1

Reproduction in Organisms

Multiple Choice Questions (MCQs)

Q. 1 A few statements describing certain features of reproduction are given below

I. gametic fusion takes place.
II. transfer of genetic material takes place.
III. reduction division takes place.
IV. progeny have some resemblance with parents.

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

(a) I and II (b) II and III (c) II and IV (d) I and III

Thinking Process

Reproduction is a biological process in which an organism gives rise to young ones (offspring) having some resemblance with itself. If enables the continuity of the species, generation after generation.

Ans. *(c)* In both types of reproduction (asexual and sexual) there is transfer of genetic material from parent (s) to their young ones which have some resemblances with their parents.

Reduction division (meiosis) has to occur if a diploid body has to produce haploid gametes that is in case of sexual reproduction only.

Gametic fusion The formation of male and female gametes and their fusion to form the zygote also takes place only in the sexual reproduction.

Q. 2 The term 'clone' cannot be applied to offspring formed by sexual reproduction because

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

Ans. *(a)* The offsprings that are produced as a result of asexual reproduction are not only identical to one another but are also exact copies of their parent. So, such individuals are called clones. While, in the case of sexual reproduction DNA of both parents, (*i.e.,* male and female gametes) is copied and passed on to the offspring after fusion. The offspring, thus formed do not possess exact copies of parental DNA.

Q. 3 *Amoeba* and yeast reproduce asexually by fission and budding respectively, because they are

(a) microscopic organisms
(b) heterotrophic organisms
(c) unicellular organisms
(d) uninucleate organisms

Ans. *(c)* Unicellular organisms, have relatively simple organisations. So, the asexual mode of reproduction is common in them. It is so because by asexual reproduction unicellular organisms can multiply very fast. In *Amoeba* it occurs by binary fission and in yeast by budding to be described first.

In the sexual reproduction, both male and female gametes have to fuse, while in asexual reproduction, cell division takes place.

Heterotrophic organisms (humans, animals and decomposers) can reproduce either asexually or sexually, *e.g.,* in bacteria sexual reproduction occurs *via* conjugation and asexual reproduction occurs *via* binary fission.

Uninucleate organisms, like *Ulva* (algae) reproduce asexually by zoospores and sexually by the fusion of gametes.

Q. 4 A few statements with regard to sexual reproduction are given below

I. Sexual reproduction does not always require two individuals.
II. Sexual reproduction generally involves gametic fusion.
III. Meiosis never occurs during sexual reproduction.
IV. External fertilisation 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

Ans. *(c)* Sexual reproduction involves formation of the male and female gametes either by the same individual (*e.g., Taenia*) or by different individuals of the opposite sex (*e.g.,* rabbit).

These gametes fuse to form the zygote which develops to form the new organism. Meiosis (reduction division) occurs only during sexual reproduction to produce haploid gametes. It is internal fertilisation which occurs during sexual reproduction. In this type egg is formed inside the female body where they fuse with the male gamete.

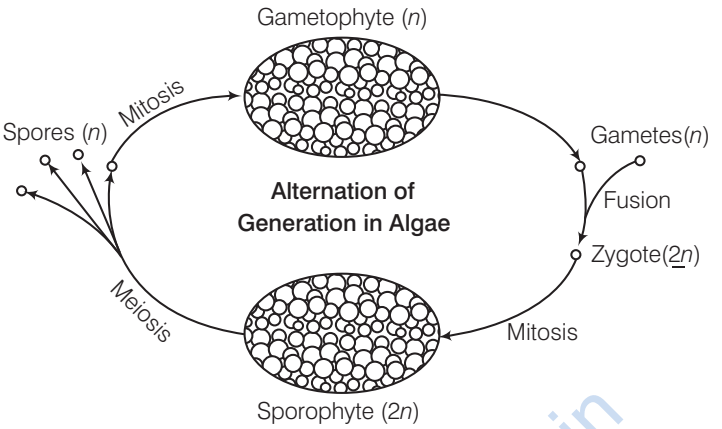
Q. 5 A multicellular, filamentous alga exhibits a type of sexual life cycle in which the meiotic division occurs after the formation of zygote. The adult filament of this alga has

(a) haploid vegetative cells and diploid gametangia
(b) diploid vegetative cells and diploid gametangia
(c) diploid vegetative cells and haploid gametangia
(d) haploid vegetative cells and haploid gametangia

Thinking Process

The literary meaning of alternation of generation is one in which one generation follows the other in alternating and repeating manner.

Ans. *(d)* A multicellular gametophyte (gametangia), which is haploid (*n*) alternates with a multicellular sporophyte, which is diploid (2*n*). A mature sporophyte produces spores (haploid cells) by meiosis, a process which reduces the number of chromosomes to half, from 2*n* to *n*.



Q. 6 The male gametes of rice plant have 12 chromosomes in their nucleus. The chromosome number in the female gamete, zygote and the cells of the seedling will be, respectively

(a) 12, 24, 12 (b) 24, 12, 12 (c) 12, 24, 24 (d) 24, 12, 24

Thinking Process

Gametes are formed from the meiotic division of meiocytes. In each gamete only one set of chromosomes gets incorporated.

Ans. *(c)* In female gamete the chromosome number will be same as that of the male gamete (12).

A zygote is a fertilised egg/seed which means gametes from the parents have been combined (diploid) and thus, the chromosome number will be 24 (2*n*).

A seedling is a young plant sporophyte developing out of a plant embryo from a seed. So, the chromosome number in the cells of the seedlings will be 24 (2*n*), which will further give rise to new diploid individual.

Q. 7 Given below are a few statements related to external fertilisation.

I. The male and female gametes are formed and released simultaneously.
II. Only a few gametes are released into the medium.
III. Water is the medium in a majority of organisms exhibiting external fertilisation.
IV. Offspring formed as a result of external fertilisation have better chances of survival than those formed inside an organism.

Choose the correct statements.

(a) III and IV (b) I and III (c) II and IV (d) I and IV

Ans. *(b)* External fertilisation occurs outside the body of the organism. It takes place in most aquatic organisms, such as a majority of algae and fishes as well as amphibians. Organisms exhibiting external fertilisation release a large number of gametes in the surrounding medium. (*e.g.,* water) in order to enhance the chances of syngamy.

A major disadvantage is that the offspring are extremely vulnerable to predators threatening their survival upto adulthood.

Q. 8 The statements given below describe certain features that are observed in the pistil of flowers.

I. Pistil may have many carpels.
II. Each carpel may have more than one ovule.
III Each carpel has only one ovule.
IV. Pistil have only one carpel.

Choose the statements that are true from the options below.

(a) I and II (b) I and III (c) II and IV (d) III and IV

Thinking Process

The gynoecium represents the female reproductive part of the flower. The pistil is the free unit of gynoecium. Each pistil is constructed of one to many enrolled leaf-like structures or carpels.

Ans. ***(a)*** A pistil, (one a many carpels) has three parts, *i.e.,* stigma, style and ovary. Ovary, the swollen part of the pistil contains an angiospermic, ovoid and whitish structure called ovule. Inside ovary it is attached to a parenchymatous cushion called placenta, either singly or in cluster.

Q. 9 Which of the following situations correctly describe the similarity between an angiospermic egg and a human egg?

I. Eggs of both are formed only once in a lifetime.
II. Both the angiosperm egg and human egg are stationary.
III. Both the angiosperm egg and human egg are motile transported.
IV. Syngamy in both results in the formation of zygote.

Choose the correct answer from the options given below.

(a) II and IV (b) only IV
(c) III and IV (d) I and IV

Ans. ***(b)*** In case of many terrestrial organisms (including both angiosperms and humans) which exhibit internal fertilisation, syngamy occurs inside the body of the organism to form zygote.

Both the angiosperm and human remains reproductively active throughout their reproductive phase. It means the formation of egg takes place not only once but many times in a lifetime.

In humans, once an egg has been released from ovary, the beating of cilia in the Fallopian tube moves the egg from the ovary to the uterus. So, the egg is considered as motile not stationary.

In flowering plants (angiosperms), the gametes are non-motile cells within gametophytes, but for the fusion to take place the non-motile male gametes are carried to female gamete by pollen-tubes.

Q. 10 Appearance of vegetative propagules from the nodes of plants such as sugarcane and ginger is mainly because

(a) nodes are shorter than internodes (b) nodes have meristematic cells
(c) nodes are located near the soil (d) nodes have non-photosynthetic cells

Ans. *(b)* Appearance of vegetative propagules from the nodes of plants such as sugarcane and ginger is mainly because of the nodes having meristematic cells.

These cells are responsible to control the growth and development of tissues and organs in plants. Nodes (present in the modified stems) when come in contact with damp soil or water, they produce roots and gives rise to new plants.

Q. 11 Which of the following statements, support the view that elaborate sexual reproductive process appeared much later in the organic evolution.

I. Lower groups of organisms have simpler body design.

II. Asexual reproduction is common in lower groups.

III. Asexual reproduction is common in higher groups of organisms.

IV. The high incidence of sexual reproduction in angiosperms and vertebrates.

Choose the correct answer from the options given below.

(a) I and III (b) I and III

(c) II and IV (d) II and III

Thinking Process

All living things are identified and categorised on the basis of their body design (structuce and function). When we connect this idea of classification to evolution we will find some organisms which have ancient body designs and have not changed much, while the other groups have acquired their particular body designs relatively recently.

Those in the first group are referred to as primitive or lower organisms, while those in the second group are called advanced or higher organisms.

Ans. *(c)* Asexual reproduction (budding) has been found in most primitive animals like *Hydra*, but over the evolutionary time as the higher or advanced organisms came into existence, they resorted the sexual reproduction as it ensures the genetic recombination that results in variation.

Q. 12 Offspring formed by sexual reproduction exhibit more variation than those formed by asexual reproduction because

(a) sexual reproduction is a lengthy process

(b) gametes of parents have qualitatively different genetic composition

(c) genetic material comes from parents of two different species

(d) greater amount of DNA is involved in sexual reproduction

Ans. *(b)* In asexual reproduction the offspring that are produced are not only identical to the parent but are also exact copies of their parent. It is because in asexual reproduction there is the involvement of a single parent. So, in this case the genetic variation is not created.

While, in sexual reproduction genetic variation is created and inherited. In sexual reproduction, two parents (opposite sex) having different genetic composition participate in the reproductive process and also involve fusion of male and female gametes, which gives rise to the new individual having genetic composition of both.

Q. 13 Choose the correct statement from amongst the following.

(a) Dioecious (hermaphrodite) organisms are seen only in animals.

(b) Dioecious organisms are seen only in plants.

(c) Dioecious organisms are seen in both plants and animals.

(d) Dioecious organisms are seen only in vertebrates.

Thinking Process

Hermaphrodite is an organism that has reproductive organs normally associated with both male and female sexes. It is the bisexual condition found in both plants (e.g., rose) and animals (e.g., snail).

Ans. *(c)* Dioecious is the term used to describe unisexual condition. Dioecious organisms are seen in both plants and animals.

Example of dioecious plant- *Marchantia*

Example of dioecious animal-Cockroach (invertebrate).

Q. 14 There is no natural death in single celled organisms like *Amoeba* and bacteria because

(a) they can'not reproduce sexually

(b) they reproduce by binary fission

(c) parental body is distributed among the offspring

(d) they are microscopic

Ans. *(c)* There is no natural death in single celled organisms like *Amoeba* and bacteria because parental body is distributed among the offspring. In such organisms, reproduction occur by cell division where a cell (parent) divides into two halves and each rapidly grows into an adult (offspring).

Q. 15 There are various types of reproduction. The type of reproduction adopted by an organism depends on

(a) the habitat and morphology of the organism

(b) morphology of the organism

(c) morphology and physiology of the organism

(d) the organism's habitat, physiology and genetic makeup

Ans. *(d)* There is a large diversity in the biological world and each organism has evolved its own mechanism to multiply and produce offspring. The type of reproduction adopted by an organism depends on the organism's habitat, its internal physiology and several other factors.

Q. 16 Identify the incorrect statement.

(a) In asexual reproduction, the offspring produced are morphologically and genetically identical to the parent.

(b) Zoospores are sexual reproductive structures.

(c) In asexual reproduction, a single parent produces offspring with or without the formation of gametes.

(d) Conidia are asexual structures in *Penicillium*.

Thinking Process

In asexual reproduction, a single individual (parent) is capable of producing offspring. As a result, the offsprings produced are identical to one another and also to their parent both genetically and morphologically.

Ans. *(b)* Asexual reproduction occurs usually in unicellular organisms by various ways like binary fission, budding, sporulation, etc. In this method, a single parent produces offspring with or without the involvement of gametes.

Members of the kingdom fungi and simple plants reproduce through special asexual reproductive structures like conidia (*Penicillium*) buds (*Hydra*) etc. The most common of these structures are zoospores that are microscopic motile structures.

All other options are correct.

Q. 17 Which of the following is a post-fertilisation event in flowering plants?

(a) Transfer of pollen grains (b) Embryo development

(c) Formation of flower (d) Formation of pollen grains

Ans. *(b)* Embryo development takes place after the fertilisation, *i.e.,* fusion of male and female gametes (*n*) result in the formation of zygote (2*n*). Thus, it is a post fertilisalion event.

Rest of the events takes place before occurrrence of fertilisation, hence are pre-fertilisation enents.

Q. 18 The number of chromosomes in the shoot tip cells of a maize plant is 20. The number of chromosomes in the microspore mother cells of the same plant shall be

(a) 20 (b) 10 (c) 40 (d) 15

Ans. *(a)* The whole plant body of maize plant including shoot tip cells remains in diploid (2*n*) condition. As the microspore mother cell is a part of reproductive organ, the chromosome number in these cells will remain same as the individual. *i.e.,* 2*n*=20.

These microspore mother cells are further responsible for producing male gametes, *i.e.,* haploid (*n*) by reduction division.

Very Short Answer Type Questions

Q. 1 Mention two inherent characteristics of *Amoeba* and yeast that enable them to reproduce asexually.

Ans. The characteristics that enable *Amoeba* and yeast to reproduce asexually, *are as follows*

(i) Unicellularity (ii) Simple body organisation

(iii) Uniparental condition

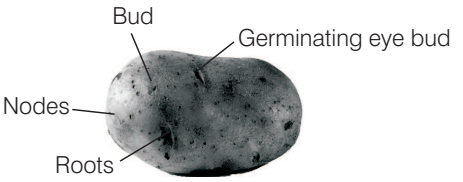
Q. 2 Why do we refer to offspring formed by asexual method of reproduction as clones?

Ans. The reproduction is called **asexual**, when offspring is produced by a single parent with or without the involvement of gamete formation.

As a result, the offspring that are produced are not only similar to one another, but are also exact copies of their parent. Such a group of morphologically and genetically similar individuals is called **clone**.

Q. 3 Although potato tuber is an underground part, it is considered as a stem. Give two reasons.

Ans. *Potato tuber is considered as a stem because of the following reasons*



(i) The tuber has nodes and internodes.

(ii) Leafy shoots appear from the nodes.

Q. 4 Between an annual and a perennial plant, which one has a shorter juvenile phase? Give one reason.

Ans. In a lifespan, the organism has to grow and develop (the juvenile phase). After that the organism mature sexually and enter into the reproductive phase, before it undergoes senescence followed by death.

Since, the entire life cycle of an annual plant is shorter and has to be completed in one growing season, its juvenile phase is shorter than that of a perennial plant.

Q. 5 Rearrange the following events of sexual reproduction in the sequence in which they occur in a flowering plant embryogenesis, fertilisation, gametogenesis, pollination.

Thinking Process

The gametes need to be formed first of all, pollination ensures their transfer, so that fertilisation can take place. Fertilised zygote divides and differentiates during embryogenesis.

Ans. The correct sequence of events of sexual reproduction in a flowering plant are as follows gametogenesis, pollination, fertilisation, embryogenesis.

Q. 6 The probability of fruit set in a self-pollinated bisexual flower of a plant is far greater than a dioecious plant. Explain.

Ans. The probability of fruit set in a self-pollinated bisexual flower of a plant is far greater than a dioecious plant.

In self-pollinated bisexual plants transfer of pollen to stigma of flowers is easier than the dioecious plants. It is so because the anther and stigma lie close to each other and pollination is not effected even in the absence of pollinator. But in dioecious plants pollinator is necessary to bring about effective pollination as the anther and stigma lie away from each other.

Q. 7 Is the presence of large number of chromosomes in an organism a hindrance to sexual reproduction? Justify your answer by giving suitable reasons.

Ans. *No*, presence of large number of chromosomes in an organism is not a hindrance to sexual reproduction. *Ophioglossum* (a fern) has chromosome number 1260, still it can reproduce sexually.

In higher organisms, the chromosomes are present in a compartment called nucleus, within the cell. Whether the number is small or large, the chromosomes are duplicated and then segregated inside this compartment, during cell division. The basis of sexual reproduction is generation of haploid gametes.

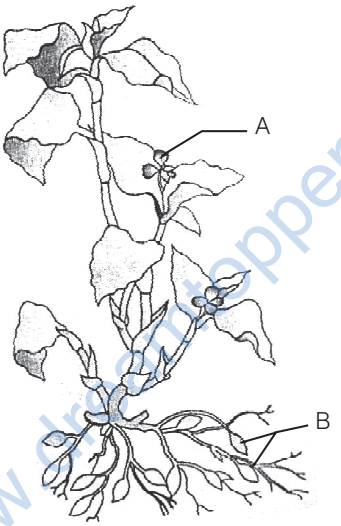
Q. 8 Is there a relationship between the size of an organism and its life span? Give two examples in support of your answer.

Ans. There is no relationship between the size and life span of an organism. *e.g.,*

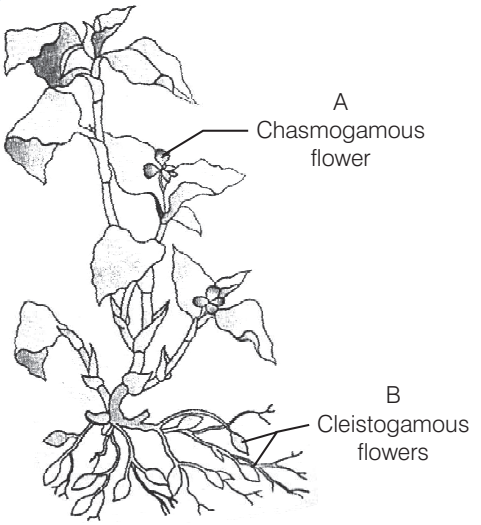
(i) The mango tree has a shorter life span as compared to a peepal tree though both are of the same size.

(ii) The size of crow and parrot is almost same but the life span is 15 years and 150 years respectively.

Q. 9 In the figure given below the plant bears two different types of flowers marked 'A' and 'B'. Identify the types of flowers and state the type of pollination that will occur in them.



Ans. *In the figure given below the plant bears folllowing two types of flowers*



A—Chasmogamous flower (the flowers remain open, exposing anthers and stigmas).

B—Cleistogamous flowers (the flowers remain closed, so that anthers and stigmas are never exposed) following are the types of pollination that will occur in these flowers.

(i) Autogamy (within same flower)

(ii) Geitonogamy (different flowers of same plant)

(iii) Xenogamy (different plants)

It is a case of cleistogamy (a type of autogamy) in which some plants, like, *Commelina bengalensis* possess both chasmogamous and cleistogamous flowers.

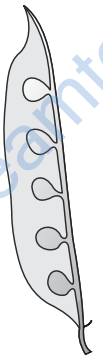
In chasmogamous flowers, the flowers may undergo self-pollination or cross-pollination, while in cleistogamous flowers, the flowers undergo only self-pollination.

Q. 10 Give reasons as to why cell division cannot be a type of reproduction in multicellular organisms.

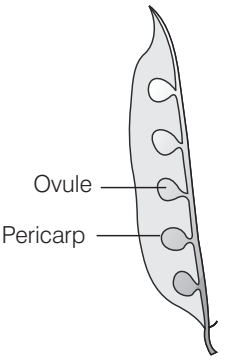
Ans. In unicellular animals, cell division is the means of reproduction to increase their number while, in case of multicellular organisms, they have well developed reproductive organs which help in reproduction.

Their whole body does not participate in reproduction like unicellular organisms.

Q. 11 In the figure given below, mark the ovule and pericarp.



Ans. In flowering plants, the zygote is formed inside the ovule. After fertilisation the sepals, petals and stamens of the flower wither and fall off. The pistil however, remains attached to the plant.



The zygote develops into the embryo and the ovules develop into the seed. The ovary develops into the fruit which develops a thick wall called pericarp that is protective in function.

Q. 12 Why do gametes produced in large numbers in organisms exhibit external fertilisation?

Thinking Process

In most aquatic organisms, such as a majority of algae and fishes as well as amphibians, syngamy (fusion of gametes in sexual reproduction) occurs in the external medium (water) , i.e., outside the body of the organism. This type of genetic fusion is called ***external fertilisation.***

Ans. *Organisms that take part in such process produce large number of gametes because*

(i) In external fertilisation, there is a great chance that the sperm and the eggs released by the organisms can be affected by factors present in the environment like dessication, predators, etc. So, to make up for the high fatality rate of the gametes, the organism produces a lot of gametes.

(ii) Producing large number of gametes increase the chance for at least some eggs and sperms to meet in the environment ensuring that atleast a stable number of offspring are able to survive and carry on.

Q. 13 Which of the following are monoecious and dioecious organisms?

(a) Earthworm ..... (b) *Chara* .....

(c) *Marchantia* ..... (d) Cockroach .....

Ans. (a) Earthworm- Monoecious animal (b) *Chara*- Monoecious plant

(c) *Marchantia*-Dioecious plant (d) Cockroach- Dioecious animal

Note *In several fungi and plants, terms such as* ***homothallic*** *and* ***monoecious*** *are used to denote the* ***bisexual condition*** *(male and female reproductive structures in the same plant) and* ***heterothallic and dioecious*** *are the terms used to describe* ***unisexual condition*** *(male and female reproductive structures on different plants).*

But in animals, individuals are either male or female (unisexual) or possess both the reproductive organs (bisexual).

Q. 14 Match the organisms given in column I with the vegetative propagules given in column II.

	Column I		Column II
A.	*Bryophyllum*	1.	Offset
B.	*Agave*	2.	Eyes
C.	Potato	3.	Leaf buds
D.	Water hyacinth	4.	Bulbils

Ans. *The correct matching is as follows*

	Column I (Plant Angiosperms)	Column II (Vegetative Propagules)
A.	*Bryophyllum*	Leaf buds
B.	*Agave*	Bulbils
C.	Potato	Eyes
D.	Water hyacinth	Offset

In plants, the units of vegetative propagation such as runner, rhizome, sucker, tuber, offset, bulb are all capable of giving rise to new offsprings. These structures are called vegetative propagules.

Q. 15 What do the following parts of a flower develop into after fertilisation?

(a) Ovary ..... (b) Ovules .....

Ans. (a) Ovary ..... fruit (b) Ovules ..... seed

After fertilisation, the zygote develops into the embryo and the **ovules** develop into the **seed**. The **ovary** develops into the **fruit** which develops a thick, protective wall called **pericarp**.

Short Answer Type Questions

Q. 1 In haploid organisms that undergo sexual reproduction, name the stage in the life cycle when meiosis occurs. Give reasons for your answer.

Thinking Process

The requirement of meiosis is to reduce the number of chromosomes to half to maintain the ploidy. As the organism is haploid meiosis cannot occur during gametogenesis.

Ans. Meiosis can take place only in a diploid stage (post-zygotic stage) because the zygote is the only diploid cell in the life cycle of such organisms. This meiosis an case of haploid organisms will occur of the fertilisation.

Q. 2 The number of taxa exhibiting asexual reproduction is drastically reduced in higher plants (angiosperms) and higher animals (vertebrates) as compared with lower groups of plants and animals. Analyse the possible reasons for this situation.

Ans. Higher plants (angiosperms) and higher animals (vertebrates) have a more complex structural organisation as compared to the lower groups of plants and animals. They have evolved very efficient mechanism of sexual reproduction. *These groups have resorted to reproduction by the sexual method for the following reasons*

(i) To ensure healthy progeny

(ii) To produce genetically varied offsprings that adapt to changes in environment and surviveal in all climatic conditions.

(iii) It ensures the genetic recombination that results in variation which gives rise to evolution.

Q. 3 Honeybees produce their young ones only by sexual reproduction. Inspite of this, in a colony of bees we find both haploid and diploid individuals. Name the haploid and diploid individuals in the colony and analyse the reasons behind their formation.

Ans. (i) Sterile diploid females as workers

(ii) One fertile diploid female as queen

(iii) Fertile haploid males as drones.

In case of honeybees, both haploid and diploid individuals formad as a result of incomplete (cyclic) parthenogenesis, *i.e.,* both sexual reproduction and parthenogenesis. Fertilised eggs (zygote) give rise to queen and workers (both are females) by the process of sexual reproduction and unfertilised eggs (ova) develop into drones (males) by the process of parthenogenesis.

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

Ans. Reduction division (meiosis) is associated with sexual reproduction. *The reasons are*

(i) Since, sexual reproduction involves the fusion of two types of gametes male and female), they must have haploid number of chromosomes.

(ii) The cell (meiocyte) which gives rise to gametes often has diploid number of chromosomes and it is only by reducing the number by half that we can get haploid gametes.

(iii) Reduction division also ensures maintenance of constancy of chromosome number from generation to generation.

Q. 5 Is it possible to consider vegetative propagation observed in certain plants like *Bryophyllum,* water hyacinth, ginger, etc., as a type of asexual reproduction? Give two/three reasons.

Ans. The formation of new plants from vegetative units (vegetative propagules) such as buds, tubers, rhizomes. etc., is called vegetative propagation (vegetative reproduction). It can be considered as a type of asexual reproduction as it involves the production of new individuals.

(i) by a single parent

(ii) without the formation and fusion of gametes

(iii) without resulting in any genetic or morphological variations.

Q. 6 'Fertilisation is not an obligatory event for fruit production in certain plants'. Explain the statement.

Ans. Fertilisation is not an obligatory event for fruit production in certain plants. Some fruits are developed from unfertilised ovary called parthenocarpic fruits.

These are seedless fruits, such as pomegranate, grapes, etc. Flowers of these plants are sprayed by a growth hormone that induces fruit development even though fertilisation has not occurred. The ovules of such fruits, however, fail to develop into seeds.

Q. 7 In a developing embryo, analyse the consequences if cell divisions are not followed by cell differentiation.

Thinking Process

The process of development of embryo from the zygote is referred as embryogenesis. During embryogenesis, zygote undergoes cell division (mitosis) and cell differentiation.

Ans. Cell divisions increase the number of cells in the developing embryo, while cell differentiation helps group of cells to undergo certain modifications to form specialised tissues and organs to form an organism.

At many stages of embryogenesis, if cell differentiation does not occur, the embryo cannot develop into a new organism. It will only remain as a mass of cells.

Q. 8 List the changes observed in an angiosperm flower subsequent to pollination and fertilisation.

Thinking Process

The changes that are subsequent to pollination and fertilisation can be categorised under post-fertilisation changes (events).

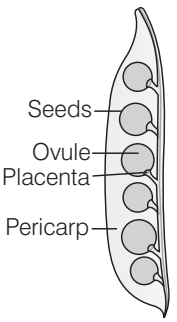
Ans. *In an angiosperm flower, the post-fertilisation changes occur as follows*

Sepal	Fall off
Petal	Fall off
Stamen	Fall off
Zygote	Embryo
Primary endosperm nucleus	Endosperm (3n)
Synergid	Disintegrate
Antipodals	Disintegrate
Ovary	Fruit
Ovule	Seed
Ovary wall	Pericarp (epicarp+mesocarp + endocarp)
Integument	Seed coat (testa+tegmen)
Funicle of the ovule	Stalk of the seed
Micropyle	Seed pore

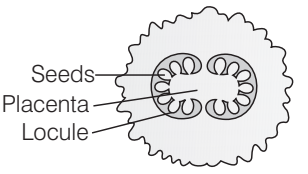
Q. 9 Suggest a possible explanation why the seeds in a pea pod are arranged in a row, whereas those in tomato are scattered in the juicy pulp.

Ans. In pea, fruit is legume. The pea pod is developed from monocarpellary, unilocular and half superior ovary. At maturity, the fruit splits along the dorsal and ventral sutures and discharge its seeds.

In gynoecium with single carpel, ovules are always attached to the ventral suture. This results in the fruit with marginal placentation. Thus, the seeds are arranged in a row in legume (pea) pod.



Marginal placentation in pea



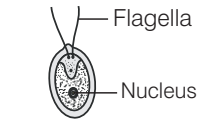
Axial placentation in tomato

In tomato, the fruit is berry. It is fleshy fruit develop from superior or inferior ovary. In this, the margins of the carpels grow inward to the centre of the ovary dividing the central chamber into compartments called locules.

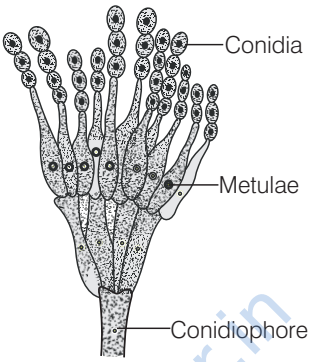
So that, the ovules are arranged radially on the axis, attached by placenta that is called axial placentation. That's the reason the seeds are embedded in the juicy pulp.

Q. 10 Draw the sketches of a zoospore and a conidium. Mention two dissimilarities between them and atleast one feature common to both structures.

Ans. The feature common to zoospores and conidia is that both of these are the asexual reproductive structures, which facilitate the process of reproduction in asexually reproducing organisms.



(a) **Zoospore of *Chlamydomonas***



(b) **Conidium of *Penicillium***

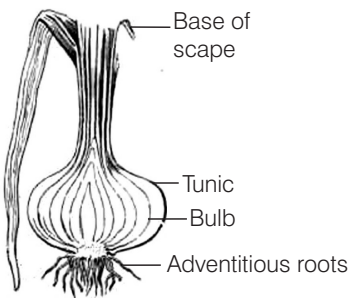
The two dissimilarities between these (zoospore and conidium) are as follows

Zoospore (Found usually in Algae)	**Conidium** (Found usually in Fungi)
Flagellated	Non-flagellated
Formed inside a sporangium (endogenously)	Formed at the tip of conidiophores (exogenously)

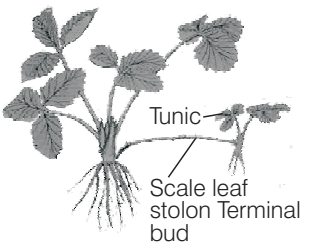
Q. 11 Justify the statement 'vegetative reproduction is also a type of asexual reproduction'.

Ans. In flowering plants, the units of vegetative reproduction such as runners, stolons, suckers, offsets, rhizome, corm, tuber, etc., are capable of giving rise to new offsprings. These structures are called vegetative propagules.

In all these plants the formation of these structures does not involve two parents, the process involved is asexual. So, it can be said that vegetative reproduction is also a type of asexual reproduction.



Bulb of onion



Stolen of strawberry

Long Answer Type Questions

Q. 1 Enumerate the differences between asexual and sexual reproduction. Describe the types of asexual reproduction exhibited by unicellular organisms.

Ans. *The differences between asexual and sexual reproduction are mentioned below*

Asexual Reproduction	Sexual Reproduction
Uniparental	Biparental
Somatic cells are involved.	Germ cells are involved.
It involves the production of asexual spores	It involves the formation and fusion of gametes.
Offsprings are genetically similar to parents.	Offsprings are genetically dissimilar to parents.
The rate of reproduction is faster.	The rate of reproduction is slower.

Asexual reproduction occurs usually in unicellular organisms, such as monerans and protists and in plants and certain animals.

It takes place in the following ways

(i) **Binary Fission** In this type of asexual reproduction, the parent organism divides into two halves, each half forming an independent daughter organism.

e.g., Amoeba, Euglena, Paramecium.

(ii) **Budding** In this type of asexual reproduction, a daughter individual is formed from a small projection, the bud, arising from the parent body.

*e.g.,*yeast, *Hydra*.

(iii) **Fragmentation** In this type of asexual reproduction, the parent body breaks into two or more fragment. Each body fragment develops into an organism.

e.g., sponges, *Selaginella*.

(iv) **Gemmule** In this type of asexual reproduction, internal buds, called gemmules are involved. Gemmules are asexually reproduced mass of cells, that is capable of developing into a new organism.

e.g., sponges.

(v) **Sporulation** In this type of asexual reproduction, dispersive structures called spores are released from the parent body that germinate under favourable conditions form new individuals.

(a) Motile spores are called **zoospores** and are found in aquatic animals. *e.g., Albugo, Chlamydomonas.*

(b) Non-motile spores are named as **sporangiospores** (*e.g., Rhizopus, Mucor*) and **conidia** *e.g., Penicillium*.

Q. 2 Do all the gametes formed from a parent organism have the same genetic composition (identical DNA copies of the parental genome)? Analyse the situation with the background of gametogenesis and provide or give suitable explanation.

Ans. *No*, all the gametes formed from a parent organism do not have the same genetic composition.

It can be better understand with the help of the explanation given below

Sexual reproduction in organisms generally involves the fusion of gametes from two different individuals. These gametes form by the process of gametogenesis. In the heterogametic species, gametes are of two types namely male and female. Gametes are haploid though the parent body from which they arise may be either haploid or diploid.

(a) A haploid parent like Monera, fungi, algae and bryophytes produce gametes by mitotic division. The number of chromosomes, *i.e.,* the genetic composition remain same after such type of division.

(b) The diploid parent like pteridophytes, gymnosperms, angiosperms and most of the animals including human beings produces gametes by meiosis. In such organisms (diploid), specialised cells called meiocytes (gamete mother cell) undergo meiosis.

At the end of meiosis only one set of chromosomes gets incorporated into each gamete. It means the gametes formed contain a haploid number of chromosomes in contrast to the number of chromosomes in mother cells.

Q. 3 Although sexual reproduction is a long drawn, energy-intensive complex form of reproduction, many groups of organisms in kingdom–Animalia and Plantae prefer this mode of reproduction. Give atleast three reasons for this.

Ans. *Follwing are the three reasons for the mode of sexual reproduction in higher group of organisms*

(i) The sexual mode of reproduction ensures creation of new variants.

(ii) Genetically varied offsprings are produced that adapt to changes in environment and survive in all climatic conditions.

(iii) Sexual reproduction ensures the genetic recombination that results in variation which gives rise to evolution.

Q. 4 Differentiate between (a) oestrus and menstrual cycles; (b) ovipary and vivipary. Give an example for each type.

Ans. *The differences between oestrus and menstrual cycle are as follows*

(a)

Oestrus cycle	Menstrual cycle
✦ The cyclic changes in the activities of ovaries and accessory ducts as well as hormones during the reproductive phase of non-primate mammals is called oestrus cycle.	✦ The cyclic changes in the activities of ovaries and accessory ducts as well as hormones during the reproductive phase of primate mammals is called menstrual cycle.
✦ Females show strong irresistible sexual urge.	✦ Females do not show irresistible sexual urge.
✦ There is estrus/heat production at the time of ovulation and copulation occurs only at that period.	✦ There is no heat period and copulation occurs during any time of the cycle.
✦ The shedding of endometrium and bleeding do not occur. *e.g.,* cows, sheep, rats, deers, dogs and tigers etc.	✦ The shedding of endometrium and bleeding occurs. *e.g.*, monkeys, apes and humans.

(b) *The differences between ovipary and vivipary are as follows*

Ovipary	Vivipary
✦ In ovipary, animals lay eggs.	✦ In vivipary, animals give birth to young ones.
✦ The eggs are covered by hard calcareous shell.	✦ Ovum are not covered by calcareous shell.
✦ The development of zygote takes place outside the female's body.	✦ The development of zygote takes place inside the female's body.
✦ Females lay eggs in a safe place in the environment, but the chances of survival are less *e.g.,* all birds, most of reptiles are egg laying mammals.	✦ Females deliver young ones and the chances of survival are more. *e.g.,* mammals except monotremes egg laying mammals.

Q. 5 Rose plants produce large, attractive bisexual flowers, but they seldom produce fruits. On the other hand a tomato plant produces plenty of fruits though they have small flowers. Analyse the reasons for failure of fruit formation in rose.

Thinking Process

Both these plants rose and tomato are selected by human beings for different characteristics, the rose for its flower and tomato for its fruit. Roses, being vegetatively propagated do not need to produce seeds.

Ans. Rose plants produce large, attractive bisexual flowers, but they seldom produce fruits. *The reasons for failure of fruit formation in rose are as follows*

(i) Rose plants may not produce viable pollens, hence, no fertilisation can take place.

(ii) Rose plants may not have functional eggs.

(iii) Rose plants may have defective and non-functional ovule ,which is the female gametophyte generator.

(iv) There may be self-incompatibility.

(v) There may be internal barriers for pollen tube growth or fertilisation.

(vi) As rose plants are hybrids and reproduce vegetatively, there are chances for them to be sterile.