b>iv</b>	Sea anemone

a) p-ii, q-i, r-iii, s-iv

b) p-iii, q-iv, r-ii, s-i

c) p-ii, q-iv, r-i, s-iii

d) **p-iv, q-iii, r-ii, s-i**

7.

LIST I		LIST II	
<b>p</b>	Morphallaxis	<b>i</b>	Star fish
<b>q</b>	Epimorphosis	<b>ii</b>	Hydra and Planaria
<b>r</b>	External fertilization	<b>iii</b>	Fishes
<b>s</b>	Internal fertilization	<b>iv</b>	Reptiles

a) **p-ii, q-i, r-iii, s-iv**

b) p-iii, q-iv, r-ii, s-i

c) p-ii, q-iv, r-i, s-iii

d) p-iv, q-iii, r-ii, s-i

8.

LIST I		LIST II	
<b>p</b>	Autogamy	<b>i</b>	Monocystis
<b>q</b>	Exogamy	<b>ii</b>	Trichonympha
<b>r</b>	Hologamy	<b>iii</b>	Paramecium
<b>s</b>	Isogamy	<b>iv</b>	Human

a) p-ii, q-i, r-iii, s-iv

b) **p-iii, q-iv, r-ii, s-i**

c) p-ii, q-iv, r-i, s-iii

d) p-iv, q-iii, r-ii, s-i

9.

LIST I		LIST II	
<b>p</b>	Anisogamy	<b>i</b>	Honey bees
<b>q</b>	Conjugation	<b>ii</b>	Higher invertebrates
<b>r</b>	Continuous breeders	<b>iii</b>	Frogs
<b>s</b>	Seasonal breeders	<b>iv</b>	Prokaryotes

a) p-ii, q-i, r-iii, s-iv

b) p-iii, q-iv, r-ii, s-i

c) **p-ii, q-iv, r-i, s-iii**

d) p-iv, q-iii, r-ii, s-i

10.

LIST I		LIST II	
<b>p</b>	Apolysis	<b>i</b>	Tail of wall lizard
<b>q</b>	Merogamy	<b>ii</b>	Fertilization
<b>r</b>	Syngamy	<b>iii</b>	Merogametes
<b>s</b>	Restorative regeneration	<b>iv</b>	Taeniasolium

a) p-ii, q-i, r-iii, s-iv

b) p-iii, q-iv, r-ii, s-i

c) p-ii, q-iv, r-i, s-iii

d) **p-iv, q-iii, r-ii, s-i**

11.

LIST I		LIST II	
<b>p</b>	Arrhenotoky	<b>i</b>	Hen
<b>q</b>	Thelytoky	<b>ii</b>	Aphis
<b>r</b>	Amphitoky	<b>iii</b>	Honey bee
<b>s</b>	Oviparous	<b>iv</b>	Solenobia

a) p-ii, q-i, r-iii, s-iv

b) **p-iii, q-iv, r-ii, s-i**

c) p-ii, q-iv, r-i, s-iii

d) p-iv, q-iii, r-ii, s-i

12.

LIST I		LIST II	
<b>p</b>	Paedogenesis	<b>i</b>	Cow
<b>q</b>	Viviparous	<b>ii</b>	Gall fly
<b>r</b>	Complete parthenogenesis	<b>iii</b>	Female only
<b>s</b>	Incomplete parthenogenesis	<b>iv</b>	Both sexual reproduction and parthenogenesis occurs.

a) **p-ii, q-i, r-iii, s-iv**

b) p-iii, q-iv, r-ii, s-i

c) p-ii, q-iv, r-i, s-iii

d) p-iv, q-iii, r-ii, s-i

## 1. Reproduction in Organisms

11

13.

LIST I		LIST II	
<b>p</b>	Ovoviviparous	<b>i</b>	Chemical stimuli
<b>q</b>	Oviparous	<b>ii</b>	Honey bee
<b>r</b>	Incomplete parthenogenesis	<b>iii</b>	Egg laying animals
<b>s</b>	Artificial Parthenogenesis	<b>iv</b>	Shark

a) p-ii, q-i, r-iii, s-iv

b) p-iii, q-iv, r-ii, s-i

c) p-ii, q-iv, r-i, s-iii

d) p-iv, q-iii, r-ii, s-i

### Type III. Assertion and Reasoning :

1. Assertion and Reasoning Question - Choose the correct one.

<b>Assertion (A)</b>	In some metazoan animals, a special type of transverse fission called strobilation occurs
<b>Reason (R)</b>	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
<b>a</b>	<b>A and R are true and R is correct explanation for A</b>
<b>b</b>	A and R are true but R is not the correct explanation for A
<b>c</b>	A is true but R is false
<b>d</b>	Both A and R are false.

2. Assertion and Reasoning Question - Choose the correct one.

<b>Assertion (A)</b>	Regeneration is regrowth in the injured region.
<b>Reason (R)</b>	When Hydra is accidentally cut into several pieces, each piece can regenerate the lost parts and develop into a whole new individual
<b>a</b>	A and R are true and R is correct explanation for A
<b>b</b>	<b>A and R are true but R is not the correct explanation for A</b>
<b>c</b>	A is true but R is false
<b>d</b>	Both A and R are false.

### Type IV. Find the correct/wrong statements or pair :

1. Which of the following is not true regarding Conjugation

- a) Conjugation is common among parasites.
- b) Conjugation is the temporary union of the two individuals of the same species.
- c) During their union both individuals, called the conjugants
- d) E.g : Paramecium, Vorticella and bacteria (Prokaryotes).

2. Find out the correct statements:

i) Juvenile phase/ vegetative phase is the period of growth between the birth of the individual upto reproductive maturity.

ii) Seasonal breeders reproduce at end of the year.

iii) Continuous breeders continue to breed throughout their sexual maturity

iv) Paedogenesis occurs in the sporocysts and Redia larvae of liver fluke

a) iis correct

b) i and iii, iv are correct

c) ii and iv are correct

d) i, ii iii and iv are correct

3. Which of the following combination is wrongly matched?

<b>a)</b>	Viviparous	Lemon shark
<b>b)</b>	Ovoviviparity	Shark
<b>c)</b>	Artificial parthenogenesis	Biological stimuli
<b>d)</b>	Oviparous	Amphibians

4. Which of the following combination is wrongly matched?

a)	Seasonal breeders	Rabbit
b)	Paedogenesis	Redia larvae
c)	Drones	Male honey bee
d)	Charles Bonnet	Parthenogenesis

5. Which of the following combination is rightly matched?

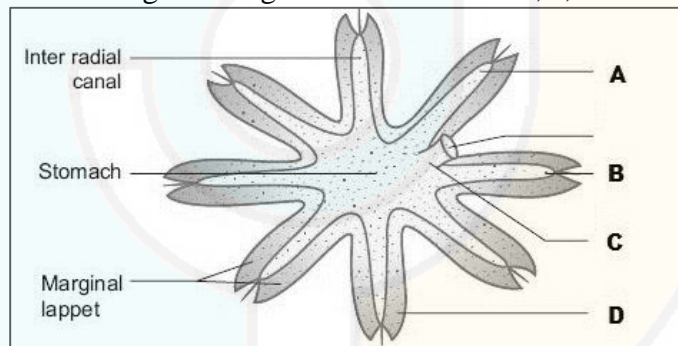
a)	Transverse binary fission	Euglena
b)	Uniparental inheritance	Sexual reproduction
c)	Longitudinal binary fission	Planaria
d)	Uniparental inheritance	Asexual reproduction

6. Which of the following combination is rightly matched?

a)	Abraham trembley	Planaria
b)	Plasmotomy	Giant Amoeba
c)	Asexual reproduction	Diploid zygote
d)	Isogamy	Merogametes

### Type V. Find the correct parts of diagram :

1. Find the correct parts from the given diagram as mentioned A,B,C and D



- |                      |                    |                    |                    |
|----------------------|--------------------|--------------------|--------------------|
| a) A- Bifid arm      | B -Per radialcanal | C -Sense organ     | D -Manubrium       |
| b) A-Manubrium       | B -Manubrium       | C -Per radialcanal | D -Senseorgan      |
| c) A-Per radialcanal | B-Sense organ      | C-Manubrium,       | D- Bifid arm       |
| d) A-Sense organ,    | B -Manubrium       | C - Bifid arm,     | D -Per radialcanal |

### Type VI. Neet based questions :

1. " Nothing lives forever, but life continues". What does it mean? [AIPMT 1995]

- Older dies but new ones are produced by reproduction
- Nothing can produce without death
- Death has nothing to do with the continuation of life
- Parthenogenesis is must for sexual reproduction

2. A few statements describing certain features of reproduction are given below. Select the options that are true for both sexual and asexual reproduction from the options given:

- Gametic fusion takes place
  - Transfer of genetic material takes place
  - Reduction division takes place
  - Progeny have some resemblance with parents
- a) i and ii                      b) ii and iii                      c) ii and iv                      d) i and ii



## 1. Reproduction in Organisms

13

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

- Sexual reproduction does not always require two individuals
- Sexual reproduction generally involves gametic fusion
- Meiosis never occurs during sexual reproduction
- 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**

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

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

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

5. Which of the following statements, support the view that elaborate sexual reproductive process develops much later in the organic evolution?

- Lower groups of organisms have simpler body design
- Asexual reproduction is common in lower groups
- Asexual reproduction is common in higher groups of organisms
- The high incidence of sexual reproduction is in angiosperms and vertebrates.

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

## PART - B & C

### Two and three mark questions :

#### 1. What is Reproduction?

Reproduction is the fundamental feature of all living organisms. It is a biological process by which organisms produce their young ones.

#### 2. What are the basic features of reproduction?

- ❖ Synthesis of RNA and proteins,                      ❖ Formation of reproductive units
- ❖ Replication of DNA,                                      ❖ Fertilization
- ❖ Cell division    ❖ Forming new individuals.
- ❖ Growth,

#### 3. What are the two major modes of reproduction.

1. Asexual reproduction
2. Sexual reproduction.

#### 4. What is Asexual reproduction?

Reproduction by a single parent without the involvement of gamete formation is asexual reproduction and the offspring produced are genetically identical.

#### 5. What is sexual reproduction?

When two parents participate in the reproductive process involving two types of gametes (ova and sperm), it is called sexual reproduction. (or) Sexual reproduction involves the fusion of male and female gametes to form a diploid zygote, which develops into a new organism.

#### 6. What are the different modes of asexual reproduction ?

- ❖ Fission,                                      ❖ Budding,                                      ❖ Fragmentation
- ❖ Sporulation,                                      ❖ Gemmule formation,                                      ❖ Regeneration.

**7. What is fission?**

Fission is the division of the parent body into two or more identical daughter individuals.

**8. What are the types of fission are seen in animals?**

- ❖ Binary Fission                      ❖ Sporulation
- ❖ Multiple Fission                      ❖ Strobilation

**9. 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.

**10. What are the types of binary fission are seen in animals ?**

- ❖ Simple irregular binary fission                      ❖ Longitudinal binary fission
- ❖ Transverse binary fission                      ❖ Oblique binary fission

**11. What is Plasmotomy?**

Plasmotomy is the division of multinucleated parent into many multinucleate daughter individuals with the division of nuclei.

**12. What is apolysis ?**

- ❖ In the tapeworm, Taeniasolium 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.

**13. What is Regeneration ?**

Regeneration is regrowth in the injured region.

**14. What are the types of Regeneration?**

1. Morphallaxis      2. Epimorphosis.

**15. What is Morphallaxis ?**

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

**16. What is Epimorphosis ?**

Epimorphosis is the replacement of lost body parts.

**17. What are the types of Epimorphosis?**

1. Reparative regeneration      2. Restorative regeneration.

**18. Differentiate between reparative regeneration and restorative regeneration.**

- ❖ In reparative regeneration, only certain damaged tissue can be regenerated.
- ❖ In restorative regeneration severed body parts can develop. **E.g.** star fish, tail of wall lizard.

**19. What is Syngamy ?**

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

**20. What is External fertilization ?**

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.

**21. 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.

## 1. Reproduction in Organisms

15

### 22. 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.

### 23. 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 bi-parental. **E.g** : Human – dioecious or unisexual animal.

### 24. 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.

### 25. What is Paedogamy ?

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

### 26. What is Merogamy ?

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

### 27. What is Isogamy ?

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

### 28. What is Anisogamy ?

The fusion of dissimilar gametes is called anisogamy. **E.g** : Higher invertebrates and all vertebrates.

### 29. What is 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).

### 30. What are the three Phases of life cycle in Organisms ?

- ❖ Juvenile phase,
- ❖ reproductive phase
- ❖ senescent phase.

### 31. What is Seasonal breeders?

- ❖ Seasonal breeders reproduce at particular period of the year
- ❖ **E.g** : frogs, lizards, most birds, deers etc.,

### 32. What is Continuous breeders ?

- ❖ Continuous breeders continue to breed throughout their sexual maturity.
- ❖ **E.g** : honey bees, poultry, rabbit etc.,

### 33. What is Senescent phase ?

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

### 34. What is parthenogenesis ?

Development of an egg into a complete individual without fertilization is known as parthenogenesis.

### 35. What are the two types Parthenogenesis ?

1. Natural Parthenogenesis
2. Artificial Parthenogenesis.

**36. What is Arrhenotoky ?**

In this type only males are produced by parthenogenesis. **E.g** :Honey bees

**37. What is paedogeneticparthenogenesis ?**

- ❖ 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.

**38. What is Thelytoky ?**

In this type of parthenogenesis only females are produced by parthenogenesis.**E.g** :Solenobia

**39. What is Amphitoky ?**

In this typeparthenogenetic egg may develop into individuals of any sex. **E.g** : Aphis.

**40. What is Oviparous ?**

- ❖ In Oviparous 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.
- ❖ **E.g** :Invertebrates, fishes and amphibians, eggs are not covered by hard calcareous shells but covered by a membrane.

**41. What is Viviparous ?**

- ❖ Viviparous 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.

**42. What is Ovoviviparous ?**

- ❖ 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.
- ❖ Ovoviviparityis seen in fishes like shark.

**PART -D : FIVE MARK QUESTIONS****I. Most expected questions :****1. What is Parthenogenesis ? Explain its types.****Parthenogenesis :**

- ❖ 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,

**1. Natural Parthenogenesis****2. Artificial Parthenogenesis****Natural 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.,

**1. Complete Natural Parthenogenesis.2. Incomplete Natural Parthenogenesis.****Complete Natural Parthenogenesis:**

- ❖ It is the only form of reproduction in certain animals and there is no biparental sexual reproduction.

## 1. Reproduction in Organisms

17

- ❖ These are no male organisms and so, such individuals are represented by females only.

### Incomplete Natural Parthenogenesis :

- ❖ It 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).

### 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.**

### Paedogenesis :

- ❖ 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.**
- ❖ The white blood corpuscles can be grouped into two categories.

## 2. What is Regeneration ? Explain its types.

### Regeneration

- ❖ Regeneration is regrowth in the injured region.
- ❖ Regeneration was first studied in Hydra by Abraham Trembley in 1740.
- ❖ Regeneration is of **Two** types,
  1. Morphallaxis
  2. Epimorphosis.

### Morphallaxis

- ❖ 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

- ❖ Epimorphosis is the replacement of lost body parts.
- It is of **Two** types, namely **1) Reparative regeneration** **2) Restorative regeneration.**
- ❖ In reparative regeneration, only certain damaged tissue can be regenerated.
- ❖ In restorative regeneration severed body parts can develop. **E.g.** star fish, tail of wall lizard.

## 3. Explain the Phases of life cycle.

Organisms have three phases	
1. Juvenile phase    2. Reproductive phase    3. Senescent phase.	
<b>1. Juvenile phase</b>	Juvenile phase/ vegetative phase is the period of growth between the birth of the individual upto reproductive maturity.
<b>2. Reproductive phase</b>	During reproductive phase/ maturity phase the organisms reproduce and their offsprings reach maturity period. <b>On the basis of time, breeding animals are of two types:</b> 1. Seasonal breeders      2. Continuous breeders.
<b>Seasonal breeders</b>	It reproduce at particular period of the year <b>e.g.</b> frogs, lizards, most birds, deers etc.,
<b>Continuous breeders</b>	It continue to breed throughout their sexual maturity <b>e.g.</b> honey bees, poultry, rabbit etc.,
<b>3. Senescent phase</b>	Senescent phase begins at the end of reproductive phase when degeneration sets in the structure and functioning of the body.



**II. More expected questions :****1. How will you classify the animals based on the site of development of embryo?**

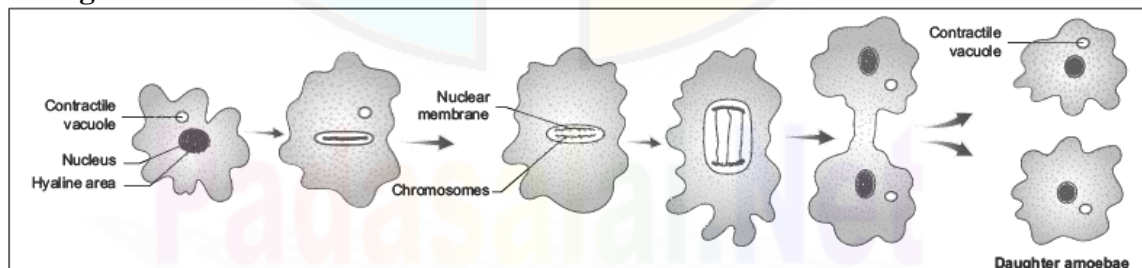
Animals are classified mainly into three groups depends on the site of development of embryo and whether they lay eggs (unfertilized or fertilized) or give birth to young ones.

**1. Oviparous 2. Viviparous 3. Ovoviviparous**

<b>Oviparous</b>	<ul style="list-style-type: none"> <li>✓ In Oviparous animals (egg laying animals), the young hatch from eggs laid outside the mother's body.</li> <li>✓ <b>E.g</b> :reptiles and birds, their eggs are covered by hard calcareous shells.</li> <li>✓ <b>E.g</b> :Invertebrates, fishes and amphibians (eggs are not covered by hard calcareous shells but covered by a membrane).</li> </ul>
<b>Viviparous</b>	<ul style="list-style-type: none"> <li>✓ Viviparous animals give rise to young ones.</li> <li>✓ Viviparity is a type of development in which the young ones are born alive after being nourished in the uterus through the placenta.</li> <li>✓ Majority of mammals including human beings are viviparous.</li> </ul>
<b>Ovoviviparous</b>	<ul style="list-style-type: none"> <li>✓ In Ovoviviparous animals, the embryo develops inside the egg and remains in the mother's body until they are ready to hatch.</li> <li>✓ 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.</li> <li>✓ Ovoviviparity is seen in fishes like shark.</li> <li>✓ The viviparous lemon shark gives birth to a young one, which is still attached by its placental cord.</li> </ul>

**III. Averagely Expected questions :****1. Explain the Simple binary fission with diagram**

- ❖ 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.
- ❖ **E.g** Amoeba

**2. Explain the 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.

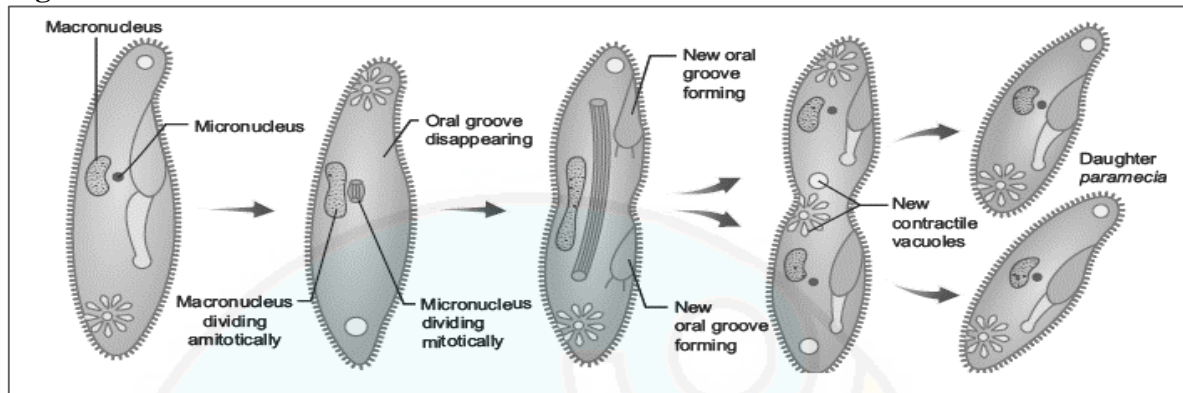
## 1. Reproduction in Organisms

19

### 3. Explain the Transverse binary fission with diagram

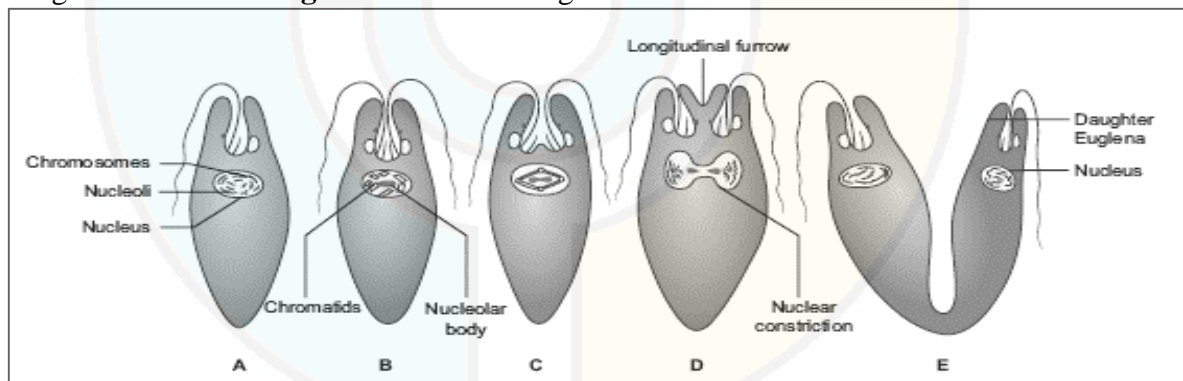
- ❖ In transverse binary fission, the plane of the division runs along the transverse axis of the individual. **E.g** : Paramecium and Planaria.
- ❖ The macronucleus divides by amitosis and the micronucleus divides by mitosis.

**E.g** : Paramecium



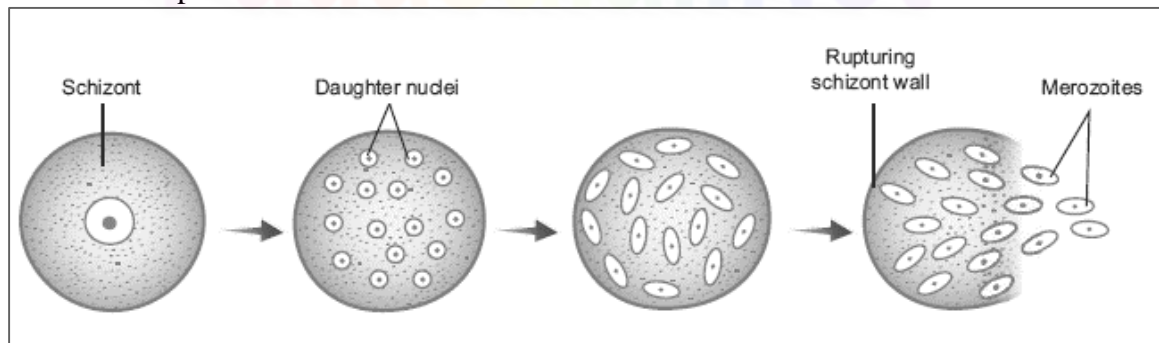
### 4. Explain the Longitudinal binary fission with diagram

- ❖ 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.



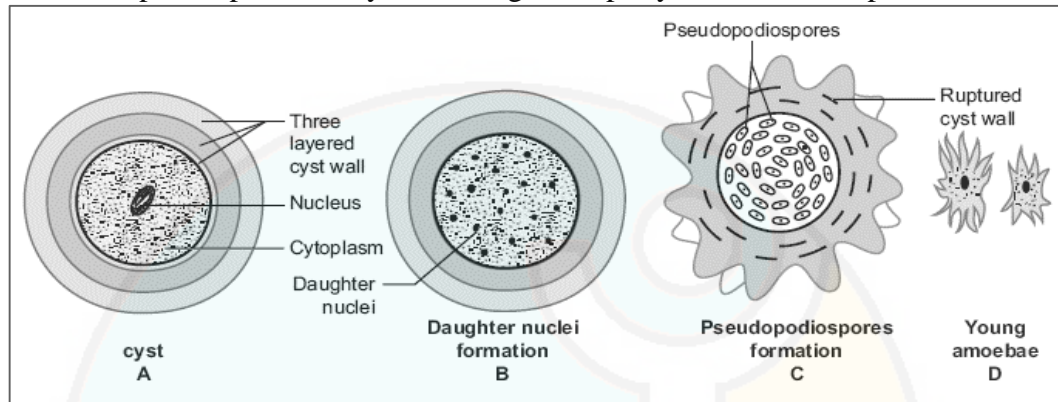
### 5. Explain the Multiple fission in Plasmodium.

- ❖ 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.



**6. Explain the Multiple fission in Amoeba.**

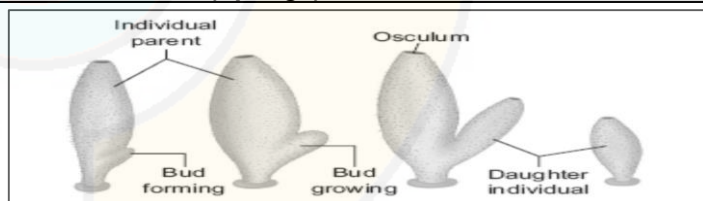
- ❖ During unfavorable conditions (increase or decrease in temperature, scarcity of food) Amoeba withdraws its pseudopodia and secretes a three-layered, protective, chitinous cyst wall around it and becomes inactive. This phenomenon is called encystment.
- ❖ When conditions become favourable, the encysted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

**7. What is Budding. Explain the Budding in Leucosolenia (Sponge), Hydra and Noctiluca with diagram.**

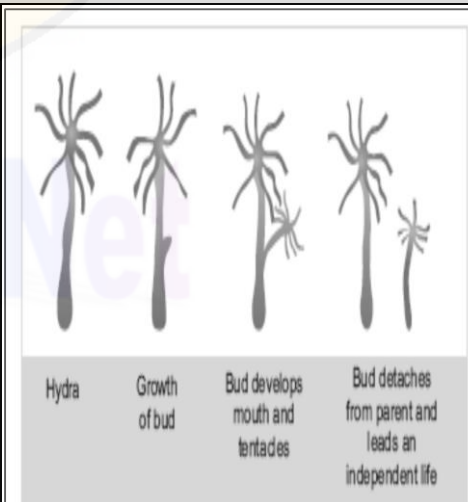
**Budding:** In budding, the parent body produces one or more buds and each bud grows into a young one. The buds separate from the parent to lead a normal life.

**Budding in Leucosolenia (Sponge)**

In sponges, the buds constrict and detach from the parent body and the bud develops into a new sponge.

**Budding in Hydra**

- ✓ 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 gastrovascular 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.



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