CHAPTER > 01

Reproduction in Organisms

NEET KEY NOTES

- The period from birth to the natural death of an organism represents its **lifespan**. Whatever be the lifespan, death of every individual organism is a certainty, i.e. no individual is immortal, except single-celled organisms.
- **Reproduction** is a vital biological process by which living organisms produce new individuals of their own species. It enables continuity of species. Reproduction is of two types **asexual** and **sexual**.

Asexual Reproduction

- It involves the participation of a single parent to produce an offspring. As a result, the offspring produced are morphologically and genetically similar to one another and also to their parents and can be referred to as **clones**.
- The unit of reproduction is commonly formed from the somatic cells of the parent. Meiosis does not occur in asexual reproduction.
- Asexual reproduction is common among single-celled organisms and in plants and animals with relatively simpler body organisation.
- **Cell division** itself is a mode of reproduction in protists, e.g. *Amoeba* and monerans. In bacteria, the parent cell divides into two to give rise to new individuals.
- It may take place by following methods

Asexual Reproduction

- **Fission**
  - **Binary** Parent body divides into two daughter individuals, e.g. *Amoeba.*
  - **Multiple** Parent body divides into many daughter individuals, e.g. *Plasmodium.*
- **Budding**
  - **External** An outgrowth (bud) formed on the parent body constricts and separates to form a new organism, e.g. *Hydra,* yeast.
  - **Internal** Small, gemmules (internal buds) form new individuals, e.g. *Spongilla* (sponge).
- **Spore formation**
  - Spores are propagules which germinate to produce new individuals, e.g. fungi.
- **Fragmentation**
  - Breaking of parent body into fragments and each fragment develops into a new organism, e.g. *Spirogyra.*
- **Regeneration**
  - Formation of the whole body of an organism from a small fragment or by replacement of the lost body part, e.g. sponge and *Planaria.*

- During unfavourable conditions, the products of multiple fission become individually surrounded by resistant coats, i.e. **cyst** (encystation) and gets released, once favourable condition arises sporulation occurs. It is seen in *Amoeba.*

- In Monera, Protista, Fungi and Algae, spores formed can be of following main types
  - Pseudopodiospore (with fine pseudopodia) – *Amoeba*
  - Zoospores (motile and flagellated) – *Chlamydomonas* and *Ulothrix*
  - Conidia (non-motile) – *Penicillium*
  - Sporangiospores (non-motile) – *Rhizopus*
- While in animals and other simple organisms, the term **asexual** is used unambiguously, in plants, the term **vegetative reproduction** is frequently used.
- In plants, units of vegetative propagation such as runner, rhizome, sucker, tuber, offset, bulb, etc., have capability to give rise to new offspring. These structures are known as **vegetative propagules**.

Types of Vegetative Propagation in Plants and their Description

Types of Vegetative Propagation in Plants	Description
1. Natural Vegetative Propagation	
Root (Root tubers)	Buds on the roots grow into leafy shoots above the ground and adventitious roots at the bases, e.g. sweet potato, guava, etc.
Stem	**Underground** Modified stems possess buds which grow into new plants. Few types are • Suckers, e.g. mint, *Chrysanthemum* • Rhizomes, e.g. ginger, turmeric • Bulbs, e.g. onion, garlic • Tubers, e.g. potato • Corms, e.g. *Colocasia, Gladiolus*. **Creeping** Few types include • Runners, e.g. *Oxalis*, water hyacinth • Offsets, e.g. *Pistia*. **Aerial** modified stems develop new plants when stem segments fall on the ground, e.g. cacti, *Opuntia*.
Leaves	Adventitious buds develop on leaves, detach and form new plants, e.g. *Bryophyllum*.
2. Artificial Vegetative Propagation	
Cutting	A small piece of any plant organ is used for propagation, e.g. leaves (*Bryophyllum*), roots (tamarind), stems (sugarcane), etc.
Layering	Roots are artificially induced on stem branches before these detach from the parent plant, e.g. jasmine, litchi, etc.
Grafting	Two plant parts, root system (stock) and shoot system (scion) from two different plants are joined to form a new plant, e.g. rose, apple, etc.
Micropropagation	Involves culturing of cells, tissues or organs to form callus which later differentiates to form a large number of plantlets.

- **Water hyacinth** (scourage of the water bodies or Terror of Bengal) propagates very quickly by vegetative mode and drains out dissolved O_2 from water bodies.

Sexual Reproduction

- In sexual reproduction, there is formation of male and female gametes either by same individual or by different individuals of opposite sex. These gametes fuse to form a new cell called **zygote**, e.g. occurs in all flowering plants, humans, etc.
- The period of growth from birth up to the reproductive maturity in an organism is called as **juvenile phase**. In plants, this period of growth starting from seed germination up to initiation of flowering is called **vegetative phase**.
- The later phase, when the organisms start reproducing sexually, is called **reproductive phase**. The end of reproductive phase is marked by the onset of another phase called **senescent phase** which is the last phase in life cycle after which the organism dies.
- A few plants exhibit unusual flowering phenomenon; some of them such as bamboo species flower only once in their lifetime, generally after 50-100 years, produce large number of fruits and die. Another plant, *Strobilanthes kunthiana* (Neelakurinji), flowers once in 12 years.
- In non-primate mammals like cows, sheep, rats, deers, dogs, tigers, etc., the cyclical changes during reproduction are called **oestrous cycle** whereas in primates (monkeys, apes and humans) it is called as **menstrual cycle**.
- Many mammals exhibit such cycles only during favourable seasons in their reproductive phase and are called **seasonal breeders**. While those are reproductively active throughout their reproductive phase are called **continuous breeders**.

Events in Sexual Reproduction

The events of sexual reproduction may be grouped into three distinct stages namely, the **pre-fertilisation, fertilisation** and the **post-fertilisation events**.

1. Pre-fertilisation Events

- These are the events of sexual reproduction which take place before the fusion of gametes. These include gametogenesis and gamete transfer.

Gametogenesis

- The process of formation of gametes is known as gametogenesis.
- The reproductive units in sexual reproduction are specialised cells called **gametes**.
- Depending upon the morphological similarity, **gametes** can be classified into **homogametes** or **isogametes** (in *Cladophora*) and **heterogametes** (in human). The gametes are generally of two kinds, i.e. male (antherozoid or sperm) and female (egg or ovum).

- **Sexuality in organisms** On the basis of location of reproductive structure, sexuality in organisms can be classified as follows
  - **Homothallic and monoecious** Both male and female reproductive structures are present on same individual (bisexual condition), e.g. in several fungi like *Mucor* and plants like maize, cucurbits and coconuts.
  - **Heterothallic and dioecious** Male and female reproductive structures are present on separate individuals (unisexual condition), e.g. papaya and date palm. In flowering plants, the unisexual male flower is **staminate**, while female is **pistillate**.
  - **Bisexual animals** have both male and female reproductive organs in single individual, e.g. earthworm, sponge, leech, tapeworm, etc. These are also called as **hermaphrodites**.
  - **Unisexual animals** have male and female reproductive organs in different individuals, e.g. cockroach, human, dog, etc.
- **Cell division during gamete formation** Gametes are always haploid, but they divide either by mitotic or meiotic division. The organisms belonging to Monera, Fungi, Algae and Bryophyta have **haploid** plant body. These organisms produce gametes by **mitotic division**.
- In pteridophytes, gymnosperms, angiosperms and most of the animals including humans, the parental body is **diploid**. In these organisms, specialised cells called **meiocytes** or gamete mother cells undergo meiosis that results in the formation of haploid gametes.

Gamete Transfer

- It occurs in various ways in different organisms.
  - In most organisms, male gamete is motile and female gamete is non-motile.
  - Both gametes are motile in few fungi and algae.
  - In algae, bryophytes and pteridophytes, gamete transfer takes place through water by producing many male gametes to ensure fertilisation because during gamete transfer, large number of male gametes are lost. In bryophytes and pteridophytes, male gametes are known as **antherozoid**.
  - In self-fertilising or bisexual plants, e.g. peas, gamete transfer is easy as the anthers and stigma are closely located. In cross-fertilising plants, gamete transfer occurs by **pollination**. It is the process of transfer of pollen grains from anther to stigma, e.g. dioecious plants.

2. Fertilisation

- It is the complete and permanent fusion of two gametes from different parents or from the same parent to form a diploid zygote. This process is also called as **syngamy**.
- When the female gamete undergoes development to form new organisms without fertilisation, the process is called as **parthenogenesis**, e.g. rotifers, honeybees, some lizards and birds (turkey).
- Depending upon, where does the syngamy occur, fertilisation may be of two types
  - **External fertilisation** It is the fusion of gametes that take place outside the body of an organism in external medium such as water, e.g. in bony fishes, frogs, etc. A large number of gametes are released in the surrounding medium by such animals.
  - **Internal fertilisation** It is the fusion of gametes that take place inside the body, e.g. in fungi, higher animals such as birds, mammals and majority of plants. The number of ova produced is less, but a large number of male gametes are formed, as many of them fail to reach the ova.

3. Post-fertilisation Events

After the fusion of male and female gametes, following processes occur

Zygote

- It is the beginning of new life. It is always diploid and ensures the continuity of race from generation to generation.
- Organism such as fungi, develops a thick wall around it that is resistant to external damaging factors.
- Zygote divides by meiosis to form haploid spores that grow into haploid individuals in case of organisms which lead haplontic life cycle, e.g. *Volvox, Spirogyra*, etc.
- In organisms with diplontic life cycle, zygote undergoes mitotic division and develops into an embryo, e.g. all flowering plants.

Embryogenesis

- It is the process of development of **embryo** from zygote.
- The events which occur in animals during embryogenesis are
  - **Mitosis** (cell division or cleavage) occurs leading to the growth of embryo.
  - Cells of embryo undergo **differentiation** and attain specific shape, size and function.
  - Cell differentiation leads to the production of different tissues, organs and organ systems.
- Depending on the development of embryo the animals can be
  (i) **Oviparous animals**, e.g. reptiles and birds. Here, embryo develops outside the body of female (eggs). In these animals, the fertilised eggs are covered by hard calcareous shell.

(ii) **Viviparous animals**, e.g. majority of mammals including humans. Here, embryo develops inside the body of female.

(iii) **Ovoviviparous animals**, e.g. sharks and rattle snakes. Here, the female retains the eggs inside its body after fertilisation and allows the development of the embryo inside the body without providing extra nourishment to the developing embryo as the placenta is absent.

- The post-fertilisation events that occur in flowering plants are
  - **Sepals, petals** and **stamens** wither and shed off.
  - **Pistil** remains attached to the plant.
  - **Zygote** develops into embryo and the **ovules** develop into seed.
  - **Ovary** develops into the fruit.
  - **Pericarp** is produced as the wall of ovary. **Seeds** disperse by different agents and germinate into new plants after getting suitable conditions.

Mastering NCERT

MULTIPLE CHOICE QUESTIONS

TOPIC 1 ~ *Lifespan and Asexual Reproduction*

1 Lifespan of tortoise is
(a) 100-150 years
(b) 250 years
(c) 20 years
(d) 1 year

2 Single-celled animals are said to be immortal because
(a) they grow indefinitely in size
(b) they can tolerate any degree of change in temperature
(c) they can reproduce throughout their lifespan
(d) they continue to live as their daughter cells

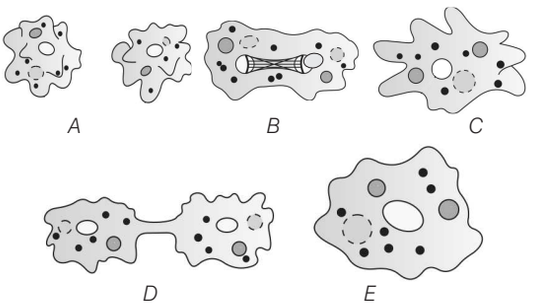
3 Arrange the organisms shown below in the increasing order of their lifespans.

Parrot Crocodile Crow

(a) Parrot < Crow < Crocodile
(b) Crow < Crocodile < Parrot
(c) Crocodile < Parrot < Crow
(d) Parrot < Crocodile < Crow

4 Reproduction can be considered as
(a) a biological process
(b) a cycle of birth, growth and death
(c) a process that enables continuity of species
(d) All of the above

5 Study the given figures and processes representing the binary fission in *Amoeba*.



A. Daughter cells formation
B. Enlargement of nucleus
C. Parent cell
D. Constricted cell formation
E. Minimisation of pseudopodia

Arrange the figures and processes in the correct sequence and select the correct answer.
(a) $D \rightarrow C \rightarrow A \rightarrow B \rightarrow E$
(b) $C \rightarrow D \rightarrow A \rightarrow B \rightarrow E$
(c) $C \rightarrow E \rightarrow B \rightarrow D \rightarrow A$
(d) $D \rightarrow C \rightarrow B \rightarrow E \rightarrow A$

6 Asexual reproduction is a method of reproduction in which participation of …… takes place.
(a) one individual
(b) two individuals (same species)
(c) multi-individuals
(d) two individuals (different species)

7 Clones are
(a) morphologically similar individuals
(b) genetically similar individuals
(c) Both (a) and (b)
(d) None of the above

8 ..... is the fastest method to obtain clones.
(a) Induced mutation
(b) Parasexual hybridisation
(c) Vegetative reproduction
(d) Parthenogenesis

9 Asexual reproduction is common in
(a) single-celled organisms
(b) plants with relatively simple organisation
(c) animals with relatively simple organisation
(d) All of the above

10 Cell division is the mode of reproduction in
(a) monerans
(b) protists
(c) Both (a) and (b)
(d) None of the above

11 Reproduction in *Amoeba* is carried out through
(a) gemmule formation (b) binary fission
(c) budding (d) plasmotomy

12 In *Amoeba*, under unfavourable conditions, …*A*… takes place but under favourable conditions …*B*… occurs.

Identify *A* and *B*.

	A	B
(a)	Sporulation	Encystation
(b)	Encystation	Sporulation
(c)	Binary fission	Encystation
(d)	Multiple fission	Encystation

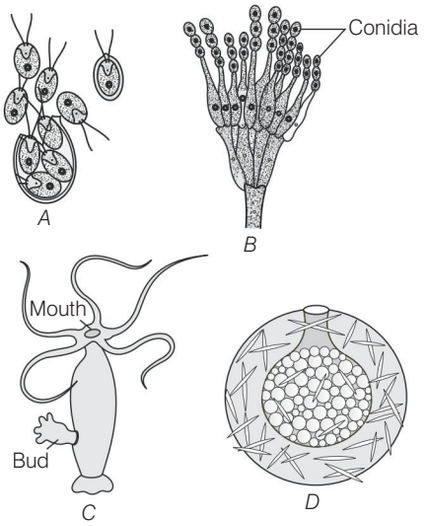
13 Zoospores are
(a) motile gametes of *Chlamydomonas*
(b) non-motile gametes of sponges
(c) motile gametes of *Hydra*
(d) non-motile gametes of *Penicillium*

14 Asexual reproductive structures found in *Penicillium* are
(a) conidia (b) buds
(c) gemmules (d) zoospore

15 Gemmule formation is a common mode of reproduction in
(a) *Hydra* (b) sponge
(c) *Penicillium* (d) *Amoeba*

16 *Hydra* reproduces by
(a) Budding (b) Fragmentation
(c) Gemmule formation (d) Both (a) and (b)

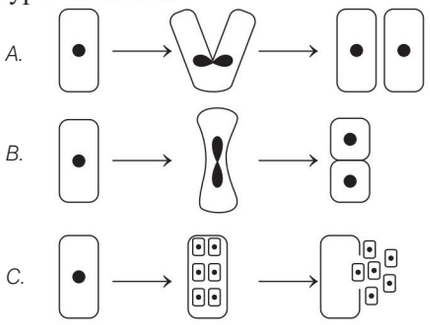
17 Study the following diagram and the information given below.



A. Zoospore of *Chlamydomonas.*
B. Conidia of *Penicillium*.
C. Buds in *Hydra*.
D. Gemmules in sponge.

All the above are
(a) bodies involved in sexual reproduction
(b) bodies involved in asexual reproduction
(c) bodies of young ones
(d) All the above are correct

18 Refer the given figures which show three different types of fission.



A. Longitudinal fission
B. Transverse fission
C. Multiple fission

Select the option which correctly matches them with the organism in which they occur.

	A	B	C
(a)	*Euglena*	*Plasmodium*	*Amoeba*
(b)	*Plasmodium*	*Paramecium*	*Euglena*
(c)	*Euglena*	*Paramecium*	*Escherichia*
(d)	*Euglena*	*Paramecium*	*Amoeba*

19 Which one of the following pairs is not correctly match? ***CBSE-AIPMT 2015***

	Modes of reproduction	Examples
(a)	Offset	Water hyacinth
(b)	Rhizome	Banana
(c)	Binary fission	*Sargassum*
(d)	Conidia	*Penicillium*

20 Offsets are produced by ***NEET 2018***

(a) parthenocarpy (b) mitotic divisions
(c) meiotic divisions (d) parthenogenesis

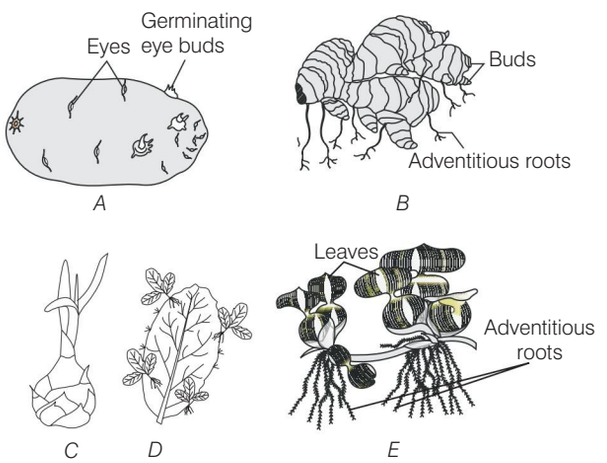
21 Refer to the given figures and identify *X* and *Y* in these.

(a) X–Buds, Y–Nodes
(b) X–Nodes, Y–Adventitious buds
(c) X–Nodes, Y–Adventitious roots
(d) X–Eyes, Y–Nodes

22 Which one of the following is correctly matched? ***CBSE-AIPMT 2012***

(a) Onion – Bulb
(b) Ginger – Sucker
(c) *Chlamydomonas* – Conidia
(d) Yeast – Zoospores

23 Choose the option with correct identification of *A, B, C, D* and *E* given below.



	A	B	C	D	E
(a)	Tuber	Rhizome	Eyes	Leaf bud	Offset
(b)	Offset	Eyes	Leaf bud	Stolon	Sucker
(c)	Offset	Leaf buds	Eyes	Stolon	Sucker
(d)	Tuber	Rhizome	Bulbil	Leaf buds	Offset

24 Which of the following is not a vegetative propagule?

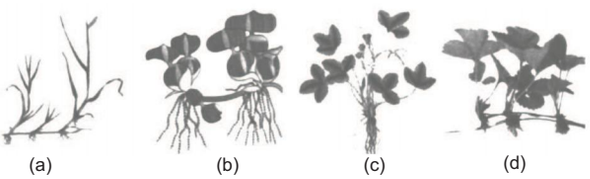
(a) Offset (b) Antherozoid
(c) Rhizome (d) Bulbil

25 If a leaf cell of *Agave* have X chromosome, then what will be the number of chromosomes in a cell of its bulbil?

(a) 2X (b) X (c) X/4 (d) X/2

26 Identify the plant which contains the features given below.

I. The plant was introduced in India because of its beautiful flowers and shape of leaves.
II. It can propagate vegetatively at a phenomenal rate and spread all over water body in a short period.
III. It is very difficult to get rid of these plants.



27 The site of origin of the new plantlets in potato, *Dahlia*, ginger and banana is

(a) floral buds present on stem
(b) internodes of modified stem
(c) nodes of modified stem
(d) adventitious buds present on root

28 Which one of the following options shows two plants in which new plantlets arise from the same organ?

(a) Guava and ginger
(b) Potato and sweet potato
(c) *Dahlia* and mint
(d) Potato and sugarcane

29 Some organisms are capable of asexual or sexual reproduction. Under favourable conditions, reproduction proceeds asexually. When conditions become more stressful reproduction switches to a sexual mode. Why?

(a) Sexual reproduction is simple and more rapid allowing larger numbers of offspring to be produced
(b) Sexual reproduction requires two separate individuals, who can mutually provide nutrient support during stress
(c) Sexual reproduction produces individuals with new combinations of recombined chromosomes increasing diversity
(d) Asexual reproduction requires more energy

30 A scion is grafted to a stock. The quality of fruits produced will be determined by the genotype of ***AIIMS 2018***

(a) stock (b) scion
(c) Both (a) and (b) (d) Neither (a) nor (b)

TOPIC 2 ~ Sexual Reproduction

31 Which one of the following generates new genetic combinations leading to variation? ***NEET 2016, 13***
(a) Vegetative reproduction
(b) Parthenogenesis
(c) Sexual reproduction
(d) Nucellar polyembryony

32 Sexual reproduction involves formation of male and female gametes by
(a) same individual
(b) different individual of opposite sex
(c) Both (a) and (b)
(d) All of the above

33 The growth phase of an organism before attaining sexual maturity is referred to as
(a) juvenile phase (b) pre-reproductive phase
(c) Both (a) and (b) (d) None of these

34 Select the correct sequence from the following.
I. Juvenile phase → Senescent phase → Reproductive phase
II. Juvenile phase → Reproductive phase → Senescent phase
III. Reproductive phase → Juvenile phase → Senescent phase
IV. Pre-reproductive phase → Reproductive phase → Senescent phase
(a) I and II (b) I and IV
(c) III and IV (d) II and IV

35 Which one of the following flowers only once in its lifetime? ***NEET 2018***
(a) Mango (b) Jackfruit
(c) Bamboo species (d) Papaya

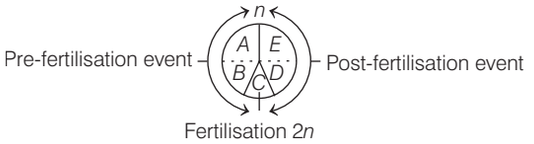
36 *Strobilanthes kunthiana* is also called
(a) Neelakurinji (b) Peela kuranji
(c) Hara kuranji (d) Kala kuranji

37 Oestrus cycle is cyclic change in the activities of ovaries and accessory duct in non-primates during
(a) reproductive (seasonal) period
(b) maturation period
(c) ageing period
(d) juvenile period

38 Organisms reproducing throughout the year are called …… breeders, e.g. … and those who show recurring sexual activity are called …… breeders, e.g. … .
(a) continuous, sparrow, seasonal, hen
(b) seasonal, lizard, continuous, hen
(c) continuous, man, seasonal, tiger
(d) seasonal, hen, continuous, tiger

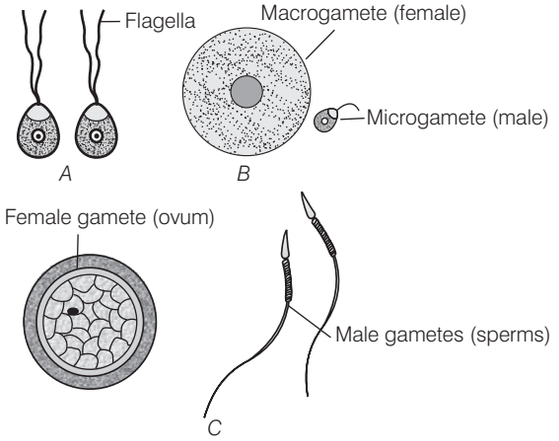
39 Select the correct sequence of events. ***NEET (Odisha) 2019***
(a) Gametogenesis → Gamete transfer → Syngamy → Zygote → Cell division (Cleavage) → Cell differentiation → Organogenesis
(b) Gametogenesis → Gamete transfer → Syngamy → Zygote → Cell divison (Cleavage) → Organogenesis→ Cell differentiation
(c) Gametogenesis → Syngamy → Gamete transfer → Zygote → Cell division (Cleavage) → Cell differentiation → Organogenesis
(d) Gametogenesis → Gamete transfer → Syngamy → Zygote → Cell differentiation → Cell division (Cleavage) → Organogenesis

40 Identify the events (*A, B, D* and *E*) of sexual reproduction given below.



Choose the correct option.
(a) A–Gamete transfer, B–Gametogeneis, D–Zygote formation, E–Embryogenesis
(b) A–Gametogeneis, B–Gamete transfer, D–Zygote formation, E–Embryogenesis
(c) A–Gametogeneis, B–Zygote formation, D–Gamete transfer, E–Embryogenesis
(d) A–Gametogeneis, B–Gamete transfer, D–Embryogenesis, E–Zygote formation

41 Identify the type of gametes shown in figure *A*, *B* and *C*, respectively.



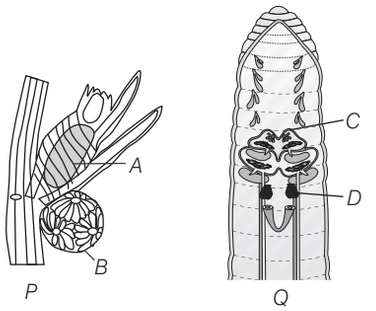
(a) A–Heterogametes, B–Isogametes, C–Homogametes
(b) A–Homogametes, B–Isogametes, C–Heterogametes
(c) A–Isogametes, B–Heterogametes, C–Heterogametes
(d) A–Heterogametes, B–Heterogametes, C–Isogametes

42 Name the type of gametes found in algae.
(a) Homogametes (b) Heterogametes
(c) Anisogametes (d) All of these

43 What is male gamete called in heterogametic condition?
(a) Antherozoid (b) Sperm
(c) Egg (d) Both (a) and (b)

44 The condition, in which, both male and female reproductive organs are found on the same plant, is called
(a) unisexual (b) bisexual
(c) monoecious (d) Both (b) and (c)

45 Figure *P* represents the reproductive organs of a plant, *Chara* and figure *Q* represents the reproductive organs of an animal, earthworm. Select the option which correctly identifies male reproductive organs of the two organisms.



(a) A and D (b) B and C (c) A and C (d) B and D

46 The condition in which male and female parts are present on different organisms, is called
(a) heterothallic (b) dioecious
(c) unisexual (d) All of these

47 In flowering plants, the unisexual male flower is called …*A*… while the female is called …*B*… . Flowering plants may be monoecious, e.g. …*C*… or dioecious, e.g. …*D*… .

Complete the paragraph by filling up the blanks.
(a) A–staminate, B–pistillate, C–date palm, D–coconut
(b) A–pistillate, B–staminate, C–date palm, D–papaya
(c) A–pistillate, B–staminate, C–*Cucurbita*, D–coconut
(d) A–staminate, B–pistillate, C–*Cucurbita*, D–papaya

48 Name the type of gametes formed in staminate and pistillate flower, respectively.
(a) Stamen, pollen (b) Antherozoid, egg
(c) Stamen, ovum (d) Ovum, antherozoid

49 Which of the following is hermaphrodite?
(a) Ant (b) Aphids (c) Earthworm (d) Cockroach

50 Which among the following is unisexual species?
(a) Tapeworm (b) Leech
(c) Cockroach (d) All of these

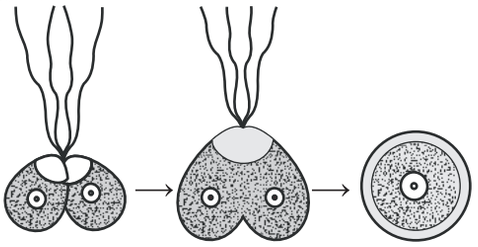
51 If the parent body is haploid then the gametes are
(a) haploid (b) diploid
(c) triploid (d) None of these

52 In diploid organism the gamete producing cells are called
(a) gamete mother cell (b) meiocytes
(c) Both (a) and (b) (d) None of these

53 Which of the following is an incorrect combination of organism with its correct chromosome number in meiocyte and in gamete?

	Name of organisms	Chromosomes number in meiocyte	Chromosomes number in gamete
(a)	Butterfly	380	190
(b)	Potato	16	08
(c)	Maize	20	10
(d)	Apple	34	17

54 Identify the sequence of events shown in the diagram below.



(a) Fission of gametes → New individual → Zygote
(b) Fusion of gametes → Zygote → New individual (cell 2*n*)
(c) Fission of gametes → Zygote → New individual (cell 2*n*)
(d) Stages in the gametogenesis

55 Self-fertilisation occurs in the
(a) bisexual flower (b) unisexual flower
(c) Both (a) and (b) (d) dioecious flower

56 In which of the following organisms self-fertilisation is seen?
(a) Peas (b) Mustard
(c) Sweet potato (d) All of these

57 Which of the following options is/are correct about pollination?
(a) Occurs in almost all flowering plants
(b) Facilitates pollen transfer to stigma
(c) Both (a) and (b)
(d) None of the above

58 Essential and most critical event in sexual reproduction is
(a) fertilisation
(b) division in male and female gametes
(c) Both (a) and (b)
(d) None of the above

59 Fusion of male and female gametes is called
(a) syngamy (b) fertilisation
(c) Both (a) and (b) (d) heterogamy

60 In some plants, the female gamete develops into embryo without fertilisation.
This phenomenon is known as ***NEET 2019***
(a) parthenocarpy (b) syngamy
(c) parthenogenesis (d) autogamy

61 Syngamy may occur in …… .
(a) external medium (b) internal medium
(c) Both (a) and (b) (d) None of these

62 'Organisms exhibiting external fertilisation release a large number of gametes'. Why?
(a) These organisms shows great synchrony between the sexes
(b) In order to enhance the chances of syngamy
(c) To produce large number of offsprings as they are vulnerable to predators
(d) All of the above

63 Internal fertilisation is the one in which syngamy
(a) occur outside the body
(b) occur inside the body
(c) is followed by meiosis
(d) None of the above

64 Diploid zygote is universal in
(a) All sexually reproducing organisms
(b) All asexually reproducing organisms
(c) All sexually and asexually reproducing organisms
(d) Only plants and animals

65 Life begins in all sexually reproducing organism from a
(a) single-celled zygote (b) double-celled zygote
(c) thick-walled zygote (d) All of these

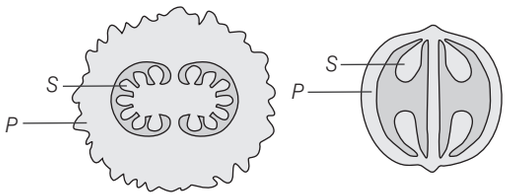
66 Embryogenesis involves
(a) formation of embryo from zygote
(b) cell division *via* meiosis and differentiation
(c) Both (a) and (b)
(d) None of the above

67 Choose the incorrect pair.
(a) Cell division in embryo – Increase the number of cells
(b) Cell differentiation – Form specialised tissues and organs
(c) Eggs covered by hard calcareous shell – Oviparous animals
(d) Zygote develops outside the body –Viviparous animals

68 Chances of survival of young ones are more in the case of..... individuals.
(a) oviparous (b) viviparous
(c) ovoviviparous (d) None of these

69 Offsprings of oviparous animals have less chances of survival as compared to those of viviparous animals because
(a) proper embryonic care and protection is absent
(b) embryo does not develop completely
(c) progenies are of smaller size
(d) genetic variations do not occur

70 What does '*P*' signifies in the diagram given below?



(a) Pistil (b) Thick pericarp
(c) Thin pericarp (d) Pollen tube

NEET

SPECIAL TYPES QUESTIONS

I. Assertion and Reason

■ **Direction** (Q. No. 71-80) *In each of the following questions, a statement of Assertion (A) is given followed by corresponding statement of Reason (R).*
Of the statements, mark the correct answer as
(a) If both A and R are true and R is correct explanation of A
(b) If both A and R are true, but R is not the correct explanation of A
(c) If A is true, but R is false
(d) If A is false, but R is true

71 **Assertion** (A) A plant can be retained and multiplied indefinitely without any change or variation through asexual reproduction.
Reason (R) Asexual reproduction does not involve meiosis and syngamy.

72 **Assertion** (A) Offspring formed by asexual reproduction are called clones.
Reason (R) Clones are morphologically similar.

73 **Assertion** (A) Reproduction by zoospores occur in some higher fungi.
Reason (R) Zoospores are motile and flagellated spores.

74 **Assertion** (A) Zygote is the link between two generations.
Reason (R) Zygote is the product of two gametes and the producer of the next generation.

75 **Assertion** (A) Vegetative reproduction is a kind of asexual reproduction in plants.

Reason (R) Vegetative propagules give rise to offspring.

76 **Assertion** (A) In perennial plant species, it is difficult to define vegetative, reproductive and senescent phases.

Reason (R) Perennial plants have very short lifespan.

77 **Assertion** (A) Gametes formed in sexual reproduction are haploid in nature.

Reason (R) Meiocytes undergo meiosis to form gametes.

78 **Assertion** (A) Papaya is a dioecious plant.

Reason (R) Dioecious plants are those that have their reproductive structures on same plants.

79 **Assertion** (A) In external fertilisation, syngamy occurs inside the female.

Reason (R) The offspring produced by external fertilisation are vulnerable to predators.

80 **Assertion** (A) In flowering plants, zygote is formed inside the ovule.

Reason (R) The ovule develop into seed after fertilisation.

II. Statement Based Questions

81 Which one of the following statement regarding post-fertilisation development in flowering plants is incorrect? ***NEET 2019***

(a) Zygote develops into embryo
(b) Central cell develops into endosperm
(c) Ovules develop into embryo sac
(d) Ovary develops into fruit

82 Choose the incorrect statement about gemmules. ***JIPMER 2019***

(a) They resist dessication
(b) They are internal buds
(c) They are asexual structure which are produce by binary fission
(d) They can give rise to new organisms

83 Which of the following statements is correct?

(a) All the individuals of a species have exactly the same lifespan
(b) Smaller organisms always have shorter lifespan and *vice-versa*
(c) Lifespan of an organism is the time period from its birth to its natural death
(d) No organism may have a lifespan of several hundred years

84 Which one of the following statements is incorrect? ***NEET 2016***

(a) Offspring produced by the asexual reproduction are called clone
(b) Microscopic motile asexual reproductive structures are called zoospores
(c) In potato, banana and ginger, the plantlets arise from the internodes present in the modified stem
(d) Water hyacinth, growing in the standing water, drains oxygen from water that leads to the death of fishes

85 Mark the incorrect statement.

(a) Perennial species shows clear cut vegetative, reproductive and senescent phases
(b) End of vegetative phase mark the beginning of reproductive phase
(c) Bamboo species flower only once in their lifetime
(d) The reproductive phase is of variable duration in different organisms

86 Choose the incorrect statement for events in sexual reproduction.

(a) All sexually reproducing organisms exhibits events and processess having fundamental similarity
(b) Structures associated with sexual reproduction vary among different groups of organisms
(c) Pre-fertilisation, fertilisation and post-fertilisation is the exact sequence of events occurring in sexual reproduction
(d) None of the above

87 Which one of the following statements is incorrect?

(a) Gamete receive only one set of chromosomes
(b) Meiosis is a reductional division occurring in both haploid and diploid organisms
(c) Male gametes are always produced in less quantity than female gametes
(d) In seed plants, pollen grains are the carriers of male gametes

88 Go through the following statements.

I. Cell division is a mode of reproduction in algae and fungi.
II. *Amoeba* and *Paramecium* divide by fragmentation.
III. In yeast, cell division is unequal and small buds are produced.
IV. Zoospores are macroscopic non-motile structures.

Choose the incorrect statements.

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

89 Read the following statements about asexual reproduction and select the correct ones.

I. It involves a single parent.
II. It is slower than sexual reproduction.
III. It produces progeny that are genetically identical with the parent, but not with one another.

IV. The progeny of asexual reproduction can be termed as clones.

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

90 Read the following statements and select the correct ones.

I. Conidia are the asexual propagules restricted to kingdom–Fungi.
II. A piece of potato tuber having at least one eye (or node) is capable of giving rise to a new plant.
III. Ginger propagates vegetatively with the help of its underground roots.
IV. Fleshy buds which take part in vegetative propagation are called bulbils, present in *Dioscorea, Agave*, etc.

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

91 Find out the incorrect statement.

I. Lifespans of organisms are necessarily correlated with their sizes.
II. The sizes of crows and parrots are not very different, but still their lifespans vary extremely.
III. A peepal tree has much shorter lifespan as compared to a mango tree.
IV. Reproduction is essential for continuity of species on the earth.

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

92 Consider the following statements.

I. Many plants propagate vegetatively even though they bear seeds.
II. Sweet potatoes multiply vegetatively by root tubers.

Select the correct option.

(a) I is true, but II is false
(b) Both I and II are false
(c) I is false, but II is true
(d) Both I and II are true

93 Read the following statements.

I. Organisms exhibiting external fertilisation show great synchrony between the sexes and release a large number of gametes.
II. A major disadvantage of external fertilisation is that the offspring are extremely vulnerable to predators.
III. In gymnosperms, male gametes reach egg with the help of water as a medium.
IV. Zygote is a vital link that ensures continuity of species between organisms of one generation and the next.
V. Every sexually reproducing organisms begin their life as a single-celled zygote.

Which of the above statements are correct?

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

94 Read the following statements.

I. *Eichhornia* contributes extra oxygen to the water bodies which reduces the mortality of fishes.
II. *Zingiber* propagates vegetatively by tap roots.
III. Fleshy buds which take part in vegetative propagation are called bulbils, e.g. *Agave*.
IV. A potato tuber having atleast one eye, i.e. axillary bud can form a new plant.
V. *Bryophyllum* posssesss leaf buds.

Which of the above statements is/are correct?

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

95 Read the following statements.

I. The vegetative phase is of same duration in different organisms.
II. Clear-cut vegetative, reproductive and senescent phases can be observed in monocarpic plants.
III. *Bambusa* differs from *Strobilanthes kunthiana* (Neelakurinji) in the length of juvenile phase and being monocarpic.
IV. The end of juvenile/vegetative phase in angiosperms is seen when they come to flower.
V. Sexual mode of reproduction is present in most animals.

Which of the above statement is/are incorrect?

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

96 Read the following statements.

I. Interaction between hormones and certain environmental factors regulate the reproductive processes and the associated behavioural expression of organisms.
II. In animals, but not in plants, hormones are responsible for the transitions between juvenile, reproductive and senescent phases.
III. After attainment of maturity, all sexually reproducing organisms exhibit events and processes that have remarkable fundamental similarity, though the structure associated with sexual reproduction are indeed very different.
IV. The post-fertilisation events include gametogenesis and gamete transfer.
V. In majority of the sexually reproducing organisms, the gametes produced are morphologically distinct types, i.e. heterogametes.

Which of the above statements are correct?

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

III. Matching Type Questions

97 Match the following columns.

	Column I (Asexual reproduction types)		Column II (Examples)
A.	Binary fission	1.	Algae
B.	Zoospore	2.	*Amoeba*
C.	Conidium	3.	*Hydra*
D.	Budding	4.	*Penicillium*
E.	Gemmules	5.	Sponge

Codes

	A	B	C	D	E
(a)	1	4	5	3	2
(b)	2	1	4	3	5
(c)	1	2	3	4	5
(d)	1	4	3	2	5

98 Match the following columns.

	Column I (Terms)		Column II (Examples)
A.	Monoecious	1.	*Cladophora*
B.	Dioecious	2.	*Fucus*
C.	Isogametes	3.	Coconut
D.	Heterogametes	4.	Papaya

Codes

	A	B	C	D		A	B	C	D
(a)	4	3	1	2	(b)	1	3	2	4
(c)	3	4	1	2	(d)	3	4	2	1

99 Match the following columns.

	Column I		Column II
A.	External fertilisation	1.	Human beings
B.	Internal fertilisation	2.	Algae and fishes
C.	Ovipary	3.	Bryophytes, pteridophytes and birds
D.	Vivipary	4	Reptiles and birds

Codes

	A	B	C	D		A	B	C	D
(a)	4	1	2	3	(b)	3	1	4	2
(c)	2	3	4	1	(d)	4	2	1	3

100 Match the following columns.

	Column I		Column II
A.	Oestrus cycle	1.	*Spirogyra*
B.	Conjugation	2.	Rose
C.	Stem cuttings	3.	Monkey, apes, humans
D.	Menstrual cycle	4.	Cows, sheeps, rats

Codes

	A	B	C	D
(a)	1	3	2	4
(b)	4	1	2	3
(c)	4	1	3	2
(d)	2	1	4	3

101 Match the following columns.

	Column I (Organisms)		Column II (Number of chromosomes)
A.	Human	1.	$2n = 12$
B.	Fruit fly	2.	$2n = 16$
C.	Onion	3.	$2n = 46$
D.	House fly	4.	$2n = 08$

Codes

	A	B	C	D
(a)	1	2	4	3
(b)	1	4	3	2
(c)	2	1	4	3
(d)	3	4	2	1

102 Match the following columns.

	Column I (Organisms)		Column II (Reproduce by)
A.	Ginger	1.	Tuber
B.	Yeast	2.	Offset
C.	Potato	3.	Rhizome
D.	Water hyacinth	4.	Budding

Codes

	A	B	C	D		A	B	C	D
(a)	4	1	2	3	(b)	3	1	4	2
(c)	3	4	1	2	(d)	4	2	1	3

103 Match the following columns.

	Column I (Floral parts)		Column II (Converted to)
A.	Ovary	1.	Pericarp
B.	Ovule	2.	Perisperm
C.	Ovary wall	3.	Fruit
D.	Nucellus	4.	Seed

Codes

	A	B	C	D
(a)	3	4	1	2
(b)	3	2	1	4
(c)	1	2	3	4
(d)	1	3	2	4

NCERT Exemplar

MULTIPLE CHOICE QUESTIONS

104 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 given below.

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

105 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

106 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

107 *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

108 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

109 Choose the correct statement from amongst the following.

(a) Dioecious 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

110 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

111 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

112 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

113 Asexual method of reproduction by binary fission is common to which of the following?

I. Some eukaryotes II. All eukaryotes
III. Some prokaryotes IV. All prokaryotes

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

114 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

115 Given below are a few statements related to external fertilisation. Choose the correct statements.

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 chance of survival than those formed inside an organism.

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

116 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 given below.

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

117 Which of the following situations correctly describe the similarity between an angiosperm egg and a human egg?

I. Eggs of both are formed 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

118 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, II and III
(b) I, III and IV
(c) I, II and IV
(d) II, III and IV

119 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

120 There is no natural death in single-celled organisms like *Amoeba* and bacteria because

(a) they cannot reproduce sexually
(b) they reproduce by binary fission
(c) parental body is distributed among the offspring
(d) they are microscopic

121 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*

122 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 will be

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

Answers

› Mastering NCERT with MCQs

1 (a)	2 (d)	3 (b)	4 (d)	5 (c)	6 (a)	7 (c)	8 (c)	9 (d)	10 (c)
11 (b)	12 (b)	13 (a)	14 (a)	15 (b)	16 (d)	17 (b)	18 (d)	19 (c)	20 (b)
21 (b)	22 (a)	23 (d)	24 (b)	25 (b)	26 (b)	27 (c)	28 (d)	29 (c)	30 (b)
31 (c)	32 (c)	33 (c)	34 (d)	35 (c)	36 (a)	37 (a)	38 (c)	39 (a)	40 (b)
41 (c)	42 (d)	43 (d)	44 (d)	45 (b)	46 (d)	47 (d)	48 (b)	49 (c)	50 (c)
51 (a)	52 (c)	53 (b)	54 (b)	55 (a)	56 (d)	57 (c)	58 (c)	59 (c)	60 (c)
61 (c)	62 (d)	63 (b)	64 (a)	65 (a)	66 (a)	67 (d)	68 (b)	69 (a)	70 (b)

› NEET Special Types Questions

71 (a)	72 (b)	73 (d)	74 (a)	75 (b)	76 (c)	77 (a)	78 (c)	79 (d)	80 (a)
81 (c)	82 (c)	83 (c)	84 (c)	85 (a)	86 (d)	87 (c)	88 (c)	89 (c)	90 (c)
91 (a)	92 (d)	93 (c)	94 (b)	95 (d)	96 (a)	97 (b)	98 (c)	99 (c)	100 (b)
101 (d)	102 (c)	103 (a)							

› NCERT Exemplar Questions

104 (b)	105 (a)	106 (c)	107 (c)	108 (b)	109 (c)	110 (d)	111 (b)	112 (c)	113 (c)
114 (d)	115 (b)	116 (a)	117 (b)	118 (c)	119 (b)	120 (c)	121 (b)	122 (a)	

Answers & Explanations

2 (*d*) No individual is immortal except some single-celled organisms (e.g. *Amoeba*). It is due to the fact that they divide and continue to live as their daughter cells.

3 (*b*) The organisms with the increasing order of their lifespans are crow (15 years) < crocodile (60 years) < parrot (140 years).

7 (*c*) Offspring produced by asexual (vegetative) reproduction are called as clones. They are morphologically and genetically similar individuals.

10 (*c*) Cell division is the common mode of reproduction in Monera and Protista as these contain single-celled organisms. In this process, the cell divides by mitosis into two parts and each part continues to live on as a daughter cell.

13 (*a*) Zoospores are motile gametes. These are commonly found in the fungi and plant kingdom, e.g. *Chlamydomonas*.

14 (*a*) Conidia are the asexual reproductive structures found in *Penicillium*. They are non-motile gametes which develops singly or in chain on the parent body.

15 (*b*) Gemmule formation is a common mode of asexual reproduction in sponges. In this, the buds are formed within the parent body and later get released into the environment to form a new organism.

19 (*c*) Option (c) contains the incorrectly matched pair. It can be corrected as

Binary fission is observed in *Amoeba* and *Sargassum* reproduces through fragmentation. Rest of the pairs are correctly matched.

20 (*b*) Offsets are produced by mitotic divisions. These are one internode long runners that occur in some aquatic plants. Breaking of offsets helps in vegetative propagation. These give rise to new plants, e.g. *Eichhornia*.

22 (*a*) Option (a) contains the correctly matched pair.

Rest of the matches are incorrect and can be corrected as

- Ginger propagates by rhizome formation.
- *Chlamydomonas* reproduces by zoospores.
- Yeast reproduces by budding.

24 (*b*) Antherozoid is not a vegetative propagule. In majority of the sexually reproducing organisms, the motile male gamete is called as antherozoid or sperm whereas the other options represent vegetative propagules which have the capability of giving rise to new offspring.

25 (*b*) In *Agave*, bulbils are modified floral buds that develop on the flowering axis, so chromosome number in a cell of bulbil will be equal to that of the leaf cell of *Agave*, i.e. $n = X$.

26 (*b*) The figure in option (b) represents water hyacinth. This plant was introduced in India because of its beautiful flowers and the shape of its leaves. This plant can propagate at a very fast rate, spreading all over the water body in a short amount of time. However, this plant becomes invasive and is very difficult to get rid of.

28 (*d*) In both potato and sugarcane, new plantlets arise from the nodes present in their modified stems.

29 (*c*) Sexual reproduction produces individuals with new combinations of recombined chromosomes. This produces variations among offspring. When conditions become more stressful, an organism switches to sexual mode of reproduction so as to produce offspring with variations. These enable the offspring to adapt to the stressful conditions and successfully survive and reproduce.

30 (*b*) In grafting technique, parts of two plants are joined to form a composite plant. One part represents the strong root system called stock and the other part having better flower or fruit yield on shoot is called the scion. Hence, the fruit produced in such plants would have the genotype of the scion.

31 (*c*) Sexual reproduction brings about variation through genetic recombinations due to the participation of two parents. In this, the random union of gametes contributes in forming new combinations of characters.

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

33 (*c*) The growth phase of an organism before attaining sexual maturity is referred to as juvenile phase and pre-reproductive phase. In plants it is known as vegetative phase.

34 (*d*) Before reproducing sexually, organisms reach a stage of growth and maturity in their life which is known as juvenile phase or pre-reproductive phase. The end of this phase, marks the beginning of the reproductive phase and this phase finally leads to old age or senescent phase.

35 (*c*) Bamboo plants are perennial, monocarpic plants. They flower only once in their lifetime, usually after 50-100 years producing a large number of fruits and then these plants die.

37 (*a*) Generally, oestrus cycle takes place in the seasonal breeders, e.g. non-primates. It is the cyclic change in the activity of ovaries and accessory duct during the reproductive (seasonal) period.

43 (*d*) Male gametes are called antherozoids in case of lower organisms like fungi and algae, and in higher organisms like mammals, reptiles, etc., these are called sperms.

44 (*d*) Hermaphrodite/bisexual/monoecious/homothallic are terms used when both the male and female reproductive organs are present in same organism. Hermaphrodite is used for animals. Bisexual and monoecious are used for both animal and plant. Homothallic is used for fungi.

45 (*b*) In figure P, B–represents the antheridium (male sex organ) of *Chara*. In figure Q, C–represents the testis sac with testis of earthworm.

46 (*d*) Heterothallic/dioecious/unisexual are terms used when the sexes, i.e. male and female reproductive parts are present on different organisms. Heterothallic is used for fungi. Unisexual and dioecious used for both animals and plants.

51 (*a*) Irrespective of the fact, whether the organism is haploid or diploid, it has haploid gametes.

In haploid parents, mitosis produces haploid gametes. In diploid parents, meiosis produces haploid gametes.

52 (*c*) Gamete mother cells are called gamete producing cells. In these, meiotic cell division takes place for the production of haploid gametes. These are also called meiocytes (diploid).

53 (*b*) Option (b) represents the incorrect combination. It can be corrected as

16 and 8 are the chromosome numbers in meiocyte and gametes, respectively in *Allium cepa* (onion). Potato has 48 and 24 chromosomes in meiocyte and in gametes, respectively.

Rest all options are correct combinations.

54 (*b*) In the given diagram, three figures are shown. First figure indicates the fusion of male and female gametes.

Second figure indicates the formed zygote because there are two nuclei visible in completely fused condition.

Third figure indicates a complete new cell after fusion is completed. Now, it can be called as a new individual.

59 (*c*) Syngamy or Fertilisation refers to the phenomenon of the haploid fusion of male and female gametes that leads to the formation of a diploid cell.

60 (*c*) Parthenogenesis is the process by which the female gamete develops into embryo without fertilisation. It is of two types, i.e. haploid and diploid. In the former, embryo develops from haploid egg and in the later a diploid egg develops into embryo.

63 (*b*) In internal fertilisation, fusion of gametes (syngamy) takes place inside the female reproductive tract. This process provides direct protection from the environment to the developing progeny.

64 (*a*) The presence of diploid zygote is universal in all sexually reproducing organisms irrespective of the fact that, the parents are haploid or diploid.

In haploid parent condition, the diploid zygote undergoes meiosis and becomes haploid body again, while in diploid organisms, the diploid zygote changes to diploid individual after undergoing mitosis.

65 (*a*) During fertilisation two haploid cells, a female and a male gamete combine to form a single diploid cell ($2n$) called zygote, from where every sexually reproducing organism begin its life.

67 (*d*) Option (d) contains the incorrect match. It can be corrected as

In viviparous animals, zygote develops inside the body of female.

Rest of the pairs are correct.

68 (*b*) In viviparous animals, the zygote develops into a young one inside the body of female organism. Thus, the chances of survival of young ones are greater in these animals because these young ones are provided with proper embryo care and protection.

71 (*a*) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

In asexual mode of reproduction, there is no variation and the genetic constituent of offspring remains the same.

Because in this process, offspring is produced without the involvement of gametic fusion (syngamy) and involves only mitotic cell division.

72 (*b*) Both Assertion and Reason are true, but Reason is not the correct explanation of Assertion.

Asexual reproduction involves the participation of a single parent to produce an offspring. As a result, the offspring produced are morphologically and genetically similar to one another and also to their parents and can be referred to as clone.

73 (*d*) Assertion is false, but Reason is true. Assertion can be corrected as

Reproduction by zoospores occurs in some lower fungi, e.g. *Albugo*.

74 (*a*) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

Zygote is the product of fusion of two gametes. It is a vital link that ensures the continuity of species between the organisms of one generation and the next.

75 (*b*) Both Assertion and Reason are true, but Reason is not the correct explanation of Assertion.

Vegetative reproduction is a kind of asexual reproduction in plants in which offspring are formed by vegetative propagules like tuber, sucker, runner, etc., rather than by fusion of gametes.

76 (*c*) Assertion is true, but Reason is false and it can be corrected as

Perennial plants have a long lifespan. Hence, it becomes very difficult to define and study their vegetative, reproductive and senescent phases.

77 (*a*) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

Meiocytes (gamete mother cell) are specialised cells in diploid organisms that undergo meiosis to form haploid gametes. Gametes have only one set of chromosome as that of meiocytes.

78 (*c*) Assertion is true, but Reason is false and it can be corrected as

Dioecious is the term used to describe unisexual condition. Dioecious plants have their reproductive structures on different plants, e.g. papaya and *Marchantia*.

79 (*d*) Assertion is false, but Reason is true. Assertion can be corrected as

In external fertilisation, fertilisation or syngamy occurs outside the female body.

80 (*a*) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

In flowering plants, the zygote is formed inside the ovule and after fertilisation, the zygote develops into embryo and the ovules into seeds.

81 (*c*) The statement in option (c) is incorrect and it can be corrected as

During post-fertilisation event, ovule develops into seed not embryo sac.

Rest of the statements regarding post-fertilisation development in flowering plants are correct.

82 (*c*) Statement in option (c) is incorrect. It can be corrected as

Gemmules are asexual structures, produced by organisms (e.g. sponge) during unfavourable condition by the process of internal budding.

Rest of the statements are correct about gemmules.

83 (*c*) Statement in option (c) is correct. Rest of the statements are incorrect and can be corrected as

- All the individuals of a species have different lifespan.
- Smaller organisms do not always have a shorter lifespan and *vice-versa*.
- Some organisms may have a lifespan of several hundred years.

84 (*c*) Statement in option (c) is incorrect. It can be corrected as

In potato, banana and ginger, new plantlets always arise from the nodes of the modified stem.

Rest of the statements are correct.

85 (*a*) Statement in option (a) is incorrect. It can be corrected as

Perennial species do not show clear cut vegetative, reproductive and senescent phases.

Rest of the statements are correct.

87 (*c*) Statement in option (c) is incorrect. It can be corrected as

The number of male gametes produced is several thousand times more than the number of female gametes produced.

Rest of the statements are correct.

88 (*c*) Statements I, II and IV are incorrect and can be corrected as.

- Cell division is a mode of reproduction in monerans and protists.
- *Amoeba* and *Paramecium* mostly divide by binary fission.
- The zoospores are microscopic and motile asexual reproductive bodies.

Remaining statement III is correct.

89 (*c*) Statements I and IV are correct. But statements II and III are incorrect and can be corrected as

- Asexual reproduction is faster than sexual reproduction.
- Asexual reproduction produces progeny that are genetically identical with one another as well as with the parent.

90 (*c*) Statements I, II and IV are correct, but statement III is incorrect and can be corrected as

- Ginger propagates vegetatively with the help of rhizome. Rhizomes are main underground stems which store food for perennation during unfavourable conditions. These have buds for the formation of new aerial shoots during favourable conditions.

91 (*a*) Statements II and IV are correct. But statements I and III are incorrect and can be corrected as

- Lifespans of organisms are not necessarily correlated with their sizes.
- A mango tree has a much storter lifespan as compared to a peepal tree.

93 (*c*) Statements I, II, IV and V are correct. Statement III is incorrect and can be corrected as

In gymnosperms, the non-motile male gametes are carried to the female gamete through pollen tube.

94 (*b*) Statements III, IV and V are correct. Statements I and II are incorrect and can be corrected as

- *Eichhornia* drains oxygen from the water bodies which increases the mortality of fishes.
- *Zingiber* propagates vegetatively by rhizome (underground stem).

95 (*d*) Statements I and III are incorrect and can be corrected as

- The vegetative phase is of different durartion in different organisms.
- *Bambusa* differs from *Strobilanthes kunthiana* in the length of juvenile phase, but both plants are monocarpic.

Rest of the statements are correct.

96 (*a*) Statements I, III and V are correct. Statements II and IV are incorrect and can be corrected as

- In both plants and animals, hormones are responsible for transitions between the three phases, i.e. juvenile, reproductive and senescent.
- The pre-fertilisation events include gametogenesis and gamete transfer.

104 (*b*) Statements I and II are correct. Statements III and IV are incorrect and can be corrected as

- Meiosis is required for the production of haploid gametes during sexual reproduction.
- External fertilisation is not a rule during sexual reproduction, it can occur internally also.

105 (*a*) The term 'clone' cannot be applied to offspring formed by sexual reproduction because offspring do not possess exact copies of parental DNA. Offspring produced by sexual reproduction has half DNA from one parent and half from another parent, thus is not an exact copy of any one parent, i.e. it is not a clone. But there DNA is still similar to their parents DNA.

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

Zygote is formed by fertilisation of male and female gametes thus, the chromosome number will be 24 ($2n$).

A seedling is young plant sporophyte developing out of embryo. So, chromosome number will be 24 ($2n$).

Thus, option (c) is correct.

107 (*c*) Unicellular organisms (like *Amoeba* and yeast) have a relatively simple body organisation. So, asexual mode of reproduction is common in them because by asexual reproduction unicellular organisms can multiply very fast. In *Amoeba*, it occurs by binary fission and in yeast by budding.

108 (*b*) The appearance of vegetative propagules from the nodes of plants like sugarcane and ginger is due to the presence of meristematic cells at the nodes. These cells have the capacity of rapid cell division, thus are responsible for growth and development of tissues and organs in plants.

109 (*c*) Statement in option (c) is correct. Dioecious is the term used to describe unisexual condition in plants and animals, e.g. *Marchantia* (plants) and cockroach (animals).

110 (*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, genetic makeup and several other factors.

111 (*b*) Embryo development takes place after the event of fertilisation, i.e. fusion of male and female gametes (n) and results in the formation of zygote ($2n$). Thus, it is a post-fertilisation event. Rest of the events takes place before the occurrence of fertilisation and hence, are pre-fertilisation events.

112 (*c*) Statements II and IV are true for both asexual and sexual reproduction. But gametic fusion and reduction division take place only in sexual reproduction.

114 (*d*) Option (d) is correct and can be explained as

In a multicellular filamentous alga (e.g. *Ulothrix*), the sexual life cycle have meiotic division after the zygote ($2n$) formation. It mean meiosis in zygote will produce haploid spores or vegetative cells (n) and when these vegetative cells undergo asexual reproduction the gametophyte or gametangia formed will be haploid (n) too.

115 (*b*) Statements I and III are correct regarding external fertilisation. Statements II and IV are incorrect and can be corrected as

- A large number of gametes are released into the medium (water) to increase the chances of fertilisation.
- The chances of survival of offspring from external fertilisation are lesser than those of internal fertilisation as they face more risk from predators.

116 (*a*) Statements I and II are correct. Statements III and IV are incorrect and can be corrected as

Gynoecium is the female part of the flower, a unit of which is called pistil. A pistil may have one or more than one carpels (monocarpellary, bicarpellary, etc).

Each carpel may have more than one ovules.

119 (*b*) In sexual reproduction genetic variation is observed. In this mode of reproduction, gametes of two parents (opposite sex) having qualitatively different genetic composition participate in the reproductive process, (i.e. fusion of male and female gametes).

This gives rise to a new individual having an entirely new genetic makeup.

120 (*c*) There is no natural death in single-celled organisms like *Amoeba* and bacteria. It is so, because of asexual reproduction, the body of parent is divided or distributed into daughter cells or offspring. In such organisms, reproduction occurs by cell division where the parent cell divides into two halves.

121 (*b*) Statement in option (b) is incorrect and can be corrected as

Zoospores are asexually reproducing structures.

Rest of the statements are correct.

122 (*a*) Shoot tip cells and microspore mother cells both are diploid in maize plant. If number of chromosomes in shoot tip cell is ($2n$) = 20, then number of chromosomes in microspore mother cell will be ($2n$) = 20.