

Very Short Answer Questions (PYQ)

[1 Mark]

Q.1. How is the continuity of species-maintained generation after generations?

Ans. Continuity of species is maintained generation after generations by the process of reproduction.

Q.2. What is the major difference you observe in the off springs produced by asexual reproduction and in the progeny produced by sexual reproduction?

Ans. Off springs produced through asexual reproduction are genetically identical (clone) to each other as well as to their parents, while sexually produced off springs show genetic variations leading to evolution.

Q.3. In yeast and Amoeba, the parent cell divides to give rise to two new individual cells. How does the cell division differ in these two organisms?

Ans. In *Amoeba*, binary fission takes place whereas in yeast cell division occurs by budding.

Q.4. Name an organism where cell division is itself a mode of reproduction.

Ans. Protists/Monerans/*Amoeba*/*Paramecium*

Q.5. How does Penicillium reproduce asexually?

Ans. *Penicillium* reproduces asexually by spore formation.

Q.6. Name an alga that reproduces asexually through zoospores. Why are these reproductive units so called?

Ans. *Chlamydomonas* reproduces through zoospores. The reproductive units are called zoospores because they are motile.

Q.7. Mention a characteristic feature and a function of zoospores in some algae.

Ans. Zoospores are microscopic motile structures. These are special structures by which algae reproduce asexually.

Q.8. Name the vegetative propagules in (i) Potato, and (ii) Pistia.

Ans. The vegetative propagules of potato is runners and that of Pistia is offsets.

Q.9. Meiosis is an essential event in the sexual life cycle of any organism. Give two reasons.

Ans.

- i. Meiosis helps in formation of gametes by reductional division and maintains constant number of chromosomes.
- ii. Meiosis brings variation in offsprings by recombination of genes.

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

Ans. Juvenile/growth phase

Q.11. State the fate of a pair of autosomes during gamete formation.

Ans. During gamete formation a pair of autosomes segregate from each other.

Q.12. Why is a coconut plant referred to as monoecious?

Ans. A coconut plant has both male and female flowers present on same individual thus it is known as monoecious.

Q.13. Mention the site where syngamy occurs in amphibians and reptiles, respectively

Ans. In amphibians, external fertilisation occurs hence, syngamy occurs in the medium of water. In reptiles, internal fertilisation occurs hence, syngamy occurs within the body of female parent.

Q.14. Name the type of cell division that takes place in the zygote of an organism exhibiting haplontic life cycle.

Ans. Meiosis.

Q.15. Name the group of organisms that produce non-motile gametes. How do they reach the female gamete for fertilisation?

Ans. Angiosperms produce non-motile gametes. They reach the female gamete with the help of air or water.

Q.16. Cucurbits and papaya plants bear staminate and pistillate flowers. Mention the categories they are put under separately on the basis of the type of flowers they bear.

Ans. Cucurbit is a monoecious plant having staminate and pistillate flowers on the same plant. Papaya has staminate and pistillate flowers on separate plants and hence it is dioecious.

Q.17. Name two animals that exhibit oestrus cycle.

Ans. Cow, sheep and rat (*Any two*)

Q.18. Name the phenomenon and the cell responsible for the development of a new individual without fertilisation as seen in honey bees.

Ans. The phenomenon is called parthenogenesis and the cell responsible for it is female gamete, ovum.

Q.19. How is it possible in Oxalis and Viola plants to produce assured seed-sets even in the absence of pollinators?

Ans. By presence of cleistogamous flowers.

Q.20. Mention the unique feature with respect to flowering and fruiting in bamboo species.

Ans. Bamboo species flower once in its life time generally after 50–100 yrs of vegetative growth. It produces large number of fruits and then dies.

Q.21. Mention the unique flowering phenomenon exhibited by Strobilanthus kunthiana (Neelakuranji).

Ans. Mention the unique flowering phenomenon exhibited by *Strobilanthus kunthiana*(Neelakuranji).

Q.22. Name the phenomenon and one bird where the female gamete directly develops into a new organism.

Ans. The phenomenon is called parthenogenesis. Turkey is the name of the bird.

Q.23. Why is banana considered a good example of parthenocarpy?

Ans. In banana formation of fruit occurs without fertilisation, *i.e.*, there is no formation of seeds. So, it is considered a good example of parthenocarpy.

Q.24. Give reasons for the following: Some organisms like honey-bees are called parthenogenetic animals.

Ans. Since drones/males develop from unfertilised eggs so they are called as parthenogenetic animals.

Q.25. Banana produces fruits but is propagated only by vegetative means. Why is it so?

Ans. Banana does not produce seeds, so it is propagated only by vegetative means.

Very Short Answer Questions (OIQ)

[1 Mark]

Q.1. On what factors does the type of reproduction adopted by an organism depend on?

Ans. The organism's habitat, physiology and genetic make-up determines the type of reproduction adopted by it.

Q.2. What is asexual mode of reproduction?

Ans. The mode of reproduction in which formation and fusion of gametes does not take place is called asexual reproduction. Only somatic part is involved in such reproduction.

Q.3. Define clone.

Ans. Clone is a group of individuals of the same species that are morphologically and genetically similar.

Q.4. Name the type of fission with examples.

Ans. Binary fission — Amoeba

Transverse fission — Paramecium

Multiple fission — Plasmodium

Q.5. What is budding?

Ans. It is a mode of asexual reproduction in which one or more outgrowths (buds) protrude out, which later get detached from the parent body to grow into a new individual, e.g., yeast.

Q.6. Name one organism where chain budding is found.

Ans. Yeast

Q.7. Mention two inherent characteristics of Amoeba and yeast that enable them to reproduce asexually.

Ans. a. They are unicellular organisms.

b. They have a very simple body structure.

Q.8. Name the type of asexual reproduction where the parent cell ceases to exist.

Ans. Fission/Binary fission/Longitudinal fission/Multiple fission.

Q.9. What is conidia?

Ans. The asexual, non-motile spores produced externally/exogenously in some fungi are called conidia, e.g., Penicillium.

Q.10. Define gemmules.

Ans. Internal asexual reproductive units or buds in sponges are called gemmules.

Q.11. Name one plant which propagates by the means of its leaf.

Ans. Bryophyllum

Q.12. How does potato multiply?

Ans. Potato multiplies by buds (eyes) of the tuber (vegetative propagation).

Q.13. Why do vegetative propagules in sugarcane and ginger appear from the nodes?

Ans. This is because the nodes have meristematic cells.

Q.14. Define sexual reproduction.

Ans. Sexual reproduction is the mode of reproduction in which male and female gametes fuse together to form a diploid zygote that grows into new individual.

Q.15. What is zygote?

Ans. Zygote is a single diploid cell formed by fusion of male and female gametes.

Q.16. What are the terms used for similar gametes and dissimilar gametes?

Ans. Similar gametes — Homogametes/Isogametes
Dissimilar gametes — Heterogametes/Anisogametes.

Q.17. What are antherozoids?

Ans. The male gamete or male reproductive unit is called antherozoid or spermatozoa.

Q.18. What are the technical terms used for a bisexual condition?

Ans. Homothallic and monoecious.

Q.19. What are the technical terms used to denote unisexual condition?

Ans. Heterothallic and dioecious.

Q.20. What do you mean by staminate?

Ans. The unisexual male flower bearing stamens is called staminate.

Q.21. What is meant by pistillate?

Ans. The female flower bearing pistil is called pistillate.

Q.22. Name two dioecious plants.

Ans. Papaya and date palm.

Q.23. What do you understand by oestrus cycle?

Ans. The reproductive cycle in non-primates is called oestrus cycle, e.g., cow, sheep.

Q.24. What is menstrual cycle?

Ans. The reproductive cycle in primates is called menstrual cycle, e.g., monkeys, apes.

Q.25. What do you mean by seasonal breeders?

Ans. Some mammals exhibit reproductive cycle only during favourable season. They are called seasonal breeders, e.g., frog, many birds and deer.

Q.26. Define continuous breeders.

Ans. Some mammals are reproductively active throughout their reproductive phase. Such animals are called continuous breeders, e.g., cattle and rabbit.

Q.27. What marks the end of reproductive phase?

Ans. Senescence marks the end of reproductive phase.

Q.28. Write the two pre-fertilisation events from the list given below:

Syngamy, Gametogenesis, Embryogenesis, Pollination

Ans. Gametogenesis, Pollination.

Q.29. Which is the most critical event in sexual reproduction?

Ans. Fertilisation of gametes is the most critical event in sexual reproduction.

Q.30. What is a gamete?

Ans. Gamete is the sexual reproductive unit. They are usually haploid cells.

Q.31. What is gametogenesis?

Ans. The process of formation of gamete in male and female sex organs is called gametogenesis.

Q.32. What are hermaphrodites?

Ans. The animal bearing both male and female sex organs are called hermaphrodites. Example, earthworms, sponge and tapeworm.

Q.33. Name one bisexual and one unisexual animal.

Ans.

Bisexual animal — Earthworm

Unisexual animal — Cockroach

Q.34. Name two plants having haploid body.

Ans. Algae and fungi.

Q.35. Name two plants having diploid body.

Ans. Pteridophytes and gymnosperms.

Q.36. What is meant by meiocytes?

Ans. In diploid organisms, gamete mother cell which undergoes meiosis to produce gamete is called meiocytes.

Q.37. Name two organisms where both male and female gametes are motile.

Ans. Algae and fungi.

Q.38. What is syngamy?

Ans. The fusion of male and female gametes to form a zygote is called syngamy.

Q.39. Name one plant and animal in which external fertilisation takes place.

Ans. Plant — Algae; Animal — Fish.

Q.40. Mention any two conditions that enhance the chances of syngamy in organisms exhibiting external fertilisation.

Ans. Organisms exhibiting external fertilisation show great synchrony between the sexes, release a large number of gametes into the surrounding medium.

Q.41. Name one plant and animal in which internal fertilisation take place.

Ans.

Plant — Gymnosperms;

Animal — Mammals.

Q.42. In which type of life cycle does a zygote undergoes

Q. Mitosis

Ans. Mitosis — Diplontic life cycle

Q. Meiosis

Ans. Meiosis — Haplontic life cycle.

Q.43. Name one oviparous and viviparous animal.

Ans.

Oviparous animal — Reptile

Viviparous animal — Mammals

Q.44. Write two advantages of vivipary.

Ans.

- Two advantages of vivipary are:
- Proper embryonic care and protection of the young one.
- The chances of survival of young one is greater.

Q.45. Rearrange the following events of sexual reproduction in the sequence in which they occur in a flowering plant: embryogenesis, fertilisation, gametogenesis, pollination.

Ans. Gametogenesis, pollination, fertilisation, embryogenesis.

Q.46. From which part does fruit, seed and embryo develop?

Ans.

Fruit — ripened ovary

Seed — ripened ovule

Embryo — mature zygote.

Q.47. Suggest a possible explanation why the seeds in a pea are arranged in a row, whereas those in tomato are scattered in the juicy pulp.

Ans. The ovary of pea plant is monocarpellary and the ovules are arranged along one margin whereas in tomato the ovary is tricarpellary with axile placentation.

Q.48. Is Marchantia monoecious or dioecious? Where are the sex organs borne in this plant?

Ans. Marchantia is dioecious. The male sex organs, antheridia, are borne on the antheridiophores and female sex organs called archegonia are borne on archegoniophores.

Short Answer Questions-I (PYQ)

[2 Marks]

Q.1. Name the units of vegetative propagation in water hyacinth. Explain giving reasons why it has become the most invasive aquatic weed.

Ans. Offsets are the unit of vegetative propagation in water hyacinth. Since the formation of hyacinth offsets does not involve two parents, the process involved is asexual, therefore they spread quickly.

Q.2. Name the vegetative propagules in the following:

Q. Agave

Ans. Agave—Bulbil

Q. Bryophyllum

Ans. Bryophyllum—leaf buds/adventitious buds.

Q.3. Explain the significance of meiocytes in a diploid organism.

Ans. In a diploid organism, meiocytes undergo meiosis to form haploid gametes. These help to restore $2n$ (diploidy) through zygote formation or syngamy.

Q.4. The cell division involved in gamete formation is not of the same type in different organisms. Justify.

Ans. The parents may be haploid or diploid but the gametes always have to be haploid. Diploid parents undergo meiosis to produce haploid gametes, whereas haploid parents undergo mitosis to produce haploid gametes.

Q.5. Coconut plant is monoecious while date palm is dioecious. Why are they called so?

Ans. Coconut palm is monoecious, as both the male and female reproductive structures are borne on the same plant (bisexual) while date palm is dioecious because male and female reproductive structures are borne on different plants (unisexual).

Q.6. Why are papaya and date palm plants said to be dioecious whereas cucurbits and coconut palms monoecious, in spite of all of them bearing unisexual flowers?

Ans.

(i) Papaya and date palm plants are dioecious, because male and female flowers are present on different plants, that is each plant is either male or female.

(ii) Cucurbits and coconut palms are monoecious, because male and female flowers are present on the same plant.

Q.7. A list of three flowering plants is given below. Which ones out of them are (i) monoecious and (ii) bearing pistillate flowers?

List: Date palm, Cucurbits and Pea.

Ans.

(i) Monoecious plant—Cucurbits

(ii) Bearing pistillate flowers—Date palm.

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

Ans. In some flowering plants, both male and female flowers may be present on the same individual (monoecious) or on separate individuals (dioecious). Some examples of monoecious plants are cucurbits and coconuts and of dioecious plants are papaya and date palm.

Q.9. A single pea plant in your kitchen garden produces pods with viable seeds, but the individual papaya plant does not. Explain.

Ans. Pea flowers of pea plants are bisexual, monoecious or self-pollinated and produce pods with viable seeds.

Papaya is a dioecious or unisexual plant bearing male and female flower on separate plants. It is unable to produce viable seeds as there is no cross-pollination. It could be a male plant which is unable to produce fruit and seeds.

Q.10. Out of many papaya plants growing in your garden, only a few bear fruits. Give reason.

Ans. Papaya plant is either unisexual or dioecious, i.e., male and female flowers are borne on separate plants. Only plants bearing female flowers will bear fruits.

Q.11. How does the floral pattern of Mediterranean orchid *Ophrys* guarantee cross pollination?

Ans. The orchid bears flowers which resemble the female wasp in colour, smell, as well as appearance. The male pollinators mistake them as their female counterparts. Therefore, in the process of their pseudocopulation they pollinate the flower

Q.12. Explain the importance of syngamy and meiosis in a sexual life cycle of an organism.

Ans. In the sexual life cycle of an organism, meiosis results in formation of haploid gametes which fuse together by syngamy and the diploid nature of the organism is restored in the zygote.

Q.13. A moss plant produces a large number of antherozoids but relatively only a few egg cells. Why?

OR

Why do moss plants produce very large number of male gametes? Provide one reason. What are these gametes called?

Ans. Antherozoids are motile male gametophytes which have to swim on the water surface to fertilise the immotile female gametophytes, i.e., egg. Since, during its transfer many antherozoids get destroyed, a large number of them are produced.

Q.14. A liverwort plant is unable to complete its life-cycle in a dry environment. State two reasons.

Ans. For sexual reproduction to take place in mosses and liverworts the motile male gametophytes, antherozoids, have to swim on the water surface to fertilise the immotile female gametophytes, egg. In dry conditions, the antherozoids do not reach the egg and hence fertilisation cannot occur

Q.15. Why do algae and fungi shift to sexual mode of reproduction just before the onset of adverse conditions?

Ans. Algae and fungi shift to sexual mode of reproduction for survival during unfavourable conditions. Fusion of gametes helps to pool their resources for survival. The zygote develops a thick wall that is resistant to desiccation and damage which undergoes a period of rest before germination.

Q.16. Name any two organisms and the phenomenon involved where the female gamete undergoes development to form new organisms without fertilisation.

Ans. The phenomenon of development of female gamete directly into an individual without fertilisation is called parthenogenesis, e.g., rotifers, honeybees, lizards and birds.

Q.17. Answer the following questions:

Q. State the difference between meiocyte and gamete with respect to chromosome number.

Ans. Meiocytes contain diploid sets of chromosomes whereas gametes contain haploid sets of chromosomes.

Q. Why is a whiptail lizard referred to as parthenogenetic?

Ans. Whiptail lizard reproduces without fertilisation, i.e., an unfertilised egg develops into a new individual. Therefore, they are referred to as parthenogenetic.

Short Answer Questions-I (OIQ)

[2 Mark]

Q.1. What is fission? What is the basic difference between fission in Amoeba and Paramecium?

Ans. The mode of asexual reproduction in which a parent body splits into two or more daughter cells, each giving rise to a new individual is called fission.

Amoeba undergoes binary fission in which cytoplasm and nucleoid (DNA molecule) divide in any plane giving rise to two equal or unequal daughter cells without mitosis. However, in Paramecium, plane of division runs along the transverse axis of an individual.

Q.2. If the chromosome numbers in meiocytes of human beings, rat, elephant, rice, butterfly and onion are 46, 42, 56, 24, 380 and 32, respectively. What will be the chromosome numbers in gametes of these species?

Ans. The chromosome numbers in the gametes of these species will be

Human beings = 23, rat = 21, elephant = 28, rice = 12, butterfly = 190 and onion = 16.

Q.3. Why dogs and cats have oestrus cycle but human beings have menstrual cycle, though all are mammals?

Ans. Dogs and cats are seasonal breeders. They have heat period during which ovulation takes place. Humans, on the other hand, have this cycle monthly.

Q.4. With which type of reproduction do we associate the reduction division? Analyse the reasons for it.

Ans. Reduction division is associated with sexual reproduction because the diploid organisms undergo meiosis to form haploid gametes.

Q.5. Name the relationship between the first two words and suggest a suitable word

Q. Doob grass : Runner : : Potato :

Ans. Stem modification; tuber

Q. Endogamy : Self-fertilisation : : Exogamy :

Ans. Fertilisation method; Cross-fertilisation.

Q.6. In haploid organisms that undergo sexual reproduction, name the stage in the life cycle when meiosis occurs. Give reasons for your answer.

Ans. Meiosis takes place during the post-zygotic stage. Since the organism is haploid, meiosis cannot occur during gametogenesis. As zygote is diploid but the individual is haploid so number of chromosome has to be reduced to half.

Q.7. The number of taxa exhibiting asexual reproduction is drastically reduced in the higher plants (angiosperms) and higher animals (vertebrates) as compared with lower groups of plants and animals. Analyse the possible reasons for this situation.

Ans. Both angiosperms and vertebrates have a more complex structural organisation. They have evolved very efficient mechanism of sexual reproduction. Since asexual reproduction does not create new genetic pools in the offspring and consequently hampers their adaptability to external conditions, these groups have resorted to reproduction by the sexual method.

Q.8. In a developing embryo, analyse the consequences if cell divisions are not followed by cell differentiation.

Ans. If differentiation does not follow division, embryo will not develop and this will not develop into a new organism.

Q.9. Which of the following are monoecious and dioecious organisms:

Q. Earthworm

Ans. Monoecious

Q. Chawra

Ans. Monoecious

Q. Marchantia

Ans. Dioecious

Q. Cockroach

Ans. Dioecious

Q.10. Zygote forms the major link between one generation and those of the next generation organism. What is the fate of zygote in organisms which show:

Q. haplontic life cycle and

Ans. Zygote of haplontic life cycle divides meiotically during its generation.

Q. diplontic life cycle

Ans. Zygote of diplontic life cycle divides mitotically during embryogenesis.

Q.11. Mention two important characteristics in the sexual reproduction of frogs and bony fishes.

Ans. Both these release the mature gametes simultaneously. They also release a large number of gametes in the water to enhance the chances of syngamy (external fertilisation).

Q.12. What is parthenogenesis? Give two examples from animals.

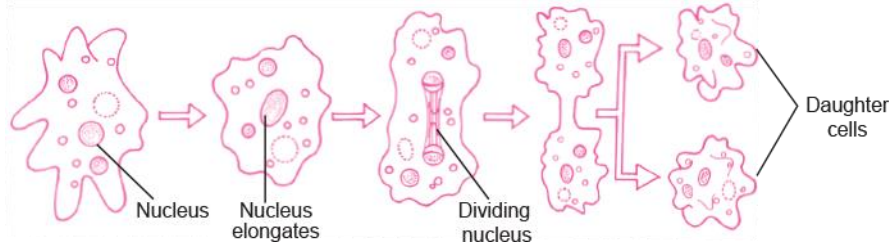
Ans. The development of a new individual from an unfertilised egg is called parthenogenesis. Parthenogenesis is a special mode of reproduction. It is simpler, easier as well as rapid mode of replication. However, it eliminates the chances of variation in a population so, it does not play important role in evolution process. Examples: Honeybees and some lizards.

Short Answer Questions-II

[3 marks]

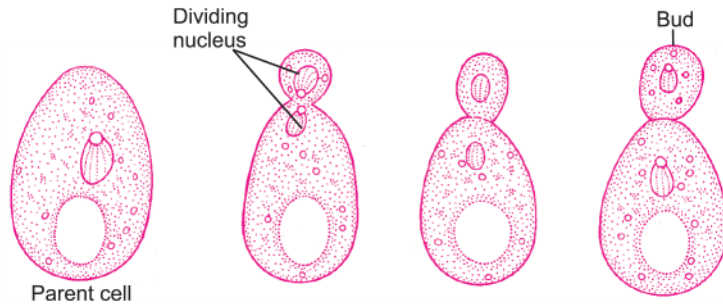
Q.1. Diagrammatically represent the asexual reproduction in Amoeba.

Ans.



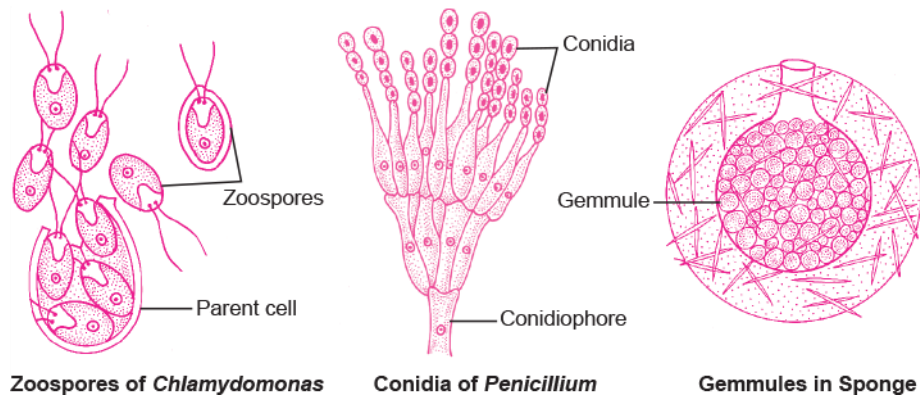
Q.2. Diagrammatically represent the asexual reproduction in yeast.

Ans.



Q.3. Draw the sketches of a zoospore and a conidium. Mention two dissimilarities between them and at least one feature common to both structures.

Ans.



Dissimilarities: Zoospores are motile whereas conidia are non-motile. Zoospores are produced in a sporangium whereas conidia are produced externally.

Common feature: Both are the means of asexual reproduction.

Q.4. Although sexual reproduction is a long drawn, energy-intensive complex form of reproduction, many groups of organism in Kingdom Animalia and Plantae prefer this mode of reproduction. Give at least three reasons for this.

Ans.

(a) Sexual reproduction brings about variation in the offspring.

(b) Since gamete formation is preceded by meiosis, genetic recombination occurring during crossing over (meiosis-I), leads to a great deal of variation in the DNA of gametes.

(c) The organism has better chance of survival in a changing environment.

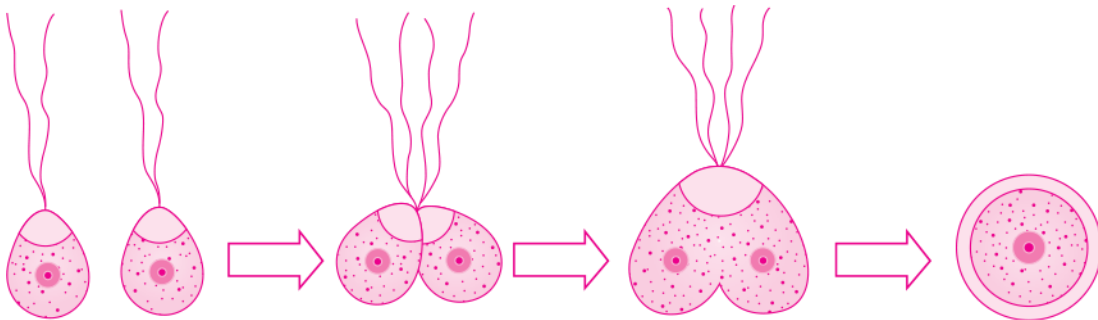
Q.5. Differentiate between an annual and a biennial plant. Provide one example of each.

Ans.

S. No.	Annual Plants	Biennial Plants
(i)	These plants require a single season to complete their whole life cycle.	These plants require two seasons to complete their whole life cycle.
(ii)	They grow, set seeds and die within one year.	In the first year, they grow a healthy root system and short stem, and become dormant in winters. In second year, they grow quickly, flower, set seeds and die.
(iii)	For example, rice, wheat, etc.	For example, onion, carrot, etc.

Q.6.

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



Ans.

- i. Isogametes.
- ii. Fertilisation is taking place and zygote is the resultant structure.
- iii. Cladophora/Chlamydomonas.

Long Answer Questions

[5 Marks]

Q.1. What are vegetative propagules? Name any four of them along with an example for each.

Ans. The units of asexual vegetative structures of plants which are capable of giving rise to new individuals/plants are called vegetative propagules.

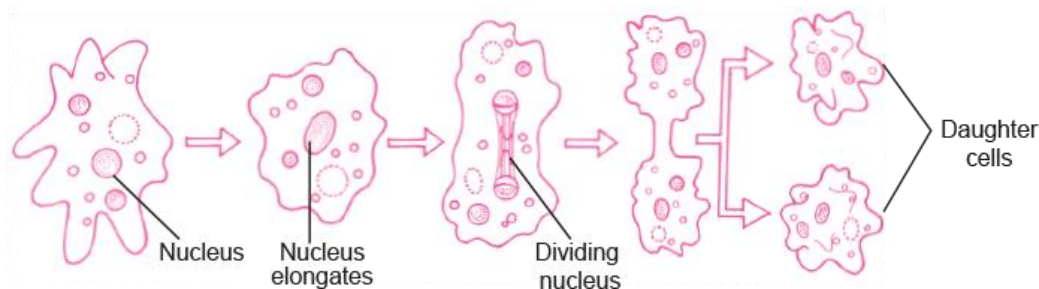
Example:

- i. Rhizome of ginger,
- ii. bulbil of Agave,
- iii. leaf buds of Bryophyllum,
- iv. bulbs of onion.

Q.2. The unicellular organisms which reproduce by binary fission are considered immortal. Justify.

Ans. Asexual reproduction is common among single-celled organisms. Thus, in these organisms cell division is itself a mode of reproduction. In binary fission, the parent body divides into two halves and each half rapidly grows into an adult. There are no remains of parent body cell and parent cannot be said to have died. In fact after binary fission, parent continues living as two daughter individuals. Hence, the unicellular organisms which undergo binary fission are considered immortal.

Example: Amoeba and Paramecium.



Q.3. Enumerate the differences between asexual and sexual reproduction. Describe the types of asexual reproduction exhibited by unicellular organisms.

Ans.

S. No.	Asexual reproduction	Sexual reproduction
(i)	Asexual reproduction does not involve formation or fusion of gametes.	Sexual reproduction involves formation and fusion of gametes.

(ii)	The offsprings formed by asexual reproduction are genetically identical to the parent and are referred to as clones.	The offsprings are not identical to the parents or to each other hence, it leads to variation in a population.
(iii)	It is a simple and fast process.	It is an elaborate, complex and slow process.
(iv)	It involves only mitosis.	It involves meiosis.
(v)	It is always uniparental (single parent).	It is usually biparental (two parents).
(vi)	It does not play important role in evolution process.	It plays a vital role in evolution process.
(vii)	It is common among single-celled organisms, and in plants and animals with relatively simple organisation.	It is common in higher animals with complex organisation.

Fission: The splitting of parental cell into two or more daughter cells.

(a) Binary fission: The splitting of a parental cell into two equal daughter cells, each of which rapidly grows into an adult is called binary fission. It occurs in single-celled animals like bacteria and protozoans (e.g., Amoeba, Paramecium). It can be simple or irregular, longitudinal, oblique or transverse, depending on the plane of division.

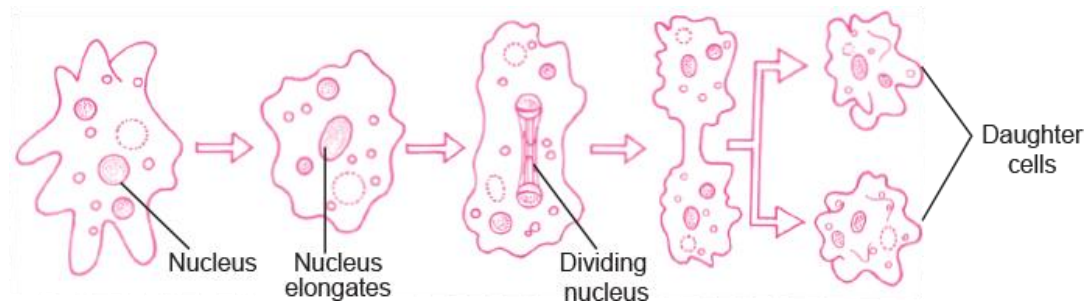


Fig. 1.1 Binary fission in Amoeba

(b) Multiple fission: The splitting of a parent cell into numerous daughter cells, each of which grow into an adult is called multiple fission, e.g., Plasmodium.

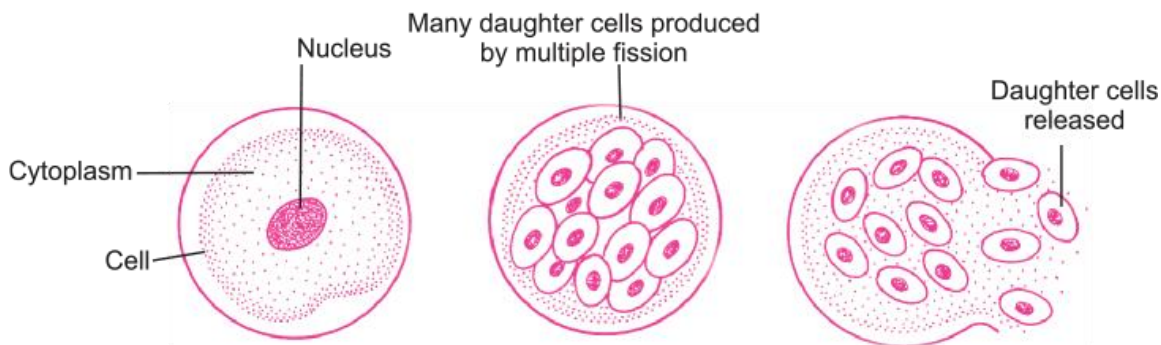


Fig. 1.2 Multiple fission in Plasmodium

Sporulation: During unfavourable conditions, organisms like Amoeba cover themselves with a three-layered hard covering or cyst. This is called **encystation**. On return of favourable conditions, it divides by multiple fission within the cyst and produces many Amoebae. The cyst bursts and spores are liberated to develop into adults. This is called sporulation.

Q.4. Explain the stages in sexual reproduction of an organism. Mention what major events occur in each of them.

Ans. Events in sexual reproduction may be grouped into three distinct stages as follows:

- i. Pre-fertilisation
- ii. Fertilisation (also known as syngamy)
- iii. Post-fertilisation.

(1) Pre-fertilisation : This includes formation of gametes (**gametogenesis**) and their transfer.

(a) Gametogenesis

- It involves formation of two haploid reproductive units called gametes.
- The formation of male gamete or male reproductive unit is called **spermatogenesis**.
- The formation of female gamete or female reproductive unit is called **oogenesis**.
- When male and female gametes are similar in appearance and it is not possible to differentiate between them, they are called **homogametes** or **isogametes**.
- When the male and female gametes are morphologically distinct, they are called **heterogametes**.
- Among heterogametes, the male reproductive unit is called **antherozoid** or **sperm** and female reproductive unit is called **egg** or **ovum**.
- A single organism bearing both male and female sex gametes is called **homothallic** or **monoecious**, e.g., coconut.
- Organisms in which different individuals carry male and female gametes are called **heterothallic** or **dioecious**, e.g., papaya.
- Unisexual male flowers bearing stamens are called **staminate** flowers.
- Unisexual female flowers bearing pistils are called **pistillate** flowers.
- The animals bearing both the sexes are called **hermaphrodites**, e.g., earthworm, sponge, tapeworm and leech.

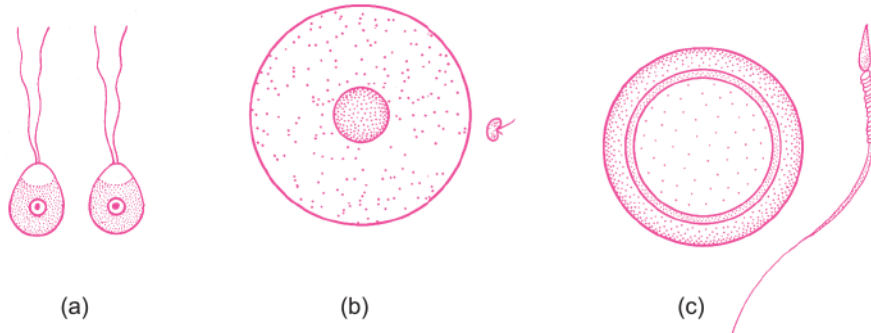


Fig. 1.8 Types of gametes: (a) Isogametes of *Cladophora* (an alga); (b) Heterogametes of *Fucus* (an alga); (c) Heterogametes of *Homo sapiens* (human beings)

Cell division during gamete formation

- Gametes are always haploid.
- Haploid organisms produce gametes by mitotic division. Diploid organisms undergo meiosis of specialised cells called **meiocytes** (gamete mother cell) to form gametes.
- At the end of both divisions, only one set of chromosomes get incorporated into each gamete.

(b) Gamete transfer

- After gamete formation, male and female gametes must be physically brought together to facilitate fusion (**fertilisation**).
- Male gametes are usually motile, whereas female gametes are static.
- In lower plants like some algae and fungi, both male and female gametes are motile.
- In simple plants like algae, bryophytes and pteridophytes, water acts as the medium for gamete transfer.
- In angiosperms, the pollen grains are transferred from anther of one flower to the stigma of another flower. This is called **pollination**.

(2) Fertilisation or syngamy

- It is the fusion of male and female gametes to form a diploid cell called **zygote**.
- The phenomenon of development of female gamete directly into an individual without fertilisation is called **parthenogenesis**, e.g., rotifers, honeybees, lizards and birds.
- Fertilisation is of two types, i.e., external fertilisation and internal fertilisation.

S. No.	External fertilisation	Internal fertilisation
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(i)	When fusion of gametes occurs outside the body of an organism, it is called external fertilisation.	When fusion of gametes occurs inside the body of an organism, it is called internal fertilisation.
(ii)	Large number of both male and female gametes are released into the surrounding medium (e.g., water) in order to enhance chances of syngamy	The number of sperms produced are very large and number of eggs produced are less.
(iii)	The offsprings are extremely vulnerable to predators, threatening their survival.	The offsprings are well protected comparatively.
(iv)	Examples: Bony fishes, frogs and majority of algae.	Examples: Birds, mammals, etc.

(3) Post-fertilisation events These include development of zygote and embryo after fertilisation.

(a) Zygote development

- In external fertilisation, zygote is formed in the external medium, whereas in internal fertilisation, zygote is formed inside the body of the organism.
- Further development of zygote depends upon the life cycle and environment.
- Zygote ensures continuity of species between organisms of one generation and the next.
- In algae and fungi, the zygote develops a thick wall to resist dessication and damage.
- In haplontic life cycle, the zygote undergoes reductional division (meiosis) to form a haploid organism.
- In diplontic life cycle, the zygote undergoes mitotic division.

(b) Embryogenesis

- The processes of development of embryo from the zygote is called **embryogenesis**.
- During embryogenesis, zygote undergoes
- cell division (mitosis) to increase cell number, and
- cell differentiation to form specialised tissues and organs.
- Based on whether the zygote develops outside the body of female parent or inside, animals can be classified into **oviparous** and **viviparous**, respectively.

S. No.	Oviparous animals	Viviparous animals
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(i)	Oviparous animals lay fertilised eggs.	Viviparous animals give birth to young ones.
(ii)	The fertilised eggs have calcareous shell and young ones hatch out after a period of incubation.	The fertilised egg (zygote) has no shell and develops into a young one inside the body of the female organism.
(iii)	Chances of survival of young one is less as the female lays egg in the environment. For example, reptiles, birds, etc.	Chances of survival of young one is more because of proper embryonic care and protection inside the mother's body.
(iv)		For example, majority of mammals including humans.

- In flowering plants, the zygote is formed inside the ovule, where the zygote develops into an embryo.

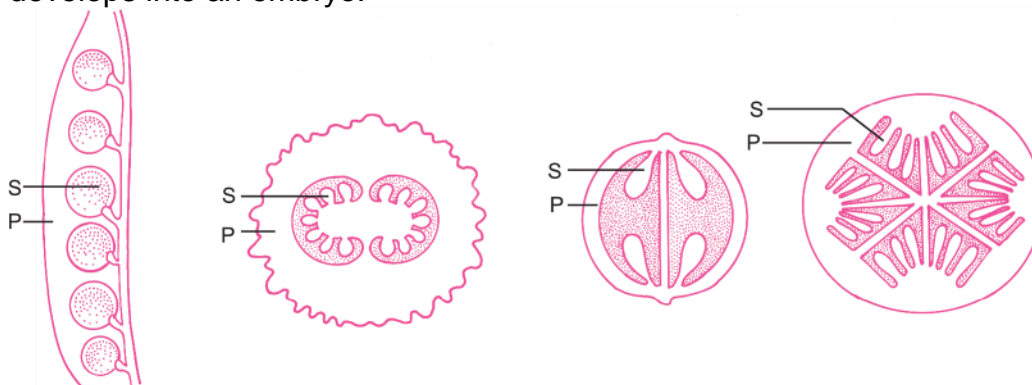


Fig. 1.9 A few kinds of fruit showing seeds (S) and protective pericarp (P)

- The fertilised ovule develops into **seed** and ovary develops into **fruit**.
- The seed after dispersal in favourable condition germinates to produce new plants.
- The outermost protective covering of fruit is called **pericarp** or fruit wall.

Q.5. Do all the gametes formed from a parent organism have the same genetic composition? Analyse the situation with the background of gametogenesis and provide suitable explanation.

Ans. Gametes do not have the same genetic composition formed by the parent organism.

Gametogenesis

When male and female gametes are similar in appearance and it is not possible to differentiate between them, they are called **homogametes** or **isogametes**.

When the male and female gametes are morphologically distinct, they are called **heterogametes**.

Among heterogametes, the male reproductive unit is called **antherozoid** or **sperm** and female reproductive unit is called **egg** or **ovum**.

Unisexual male flowers bearing stamens are called **staminate** flowers.

Unisexual female flowers bearing pistils are called **pistillate** flowers.

Q.6. Differentiate between

Q. oestrus and menstrual cycles

Ans. Oestrus and menstrual cycles

S. No.	Oestrus cycle	Menstrual cycle
(i)	It involves no uterine bleeding.	It ends with uterine bleeding.
(ii)	It continues until death.	It continues till menopause.
(iii)	Occurs in non-primates. eg. sheeps, cows	Occurs in apes and humans.

Q. ovipary and vivipary. Cite an example for each type.

Ans. Based on whether the zygote develops outside the body of female parent or inside, animals can be classified into oviparous and viviparous, respectively.

S. No.	Oviparous animals	Viviparous animals
(i)	Oviparous animals lay fertilised eggs.	Viviparous animals give birth to young ones.
(ii)	The fertilised eggs have calcareous shell and young ones hatch out after a period of incubation.	The fertilised egg (zygote) has no shell and develops into a young one inside the body of the female organism.
(iii)	Chances of survival of young one is less as the female lays egg in the environment.	Chances of survival of young one is more because of proper embryonic care and protection inside the mother's body.
(iv)	For example, reptiles, birds, etc.	For example, majority of mammals including humans.