

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.

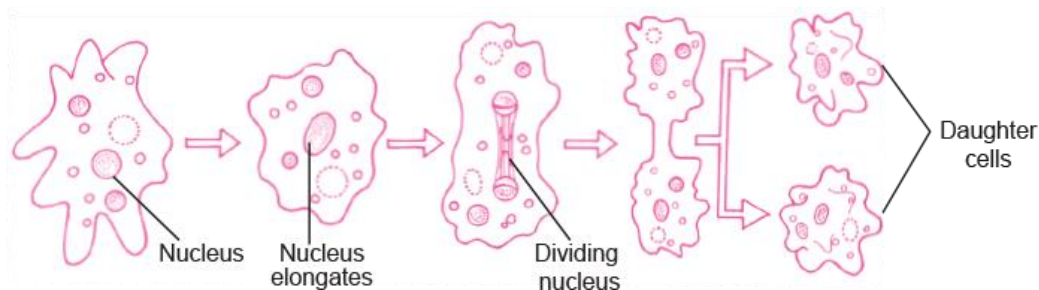
Example:

- 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.

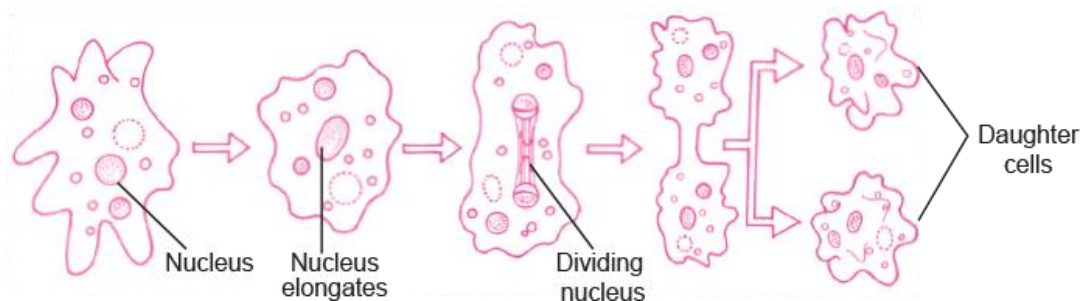


Fig. 1.1 Binary fission in Amoeba

(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.

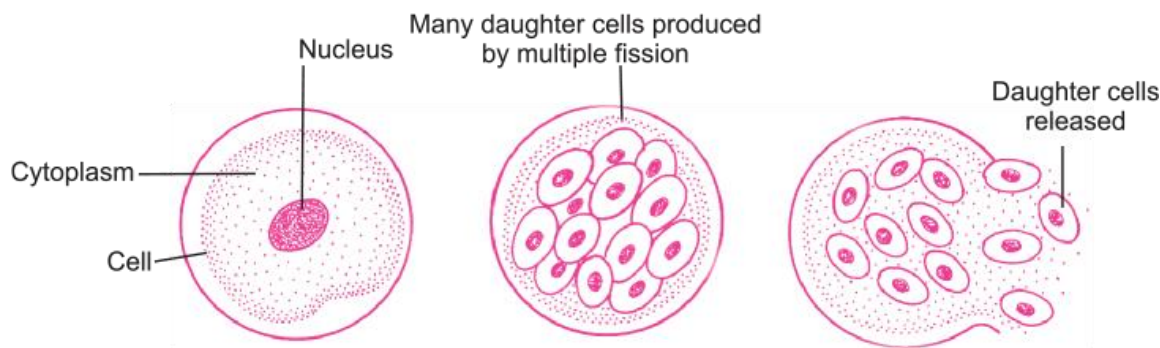


Fig. 1.2 Multiple fission in Plasmodium

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.

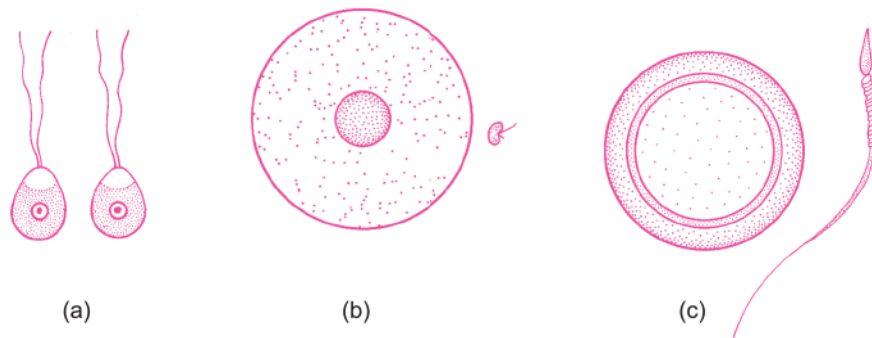


Fig. 1.8 Types of gametes: (a) Isogametes of *Cladophora* (an alga); (b) Heterogametes of *Fucus* (an alga); (c) Heterogametes of *Homo sapiens* (human beings)

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. For example, majority of mammals including humans.

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

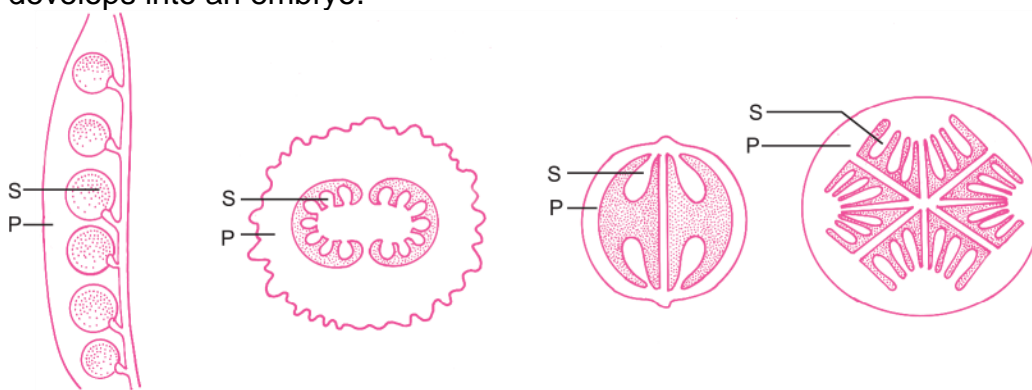


Fig. 1.9 A few kinds of fruit showing seeds (S) and protective pericarp (P)

- 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 canbe 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.