

For all Medical Entrance Examinations held across India.

Challenger

NEET – UG

Biology Vol. II

Salient Features

- Exhaustive coverage of MCQs under each sub-topic.
- ‘2014’ MCQs including questions from various competitive exams.
- Includes solved MCQs from NEET, MHT-CET and various entrance examinations from year 2015 to 2017.
- Concise theory for every topic.
- Hints provided wherever deemed necessary.
- Test papers for thorough revision and practice.
- Important inclusions: Problems to Ponder.

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Frequently Asked Questions

➤ **Why Challenger Series?**

Gradually, every year the nature of competitive entrance exams is inching towards conceptual understanding of topics. Moreover, it is time to bid adieu to the stereotypical approach of solving a problem using a single conventional method.

To be able to successfully crack the NEET and JEE (Main) examination, it is imperative to develop skills such as data interpretation, appropriate time management, knowing various methods to solve a problem, etc. With Challenger Series, we are sure, you'd develop all the aforementioned skills and take a more holistic approach towards problem solving. The way you'd tackle advanced level MCQs with the help of hints, tips, shortcuts and necessary practice would be a game changer in your preparation for the competitive entrance examinations.

➤ **What is the intention behind the launch of Challenger Series?**

The sole objective behind the introduction of Challenger Series is to severely test the student's preparedness to take competitive entrance examinations. With an eclectic range of critical and advanced level MCQs, we intend to test a student's MCQ solving skills within a stipulated time period.

➤ **What do I gain out of Challenger Series?**

After using Challenger Series, students would be able to:

- assimilate the given data and apply relevant concepts with utmost ease.
- tackle MCQs of different pattern such as match the columns, diagram based questions, multiple concepts and assertion-reason efficiently.
- garner the much needed confidence to appear for various competitive exams.

➤ **Can the Questions presented in Problems to Ponder section be a part of the NEET/JEE (Main) Examination?**

No, the questions would not appear as it is in the NEET/JEE (Main) Examination. However, there are fair chances that these questions could be covered in parts or with a novel question construction.

➤ **Why is then Problems to Ponder a part of this book?**

The whole idea behind introducing Problems to Ponder was to cover an entire concept in one question. With this approach, students would get **more variety and less repetition** in the book.

Best of luck to all the aspirants!

01 | Reproduction in Organisms

1.0 Introduction

1.1 Asexual Reproduction

1.2 Vegetative Propagation in Plants

1.3 Sexual Reproduction

1.0 Introduction

➤ **Reproduction:**

- It is a characteristic feature of all organisms for continuation of species.
- Reproduction is a process of organic evolution by transmitting advantageous variations to the offsprings.
- The period from birth to the natural death of an organism is called Life span.

Animals	Life span (approx.)
Butterfly	1 - 2 weeks
Crow	15 years
Parrot	140 years
Crocodile	60 years
Tortoise	100 - 150 years

➤ **Types of Reproduction:**

- Asexual:** Offspring produced by a single parent with/without gamete formation.
- Sexual:** Offspring produced by two parents (of opposite sex) and fusion of male and female gamete is involved.

1.1 Asexual Reproduction

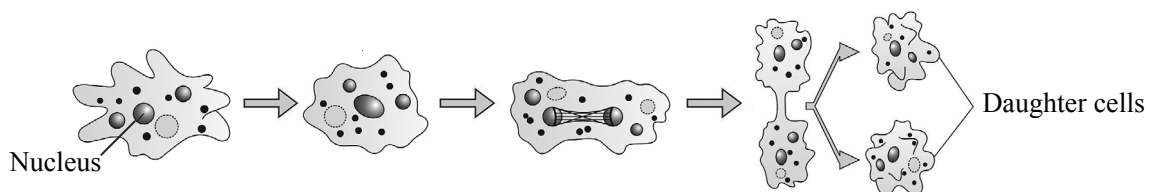
➤ **Characteristics:**

- Single (parent) individual is involved in producing the offspring.
- Offsprings produced are identical to one another.
- They are exact copies of their parents.
- They are clones, i.e. morphologically and genetically similar individuals.
- It is common among single-celled organisms and in plants and animals having relatively simple organizations.

➤ **Types of Asexual Reproduction:**

i. **Binary fission:**

Parental cell divides into two halves and each grows rapidly into an adult. e.g. *Amoeba*, *Paramecium*.



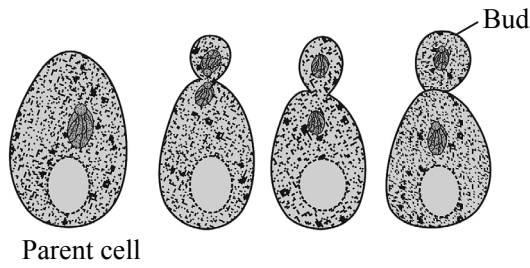
Binary fission in *Amoeba*

ii. **Sporulation:**

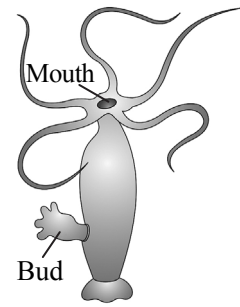
Under unfavourable condition, *Amoeba* shows encystation, in which *Amoeba* withdraws its pseudopodia and secretes a three-layered hard covering or cyst around itself. When conditions are favourable, the encysted *Amoeba* divides by multiple fission producing many minute *Amoebae* or pseudopodiospores. Cyst wall bursts out to release the spores in the surrounding medium. These spores grow up into many *Amoebae*.

iii. **Budding:**

Unequal division takes place. Small buds are produced which initially remain attached to the parent cell, but later get separated and mature into new organisms (cells), e.g. Yeast, *Hydra*.

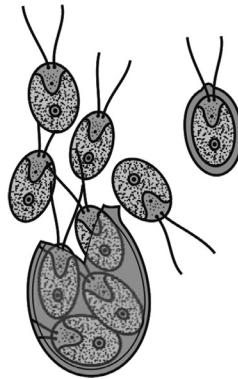


Budding in Yeast



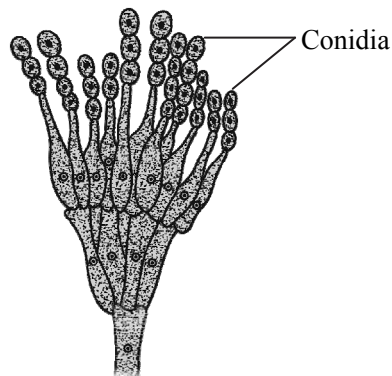
Buds in Hydra

- iv. **Zoospore formation:**
Zoospores are microscopic motile structures. This type of asexual reproduction is seen in *Chlamydomonas*.



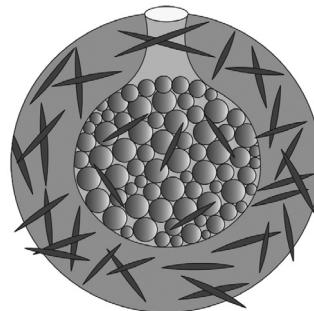
Zoospores of Chlamydomonas

- v. **Conidia:**
Seen in *Penicillium*.



Conidia of Penicillium

- vi. **Gemmules:**
Seen in Sponge.



Gemmule in Sponge



vii. Fragmentation:

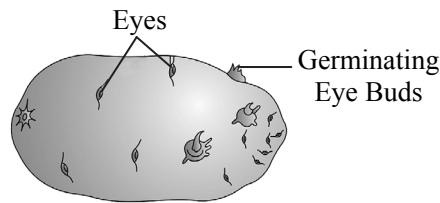
In this, parental body breaks up into fragments and each fragment grows into an adult, which is capable of producing offspring. This mode of asexual reproduction is called as fragmentation. It is found in filamentous algae, sponges, some flat worms, etc.

1.2 Vegetative Propagation in Plants

- **Vegetative Propagation:** Vegetative propagation is an asexual mode of reproduction as only a single parent is involved. It is a process of reproduction seen in plants in which a portion of the plant body functions as a propagule and gives rise to a new plant.
- **Vegetative propagules:** These are the units of vegetative propagation which are capable of giving rise to new offspring.
- **Some of the vegetative propagules in Angiosperms are:**

i. Eyes of potato:

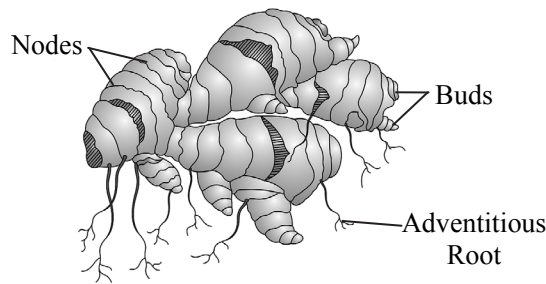
Small plantlets emerge from the eyes (axillary buds) of potato tuber.



Eyes of Potato

ii. Rhizome:

Small plantlets develop from rhizome of ginger, turmeric, banana, etc.

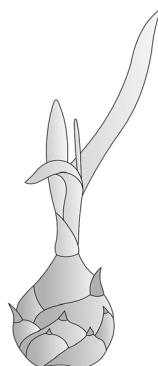


Rhizome of Ginger

iii. Bulbil:

A vegetative propagule seen in *Agave*.

Bulbils are modified vegetative or floral buds, propagative in function. Bulbils on maturation, get detached from the plant and fall on the ground. Under favourable condition, it develops into new plant.



Bulbil of Agave



iv. **Leaf buds:**

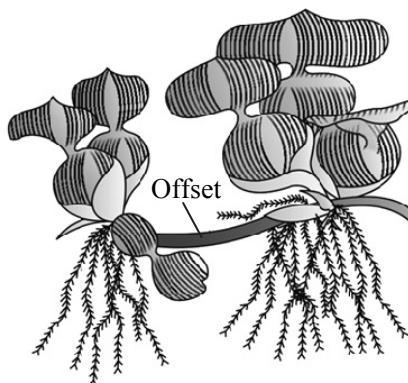
In *Bryophyllum*, leaves are notched along the margin. Adventitious buds arise from the notches on the leaves. These buds are capable of giving rise to a new plant.



Leaf buds of *Bryophyllum*

v. **Offset:**

It is found in water hyacinth, an aquatic plant which can propagate vegetatively at a rapid rate and spread over the standing water body in a relatively short time. Water hyacinth drains oxygen from water, resulting in death of fishes. It is also called 'scourge of water bodies and 'Terror of Bengal'.



Offset of water hyacinth

1.3 Sexual Reproduction

i. **Sexual reproduction:**

Production of offsprings by formation and fusion of gametes.

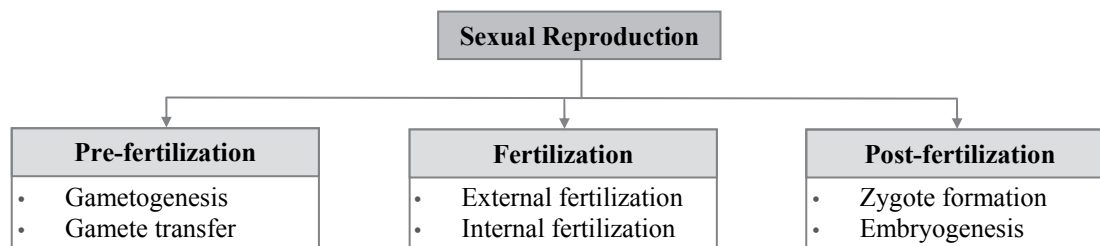
Characteristics:

- a. Male and female gametes are produced.
 - b. Gametes are produced either by the same individual or by different individuals of opposite sex.
 - c. Gametes fuse to form zygote which develops into the new organism.
 - d. In comparison to asexual reproduction, it is a slow, elaborate and more complex process.
 - e. Offsprings produced are not identical to the parents or amongst themselves.
- ii. Before organisms can reproduce sexually, they have to reach a certain stage of growth and maturity, which is called the juvenile phase in animals. In plants, it is called vegetative phase. This phase has variable durations in different organisms.
- iii. The reproductive phase begins after the end of juvenile/vegetative phase. Flowering in higher plants marks the beginning of the reproductive phase. Few plants exhibit unusual flowering phenomenon:
For e.g.
- a. Bamboo species flower only once in their lifetime, generally after 50 – 100 years, produce numerous fruits and die.
 - b. *Strobilanthus kunthiana* (Neelakuranji) flowers once in 12 years.



- iv. Females of placental mammals exhibit cyclic changes in the activities of ovaries and accessory ducts as well as hormones during the reproductive phase.
- Oestrus cycle:**
Takes place in non-primate mammals like dogs, cows, sheeps, rats, tigers, deers, etc.
 - Menstrual cycle:**
Takes place in primates (monkey, ape and human beings).
 - Seasonal breeders:**
Many mammals, which live in wild exhibit reproductive cycles only during favourable seasons.
 - Continuous breeders:**
Many other mammals are reproductively active throughout their reproductive phase.

➤ **Events in Sexual Reproduction:**

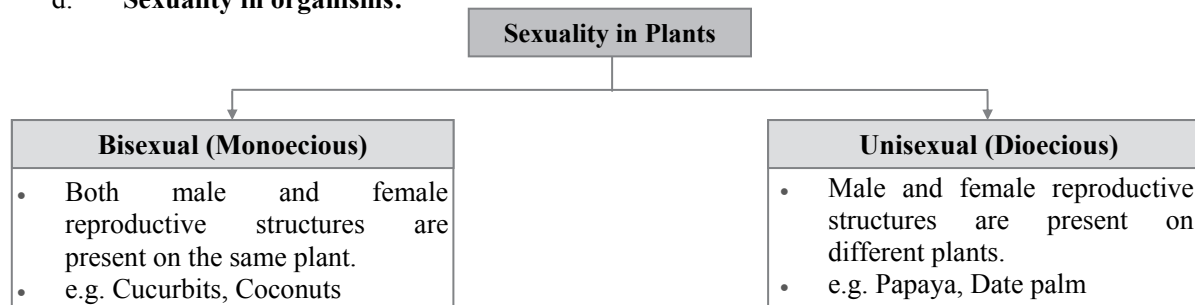


➤ **Pre-fertilization events:**

These include the events taking place in sexual reproduction prior to the fusion of gametes. These events are: **Gametogenesis and gamete transfer**

i. **Gametogenesis:**

- It involves formation of two types of haploid gametes, i.e. male and female gametes.
- In some algae, the two gametes are similar in appearance. Such gametes are called Homogametes (Isogametes).
- In majority of sexually reproducing organisms, the two gametes are morphologically distinct types, i.e. Heterogametes.
Male gamete → Antherozoid/sperm
Female gamete → Egg/ Ovum
- Sexuality in organisms:**

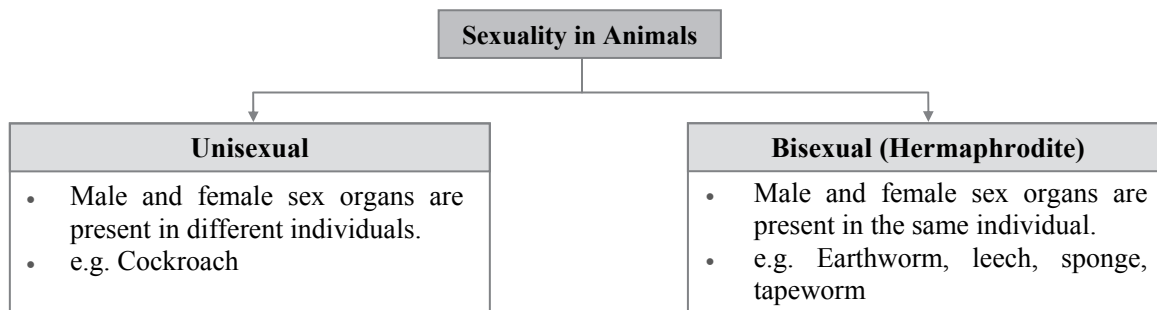


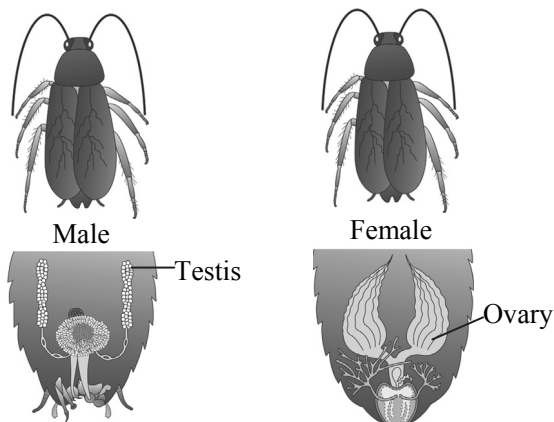
In many plants and fungi, the terms homothallic/monoecious are used to denote the bisexual condition, while the terms heterothallic and dioecious are used to denote unisexual condition.

In flowering plants,

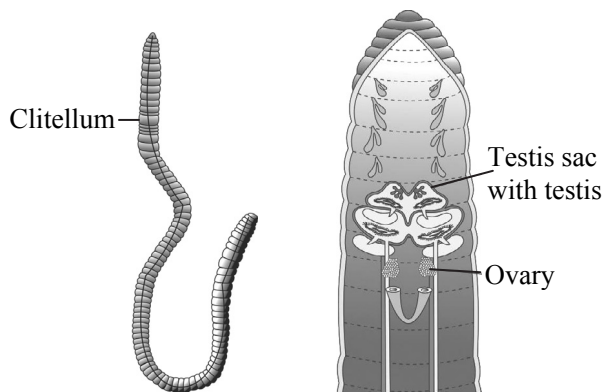
Unisexual male flower: Staminate (Bearing only stamens)

Unisexual female flower: Pistillate (Bearing only pistils)





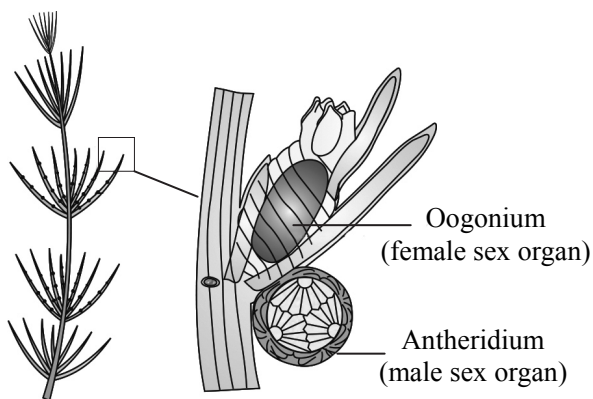
Cockroach : Unisexual animal



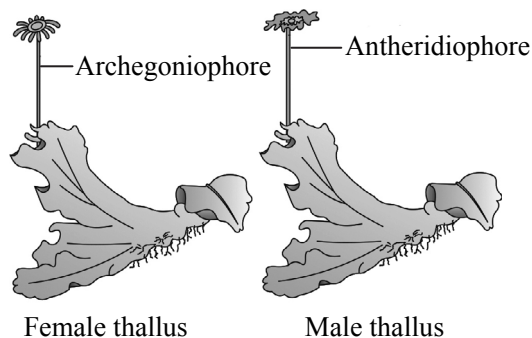
Earthworm : Bisexual animal

➤ **Cell division during gamete formation:**

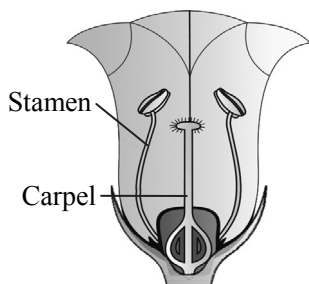
- i. Gametes → Heterogametic species → Male + Female
- ii. Haploid parent plant body $\xrightarrow{\text{Mitosis}}$ Haploid gametes
- iii. Diploid parent plant body \rightarrow Meocytes (Gamete mother cell) $(2n)$ $\xrightarrow{\text{Meiosis}}$ Haploid gametes (n)



Chara : Monoecious plant



Marchantia : Dioecious plant

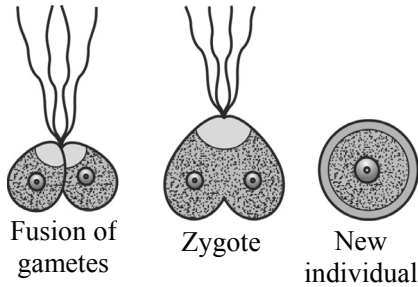


Sweet potato : Bisexual flower

Diversity of sexuality in organisms

ii. **Gamete Transfer:**

- a. In most organisms, male gamete is motile, while the female gamete is non-motile. Exception to this are few fungi and algae, in which both gametes are motile.
- b. Male gametes require a medium for movement.
- c. In algae, bryophytes and pteridophytes, water serves as the medium for gamete transfer.
- d. Number of male gametes produced are more than the female gametes.

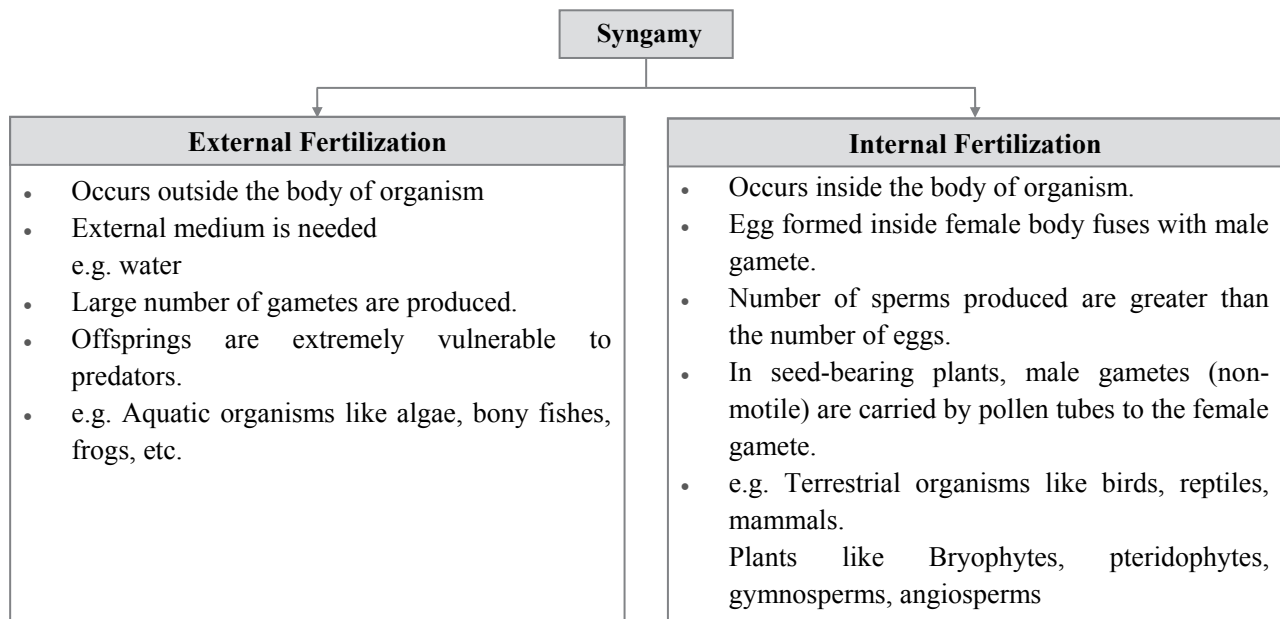
**Homogametic contact in alga****Germinating pollen grains on the stigma of flower**

- e. In seed-bearing plants, pollen grains produced in anthers are the carriers of male gametes and ovule has the egg.
- f. In self-fertilizing plants like pea, transfer of pollen grains from anther to stigma is relatively easy as they are located in close proximity.
- g. In cross pollinating plants (dioecious plants), **pollination** takes place which involves transfer of pollen grains to the stigma.

Successful transfer + Fusion of gametes → Most essential for Fertilization

➤ **Fertilization:**

Fertilization is the complete and permanent fusion of two haploid gametes to form a diploid zygote. It is also known as syngamy.

➤ **Parthenogenesis:**

Development of an egg into a complete individual without fertilization is known parthenogenesis. It is found in many non-vertebrates such as bees, rotifers and even some lizards and birds (turkey).

➤ **Post - fertilization Events:**

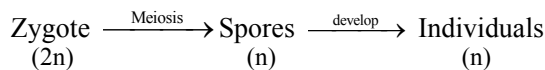
These include the events which take place after zygote formation in sexual reproduction.

i. Zygote formation:

- a. Formation of diploid zygote takes place in all sexually reproducing organisms.
- b. After a zygote is formed, its development depends on the type of life cycle of the organism and the environment to which it is exposed.
- c. In fungi and algae, zygote develops a thick wall which is resistant to dessication and damage. It germinates after a period of rest.



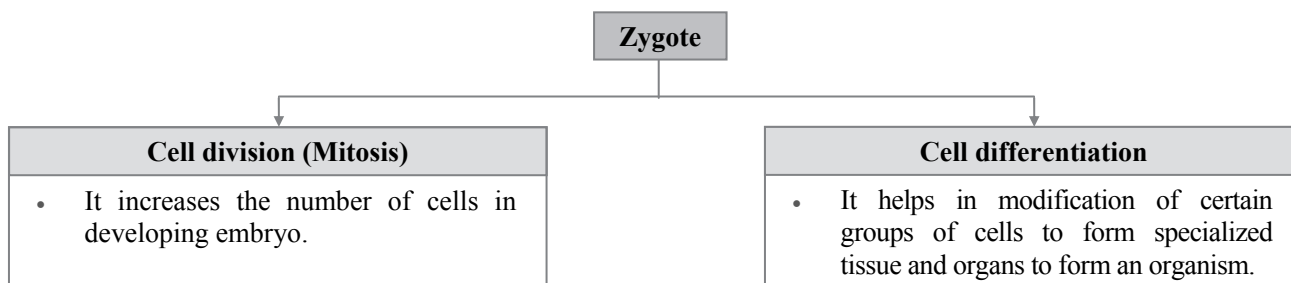
d. In organisms having haplontic life cycle:



e. Zygote : Vital link between organisms of one generation and the next.

ii. Embryogenesis:

- a. It is the process of development of embryo from zygote.
- b. During embryogenesis, zygote undergoes cell division and differentiation.

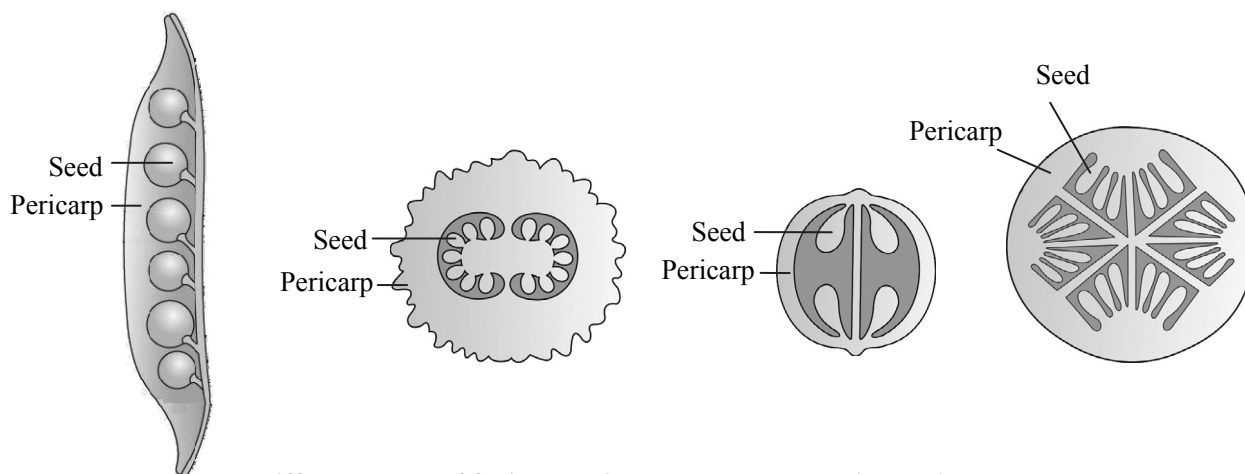


➤ **Oviparous and viviparous animals:**

	Oviparous Animals	Viviparous Animals
i.	Development of zygote takes place outside the female's body.	Development of zygote takes place inside the female's body.
ii.	They lay eggs which are covered by hard calcareous shell.	Zygote develops into young one.
iii.	They lay eggs in a safe place in the environment, but chances of survival of young one is less.	They give birth directly to young ones and their chances of survival are more.
iv.	e.g. Birds, reptiles	e.g. Majority of mammals including humans.

➤ **Post- fertilization changes in flowering plants:**

Sepals, petals, stamens	Wither and fall off
Zygote	Embryo
Ovules	Seeds
Ovary	Fruit
Ovary wall	Pericarp



Different types of fruits showing seeds and protective pericarp