

REPRODUCTION IN ORGANISMS

STUDY-NOTES

Life span is defined as the period from the birth to the natural death of an organism. It varies from organism to organism and is not correlated with the size of the organism.

Reproduction is a biological process by which an organism gives rise to another organism similar to itself.

- Reproduction involving a single parent is called **asexual**.
- When reproduction involving two parents of opposite sexes with the fusion of male and female gametes, it is called **sexual** reproduction.
- Reproduction enables the continuity of the species generation after generation. It results in the **genetic variation**. The genetic variation is inherited during reproduction.

ASEXUAL REPRODUCTION

- Asexual reproduction is common among single celled organisms, and in plants and animals with relatively simple organisations. It is also seen in multicellular organisms.
- Only a single parent is involved in producing offspring. As a result, the offspring produced are identical to each other as well as to the parent. The term clone is used to describe this phenomenon.

VARIOUS ASEXUAL REPRODUCTION METHODS

The most common modes of asexual reproduction seen are as follows :

Fission

- This method is observed in the members of Protista and Monera. In fission, the division of the nucleus occurs first which is then followed by the division of the cytoplasm. Subsequently, the mother cell splits into two equal sized daughter cells. Binary fission involves mitosis only.
- It is the simplest of all asexual methods. In plants, it is commonly found in algae, fungi and monera (bacteria). In this process, the unicellular mother cells divide mitotically to form two daughter cells that are identical to each other as well as to the mother cell. Each daughter cell eventually grows into an independent organism.
- When the cytoplasmic division occurs in any direction (e.g. *Amoeba*) the fission is called simple binary fission. If cytoplasm divides along the transverse axis of the individual the fission is termed as transverse binary fission. E.g. *Paramecium* and *Planaria*. If the cytoplasm divides the longitudinal axis of the individual it is designated as longitudinal binary fission. E.g. *Euglena* and *Vorticella*.
- In some cases the nucleus divides several times by amitotic divisions. This leads to the formation of multiple new copies of nuclei. Cytoplasmic division does not occur during this period. The cytoplasm collects around each nucleus. Thus, from a single cell many unicellular and uninucleated offspring are formed. This method of reproduction is called **multiple** fission. E.g. *Amoeba* and *Plasmodium*.

Sporulation

- Asexual reproduction takes place by a variety of motile and non-motile spores/conidia.
- Ciliated motile asexual spores, called zoospores are produced by algae and fungi. These zoospores swim in water for some time with the help of their flagella. They later directly develop into new independent individuals under favourable conditions. e.g. *Ulothrix*.
- Sporulation occurs during unfavourable conditions. Organisms like *Amoeba* withdraw their pseudopodia and become round in shape. They create a protective and hard three layered cyst and the process is called encystations.

Under favourable conditions, the nucleus of encysted *Amoeba* undergoes multiple divisions to form a large number of *Amoeba*. These structures are called pseudo-podiospores. This process is called **sporulation**. The cyst then ruptures to release all new Amoebae.

Budding

- In this method cells of some parts of the body of an animal undergo repeated mitotic cell divisions. This leads to the formation of overgrown regions of cell masses. Such regions of cell masses that result due to mitosis are called buds. A young animal is developed from such a bud. It detaches itself from the parent body and lives as an independent organism.
- Some algae produce adventitious branches (e.g. *Dictyota*, *Fucus*) or buds (e.g. *Protosiphon*). Fungus like yeast produces buds. These structures are attached to the parental cell and eventually get separated and mature into a new organism.
- A bud produced on the outside of the body, is called exogenous budding. E.g. *Hydra*.
- When the cell mass develop towards the inside of the body are called internal buds or **gemmules**. Such gemmules can be seen in freshwater sponge. Each gemmule gives rise to a new animal. This is called endogenous budding.

Fragmentation

- In this method of reproduction, the body becomes fragmented into several different parts. Each part develops the remaining body parts and becomes a complete animal. This method of reproduction of an organism is known as regeneration. E.g. *Planaria*, *Hydra*.
- This method is observed in some algae (e.g. *Ulothrix*, *Spirogyra* and *Zygnema*) and fungi (e.g. *Mucor*, *Rhizopus*, and *Saprolegnia*).

Vegetative Propagation

- In flowering plants the method of vegetative propagation or reproduction are grouped into natural and artificial methods.

Natural Methods

- There is development of a new plant from a few organs of the mother plant under suitable environmental conditions. Those modified organs may develop from stem, leaf, root or even flower.

Examples of Vegetative Reproduction

- **Floral buds:** In plants like *Agave* and *Oxalis*, floral buds produce new plants and in *Dioscorea*, axillary buds do so.
- **Stem:** Runners observed in lawn grass, offsets found in *Pistia*, stolons in *Neprolepis* and suckers in mint plants.
- **Roots:** Sweet potato, *Asparagus* and *Dahlia*.
- **Leaves:** In this method buds develop in the margins of leaves. These buds produce new plants as can be seen in *Bryophyllum*.

Artificial Methods

- These are the methods which are developed for artificial vegetative propagation in which some part of the plant organ is utilised for obtaining a new complete plant.
- The most common methods are – Cutting, layering and grafting.
- Technique of tissue culture in plants is another method in which fragments of tissue from any part of the body is taken and grown in sterile condition in special nutrient media to produce a whole plant.

Cutting: Cut pieces of stems and roots when planted in moist soil leads to the artificial inducement and development of adventitious roots. Examples: new plants are developed in this way in rose, *Hibiscus*, lemon and tamarind.

Layering: This method is used in the cultivation of grapes and jasmine. The lower branches of the plants are bent and covered with soil in such a way that the tip of the branch remains outside the soil and the middle portion is buried inside the soil.

Grafting: In this method two plants of the same or different kinds are joined together. This is achieved by bringing the tissues of the two plants in direct contact with each other. The meristematic tissue of both

plants divide and multiply and eventually the cells of each plant fuse together. Grafting can be of different types, namely bud grafting, side grafting, tongue grafting, wedge grafting and crown grafting depending on the methods of uniting the two parts.

Significance of Vegetative Reproduction

- Vegetative reproduction can be used for obtaining disease-free plants.
- It is ideal for propagation of those plants which have less efficient sexual reproduction, small seeds, seed dormancy, poor seed viability, etc. Those plants can be multiplied easily through this method.
- It is a method of reproduction in plants to obtain the same traits as of their parents.
- Grafting is the process that can be used to bring together the desired characters from two different plants.

SEXUAL REPRODUCTION

- Sexual reproduction involves formation of the male and female gametes, either by the same individual or by different individuals of the opposite sex. It is a complex and slow process as compared to asexual reproduction.
- The sexual mode of reproduction is similar in pattern in plants, animals and fungi. Only when they are reproductively mature they can reproduce sexually. Before that, period of general growth is called the **juvenile** phase and in plants it is known as **vegetative** phase.
- The gametes that fuse together to form the zygote which develops to form the new organism.
- As it involves the fusion of male and female gametes, offspring are not identical to the parents or amongst themselves.
- The sequential events may be studied as three distinct stages namely, the pre fertilisation, fertilisation, and the post fertilisation.

Pre-fertilisation Events

Gametogenesis

- Gametogenesis is the process of formation of gametes. Gametes are of two types; male and female gametes derived from male and female parent respectively. Gametes are haploid (n) cells.
- Gametes that are similar in appearance are called isogametes or homogametes. They are morphologically and physiologically similar (e.g. *Cladophora*, *Ulothrix*).
- A majority of sexually reproducing organisms show two morphologically and physiologically distinct types of gametes. Such gametes are called heterogametes or anisogametes. The male gametes are smaller and more active whereas the female gametes are larger and sluggish. The male gamete is called sperm and the female gamete is called egg or ovum.

Gamete transfer

- After gamete formation, the male and female gametes have to come in contact for fertilisation. Gamete transfer requires a suitable medium. In Algae, Bryophytes and Pteridophytes, water is the medium for gamete transfer. A large number of the male gametes fail to reach the female gametes. Therefore, male gametes are synthesised in very large numbers as compared to female gametes.
- In bisexual animals, the organism evolves the special mechanism for gamete transfer since male and female gametes are formed in different individuals.
- In angiosperms, pollen grains carry the male gametes and ovules contain the egg cells. Pollen grains produced in anthers are transferred to stigma. This phenomenon is known as **pollination**. Sometimes, pollination requires the engagement of external agents such as insects, animals, wind and water. Pollen grains germinate on the stigma and the pollen tubes that carry the male gametes reach the ovule and release two gametes near the egg cell.

Fertilisation

- It is the fusion of male and female gametes and also called **syngamy**. As a result, diploid zygote is formed.
- In plants as well as reptiles, birds and mammals, syngamy occurs inside the body of the organism. Hence, the process is called internal fertilisation. So that the motile male gametes reach and fuse with the egg. This takes place inside the female body.

- In most of the algae, fishes and amphibians syngamy occurs outside the body of organisms. This type of gametic fusion is called external fertilisation.

Post-fertilisation Events

The Zygote

- Zygote is the important link that ensures continuity of species between organism of one generation and the next generation.
- Formation of zygote (Diploid cell - $2n$) is common in sexual reproduction.
- Further development of zygote depends on the life cycle of the organism and the environment to which it is exposed.
- Few unicellular animals (e.g. *Paramecium*) exhibit sexual reproduction by forming male and female gamete nuclei, which they exchange through temporary cytoplasmic bridge.

Embryogenesis

- It is the process of development of embryo from the zygote. During this process the zygote undergoes cell division (mitosis) and cell differentiation.
- Cell divisions result in the increase in number of cells in the developing embryo while cell differentiation helps to form specialised tissues and organs to form organism.
- When the development of zygote takes place inside the body of the female parent, it is called **viviparous**. In the animals like mammals including human beings, the zygote develops into a young ones and are then delivered out of the body of the female parent.
- In **oviparous** animals like Reptiles and Birds the fertilised eggs are covered by hard calcareous shell and after the incubation period young ones hatch out.
- On the other hand, the chances of survival of young ones, are greater in viviparous organisms because of proper embryonic care and protection.

Embryogenesis in plants:

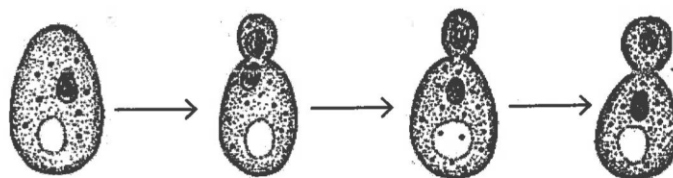
- Zygote develops into embryo.
- Ovule develops into seed.
- Integument of the ovule develops into seed coat.
- Ovary develops into fruit.
- Ovary wall develops into pericarp, which is protective in function.
- After dispersal, seeds germinate under favourable conditions to produce new plants.

QUESTION BANK

MULTIPLE CHOICE QUESTIONS

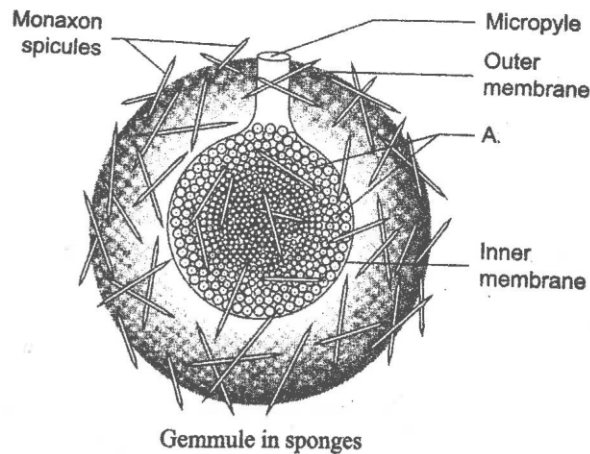
- Which one of the following statements is not correct?
 - Offspring produced by the asexual reproduction are called clone.
 - Microscopic, motile, asexual reproductive structures are called zoospores.
 - In potato and ginger, the plantlets arise from the internodes present in the modified stem.
 - Water hyacinth, growing in the standing water, drains oxygen from water that leads to the death of fishes.
- Which of the following groups of plants are propagated through the underground root system?
 - Bulbophyllum and kalanchoe
 - Ginger, potato
 - Pistia*, *Chrysanthemum* and pineapple
 - Sweet potato, *Asparagus*, *Tapioca*, *Dahlia*

3. Life span of crocodile is
 (a) 60 years (b) 30 years (c) 35 years (d) 15 years
4. In a majority of sexually reproducing organisms, the gametes are
 (a) Heterozygous (b) Homogametes (c) Hemigamete (d) Heterogametes
5. In heterogamous organisms the male gamete and female gametes are called
 (a) Spermatogonia, oogonia respectively (b) Spermatid, ootid respectively
 (c) Antherozoid (sperm), Egg (ovum) respectively (d) Spore and oospore respectively
6. Birds in captivity (as in poultry farms) can be made to lay eggs throughout the year. In this case laying eggs is
 (a) Related to reproduction and commercial exploitation for human welfare.
 (b) Neither related to reproduction nor commercial exploitation for human welfare.
 (c) Not related to reproduction but a commercial exploitation for human welfare.
 (d) Related to reproduction but not a commercial exploitation for human welfare.
7. 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. Vegetative phase → Reproductive phase → Senescent phase
 (a) I and II (b) I and IV (c) III and IV (d) II and IV
8. Which of the following is correct about *Strobilanthes kunthiana*?
 (a) It flowers once in 12 years.
 (b) The plant came to flower last time in September-October 2006.
 (c) Its mass flowering converted large hilly tracts of Kerala, Karnataka and Tamil Nadu into blue stretches.
 (d) All the above
9. Which of the following statements is true about water hyacinth?
 (a) It gives useful products to be used in medicine and therapy.
 (b) It is a marine plant.
 (c) It takes oxygen from water which causes death of fishes.
 (d) It is being cultivated in sea water for biogas.
10. Oestrus cycle can be seen in
 (a) Cows and sheep (b) Rats and deers
 (c) Dogs and tiger (d) All of these
11. The figure below refers to which type of reproduction?



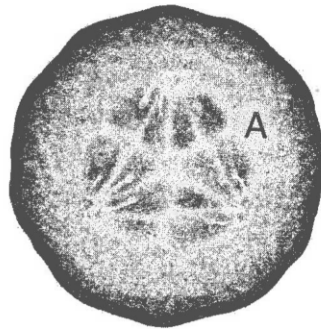
- (a) Multiple fission (b) Budding
 (c) Layering (d) Grafting
12. Bamboo species Hovers
 (a) Every year (b) Once in 2 years
 (c) Only once in life time (d) Twice in 50-100 years

13. What does A signifies here?



- (a) Archaeocytes (b) Gemmules (c) Micropyle (d) Middle covering

14. This given picture is the T.S. of cucumber. Name the part of the fruit marked A.



- (a) Mesocarp (b) Placenta (c) Micropyle (d) Seed

15. Find out the correct statement.

- (a) Life spans of organisms are necessarily correlated with their sizes and shapes.
 (b) The size of crows and parrots are not very different, so their life spans are almost similar.
 (c) A peepal tree has much shorter life span as compared to a mango tree.
 (d) Reproduction is essential for continuity of species on the earth.

16. Seeds are called products of sexual reproduction because they

- (a) Give rise to new plants (b) Involve the fusion of gametes
 (c) Can be stored for a long time (d) Are formed by fusion of pollen tubes

17. Some organisms are capable of asexual or sexual reproduction. Under favourable conditions, reproduction proceeds asexually. When conditions become more stressful reproduction switches to 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.

18. Choose the correct sequences of organisms in respect of life spans?

- (a) Banyan tree > Parrot > Elephant > Crocodile > Crow
 (b) Crow > Crocodile > Elephant > Parrot > Banyan tree

- (c) Banyan tree > Elephant > Crocodile > Parrot > Crow
- (d) Crow > Parrot > Elephant > Crocodile > Banyan tree

19. Choose the correct sequence from the following

- (a) Gametogenesis → Syngamy → Zygote → Embryogenesis
- (b) Gametogenesis → Syngamy → Embryogenesis → Zygote
- (c) Zygote → Embryogenesis → Gametogenesis
- (d) Syngamy → Gametogenesis → Zygote → Embryogenesis

20. Identify the events (A, B, D and E) in life of general reproduction.



- (a) A- Gamete transfer, B - gametogenesis, D - Zygote formation, E - Embryogenesis
- (b) A- gametogenesis, B - Gamete transfer, D - Zygote formation, E - Embryogenesis
- (c) A- gametogenesis, B - Zygote formation, D - Gamete transfer, E - Embryogenesis
- (d) A- gametogenesis, B - Gamete transfer, D - Embryogenesis, E - Zygote formation

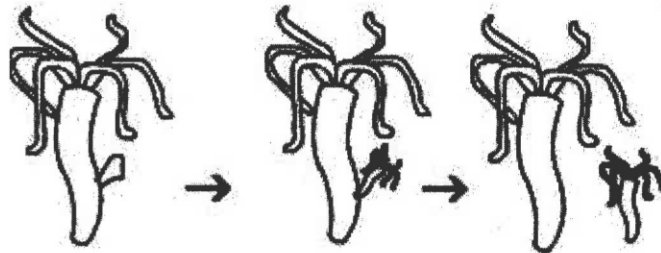
21. In majority of organisms male gamete is _____ and female gamete is _____.

- (a) Motile, motile
- (b) Non-motile, non-motile
- (c) Non-motile, motile
- (d) Motile, stationary (non-motile)

22. In which of the following options the fertilised eggs are covered by a hard calcareous shell?

- (a) Fish
- (b) Reptiles and birds
- (c) Mammals
- (d) Amphibians

23. What type of reproduction is shown in the figure?



- (a) Fragmentation
- (b) Budding
- (c) Sporulation
- (d) Fission

24. In grafting method the contact is made between

- (a) Cambium
- (b) Flower
- (c) Xylem
- (d) Seeds

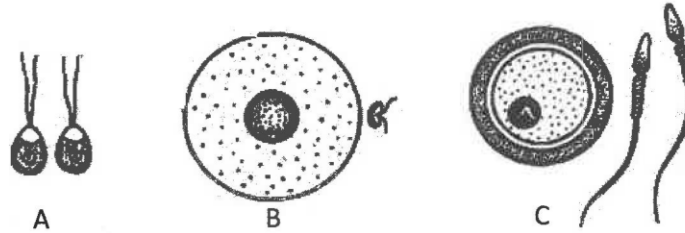
25. Offspring of oviparous animals are at greater risk as compared to offspring of viviparous animals. The reason is

- (a) Proper embryonic care and protection is lesser
- (b) Embryo is not developed
- (c) Progenies are with more variation
- (d) Progenies are larger and predator

26. Identify gametes A, B and C.

- (a) Heterogametes, isogametes, Homogametes respectively
- (b) Isogametes, homogametes, heterogametes respectively

- (c) Homogametes, isogametes, heterogametes respectively
 (d) Homo/Isogametes, heterogametes, heterogametes respectively



27. Which of the following pairs is not correctly matched?

Mode of reproduction	Example
(a) Binary fission	<i>Sargassum</i>
(b) Conidia	<i>Penicillium</i>
(c) Offset	Water hyacinth
(d) Rhizome	Banana

28. In oogamy, fertilisation involves

- (a) a small non-motile female gamete and a large motile male gamete
 (b) a large non-motile female gamete and a small motile male gamete
 (c) a large non-motile female gamete and a small nonmotile male gamete
 (d) a large motile female gamete and a small non motile male gamete.

29. 'Nothing lives forever, but life continues'. What does this statement signify?

- (a) Older die but new are produced due to reproduction.
 (b) Death has nothing to do with the continuation of life.
 (c) Nothing can produce without death.
 (d) Parthenogenesis is must for sexual reproduction.

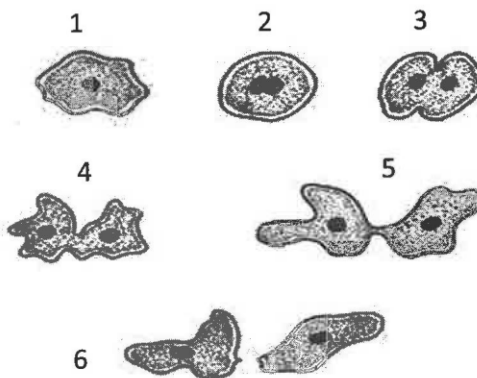
30. Asexual reproduction is common

- (a) Among single celled organisms only
 (b) Among plants only
 (c) Among single celled organisms, plants and all animals
 (d) Among single celled animals, plants and animals with simple organisations

31. Ploidy of ovary, anther, egg, pollen, male gamete and zygote are respectively

- (a) $2n, 2n, n, 2n, n, 2n$
 (b) $2n, 2n, n, n, n, 2n$
 (c) $2n, n, n, n, n, n$
 (d) $2n, 2n, n, 2n, 2n, 2n$

32. What event is shown in the given diagram?



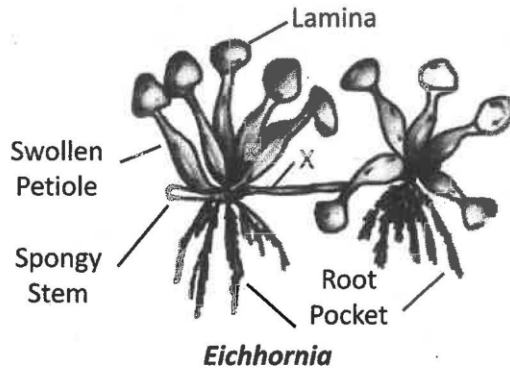
- (a) Binary fission (b) Fragmentation (c) Multiple fission (d) Budding

33. Name the plant shown in the picture given below.



- (a) Cactus (b) *Bryophyllum* (c) Water Hyacinth (d) *Agave*

34. Name the propagule which is marked X.



- (a) Bud (b) Offset (c) Roots (d) Tuber

35. The given picture of the plant is a



- (a) Dicotyledon (b) Monocotyledon (c) Nut (d) Flower

36. Which one of the following generates new genetic combinations leading to variation?

- (a) Vegetative reproduction (b) Apomixis
(c) Sexual reproduction (d) Nucellar polyembryony

37. In ginger, vegetative propagation occurs through

- (a) tubers (b) runners (c) rhizome (d) offsets

38. During regeneration, modification of an organ to other organ is known as

- (a) morphogenesis (b) epimorphosis
(c) morphallaxis (d) accretionary growth.

39. *Amoeba* and Yeast reproduce asexually by fission and budding respectively. They are

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

40. The series of changes from larva to adult after embryonic development is called

- (a) regeneration (b) growth (c) metamorphosis (d) ageing

41. Find out the organism with highest life span.

- (a) Tortoise (b) Cat (c) Fruit fly (d) Dog

42. "How organisms reproduce" depends upon
 (a) Habitat of organisms (b) Internal physiology of organisms
 (c) Genes (d) All these
43. Which of the following is an incorrect statement?
 (a) All organisms have evolved similar mechanism to multiply and produce offspring.
 (b) Asexual reproduction is uniparental.
 (c) Sexual reproduction is biparental.
 (d) In asexual reproduction no fertilisation occurs.
44. The chromosome number is haploid in
 (a) Gamete (b) Zygote (c) Seed (d) Embryo
45. In animals and other simple organisms uniparental reproduction is called _____ reproduction.
 (a) Vegetative, Sexual (b) Asexual, Vegetative
 (c) Parthenogenetic, Amphimictic (d) Amphimictic, Apomictic
46. Which of the following is not a vegetative propagule?
 (a) Rhizome and sucker (b) Tuber and offset
 (c) Bulbil, leaf buds, bulb (d) Antherozoid.
47. Vegetative propagation in mint occurs by
 (a) Offset (b) Rhizome (c) Sucker (d) Runner
48. In which of the following organism, self fertilisation is seen?
 (a) Fish (b) Roundworm (c) Earthworm (d) Liver fluke
49. The plant was introduced in India because of its beautiful flowers and shape of leaves. It can propagate vegetatively at a phenomenal rate and spread all over water body in a short period. It is very difficult to get rid off these plants.
 The above discussed plant is
 (a) *Dahlia* (b) Water hyacinth (c) *Azolla* (water fern) (d) Mosses
50. The fastest method to obtain clones is through
 (a) induced mutation (b) sexual hybridisation
 (c) parthenogenesis (d) vegetative reproduction
51. Among the following which one is not a method of asexual reproduction?
 (a) Budding (b) Layering (c) Sowing (d) Binary fission
52. In Monera (e.g. bacteria) and Protista (*Amoeba*) asexual reproduction occurs by
 (a) Budding (b) Multiple fission (c) Binary fission (d) Amphimixis
53. Clone is the product of
 (a) Sexual reproduction (b) Sexual or asexual reproduction
 (c) Amphimixis (d) Asexual reproduction
54. Individuals of a clone
 (a) Are genetically similar but morphologically different
 (b) Are morphologically similar but genetically different
 (c) Are morphologically and genetically similar
 (d) Are genetically and phenotypically different
55. A scion is grafted on stock. The quality of fruits produced will be determined by the genotype of
 (a) Stock (b) Scion
 (c) Both Stock and Scion (d) Neither Stock or Scion

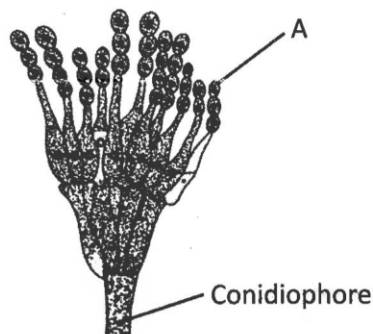
- 56. No individual is immortal except**
 (a) Single celled organisms (b) Green plants
 (c) Snake (d) Drones
- 57. The period from birth to the natural death of an organism represents**
 (a) Reproductive phase (b) Life cycle (c) Life span (d) Life style
- 58. Which of the following statements is incorrect?**
 (a) Asexual reproduction is simpler than sexual reproduction.
 (b) Asexual reproduction occurs by fission, budding and fragmentation.
 (c) In most of the animals both asexual and sexual modes of reproduction are found.
 (d) Vegetative and sexual modes of reproduction are exhibited by the higher plants.
- 59. Which of the following is cultivated through vegetative propagation?**
 (a) Potato and Sugarcane (b) Banana and Ginger
 (c) *Dahlia* and Rose (d) All of these
- 60. Which of the following animal is performing longitudinal binary fission?**
 (a) *Euglena* (b) *Plasmodium* (c) *Planaria* (d) *Paramecium*
- 61. Spermatids are transformed into spermatozoa by**
 (a) Spermiation (b) Spermatogenesis (c) Spermiogenesis (d) Supermitosis
- 62. Which of the following plants do not show clear cut vegetative, reproductive and senescent phase?**
 (a) Perennial plants (b) Annual plants (c) Biennial plants (d) Either (b) or (c)
- 63. Which of the following are responsible for regulation of the reproductive processes and the associated behavioural expressions of organisms?**
 (a) Hormones
 (b) Environmental factors
 (c) Abiotic components
 (d) Interaction between hormones and environmental factors
- 64. Which of the following is a hermaphrodite organism?**
 (a) Honeybee (b) Aphids (c) Earthworms (d) Cockroach
- 65. In flowering plants both male and female gametes are non-motile. The method to bring them together for fertilisation is called**
 (a) Amphimixis (b) Gametogenesis (c) Pollination (d) Apomixis
- 66. Meiosis**
 (a) does not take place in organisms showing asexual reproduction only
 (b) takes place in sexually reproducing haploid organism
 (c) takes place in sexually reproducing diploid organism
 (d) all the above
- 67. Transverse binary fission can be seen in**
 (a) *Euglena* (b) *Amoeba* (c) *Hydra* (d) *Paramecium*
- 68. Menstrual cycle is reported in**
 (a) Only chimpanzees and human (b) Only apes
 (c) Only monkey (d) Primates like humans, apes and monkey
- 69. Animals which give birth to young ones are said to be**
 (a) Viviparous (b) Amphibious (c) Coelomates (d) Oviparous
- 70. Which of the following is viviparous?**
 (a) Reptiles (b) Amphibians
 (c) All mammals (d) Majority of mammals

71. Find out the correct combination.
- (a) Zoospore in sponge (b) Conidia in algae
(c) Gemmules in *Penicillium* (d) Buds in *Hydra*
72. The motile reproductive structure of algae and fungi, which directly give rise to new individuals are called
- (a) Offsets (b) Conidia (c) Buds (d) Zoospores
73. Ciliated motile spores are called
- (a) Aplanospores (b) Conidia (c) Zoospores (d) Oospores
74. In grafting process, the callus is
- (a) Formed by proliferation of exposed parachyma cells of stock and scion
(b) The protective padding field around the plant
(c) The tissue produced through culture of explant and tied around the joint of stock and scion
(d) Developed by the activity of the cambium of scion and stock
75. Which of the following are seasonal breeders?
- (a) Frogs (b) Birds (c) Lizards (d) All of these
76. Which of the following is a unisexual animal?
- (a) Round Worm (b) Earthworm (c) Leech (d) All of these
77. In all of the following options water is essential medium for fertilisation except
- (a) Algae (b) Bryophytes (c) Angiosperms (d) All of these
78. Grafting is not possible in monocots as they
- (a) are herbaceous (b) Lack cambium
(c) have scattered vascular bundles (d) Lack parallel venation
79. In grafted plant, stock cell has 48 chromosome, while scion cell has 24 chromosomes the chromosome number in root cells and eggs are
- (a) 48 and 12 (b) 24 and 12 (c) 24 and 24 (d) 48 and 24
80. Match List I with List II and select the correct option.

List I	List II
A. Gemmules	1. <i>Agave</i>
B. Leaf buds	2. <i>Penicillium</i>
C. Bulbil	3. Water hyacinth
D. Offset	4. Sponges
E. Conidia	5. <i>Bryophyllum</i>

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

81. The marked A in the given image is known as



- (a) Conidia (b) Gemmule (c) Bud (d) Zoospore

82. 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
83. 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 may 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
84. 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
85. 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

INPUT-TEXT BASED QUESTIONS

Read the following paragraphs and answer the following questions.

I. The period from birth to the natural death of an organism represents its life span. Isn't it both interesting and intriguing to note that it may be as short as a few days or as long as a few thousand years? You may note that life spans of organisms are not necessarily correlated with their sizes; the sizes of crows and parrots are not very different yet their life spans show a wide difference. Similarly, a mango tree has a much shorter life span as compared to a *peepal* tree. Whatever be the life span, death of every individual organism is a certainty, i.e., no individual is immortal, except single-celled organisms.

- Generally _____ have greater life span.
 (a) Small animals (b) Big animals (c) Trees (d) Water animals
- The life span of an organism generally includes four stages, these are
 (a) Juvenility, embryo, maturity, death
 (b) Juvenility, maturity, aging and senescence, death
 (c) Gametes, embryo, senescence, aging
 (d) Maturity, senescence, aging, death
- Death causes reduction in the number of individuals of a population which is restored by
 (a) addition of new individuals through reproduction
 (b) transferring a part of population to some other place
 (c) adding more individuals through cloning in labs
 (d) producing more plants in compare to animals
- Which of the following has the shortest life-span?
 (a) Fruit fly (b) Rat (c) Butterfly (d) Deer
- The unicellular organisms like bacteria reproduce by binary fission, in which the parent continues to live as daughter individuals. It concludes that
 (a) The single-celled organisms have no longer life-span.
 (b) The microorganisms get destroyed by their own daughter cells.
 (c) The organisms have very short life-span.
 (d) There is no natural death in single-celled organisms.

Read the following paragraph and answer the following questions.

II. In asexual reproduction method, a single individual (parent) is capable of producing offspring. As a result, the offspring that are produced are not only identical to one another but are also exact copies of their parent.

Asexual reproduction is common among single-celled organisms, and in plants and animals with relatively simple organisations. In Protists and Monerans, the organism or the parent cell divides by mitosis into two to give rise to new individuals. Thus, in these organisms cell division is itself a mode of reproduction.

- Most of the single celled organisms reproduce by binary fission, where a cell divides into two halves and each rapidly grows into an adult.
Which of the following organisms is/are coming under the above type of reproduction?
(i) *Amoeba* (ii) Yeast
(iii) *Paramecium* (iv) *Hydra*
(a) (i) only (b) (ii) and (iv) (c) (iv) only (d) (i) and (iii)
- Under unfavourable condition *Amoeba* withdraws its pseudopodia and secretes a three-layered hard covering or cyst around itself. This phenomenon is termed as
(a) Sporulation (b) Cloning (c) Encystation (d) Budding
- Some common asexual reproductive structures in organisms are
(i) *Gemmules* (ii) Buds
(iii) *Conidia* (iv) *Zoospores*
Which of the following organisms is/are correct regarding above?
(a) (i), (ii) and (iii) (b) (i), (ii), (iii) and (iv)
(c) (ii), (iii) and (iv) (d) (i) and (iii)
- In some organisms, if the body breaks into distinct pieces and each piece grows into an adult capable of producing offspring. This process is called
(a) Sporulation (b) Cloning (c) Fragmentation (d) Regeneration
- Zoospores are the most common structures of asexual reproduction in
(a) Higher Plants (b) Fungi and simple lower plants
(c) Unicellular animals and plants (d) Unicellular animals only

ANSWERS

- | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (c) | 2. (d) | 3. (a) | 4. (d) | 5. (c) | 6. (c) | 7. (d) | 8. (d) | 9. (c) | 10. (d) |
| 11. (b) | 12. (c) | 13. (a) | 14. (a) | 15. (d) | 16. (b) | 17. (c) | 18. (a) | 19. (a) | 20. (b) |
| 21. (d) | 22. (b) | 23. (b) | 24. (a) | 25. (a) | 26. (d) | 27. (a) | 28. (b) | 29. (a) | 30. (d) |
| 31. (b) | 32. (a) | 33. (b) | 34. (b) | 35. (a) | 36. (c) | 37. (c) | 38. (b) | 39. (c) | 40. (c) |
| 41. (a) | 42. (d) | 43. (a) | 44. (a) | 45. (b) | 46. (d) | 47. (c) | 48. (d) | 49. (b) | 50. (d) |
| 51. (c) | 52. (c) | 53. (d) | 54. (c) | 55. (b) | 56. (a) | 57. (c) | 58. (c) | 59. (d) | 60. (a) |
| 61. (c) | 62. (a) | 63. (d) | 64. (c) | 65. (c) | 66. (d) | 67. (d) | 68. (d) | 69. (a) | 70. (d) |
| 71. (d) | 72. (d) | 73. (c) | 74. (a) | 75. (d) | 76. (a) | 77. (c) | 78. (b) | 79. (a) | 80. (a) |
| 81. (a) | 82. (c) | 83. (a) | 84. (b) | 85. (a) | | | | | |

EXPLANATION

- The gametes which are similar to each other are called Homogametes. Heterogametes differ from each other in shape and size.
- Strobilanthus kunthiana* is also called neelakuranji. It flowers in every 12 years.
- In non-primate mammals like cows, sheep, deer, dog, tiger, etc., physiological cyclic changes taking place during reproduction are called the oestrus cycle whereas in primates (monkey, apes, and humans) such cyclic changes are called the menstrual cycle.
- Grafting, a vascular connection takes place between the grafted tissues of stock and scion plants. The vascular cambium must be placed in contact with each other. The part selected for the role of roots is stock and the part selected for the stem is scion.

25. Oviparous animals are egg-laying animals that bear young ones in the egg stage of development outside the female body. It poses a greater risk of predation and lower survival rate. Viviparous animals bear living young that develop within the body of the mother thereby getting proper prenatal care and protection.
31. Ploidy: The number of sets of chromosomes in a cell or an organism.
40. Metamorphosis is a biological process by which animals, including insects, amphibians and few aquatic animals undergo extreme and rapid physical changes after birth. The effect of metamorphosis modifies the entire body of an organism.
55. A scion is grafted on a stock, the scion forms the vegetative part of the plant like stem, branches, leaves, flower, and fruit while the stock forms the root which helps in the absorption of water and minerals from the soil. The genotype of the scion affects the quality of fruit so it should be disease free.
61. During spermiogenesis, spermatids transform into motile spermatozoa or sperms. Spermiogenesis is a part of the spermatogenesis process.
62. Annuals plants complete their life cycle in one year while biennials plants complete their life cycle in two years. Hence, vegetative, reproductive and senescent phases are clearly visible. Perennials are the plants which grow for more than two years, so the demarcation of three phases is not clear and it is very difficult to identify these phases.
64. A hermaphrodite is an organism that has both kinds of reproductive organs and can produce both gametes associated with male and female sexes.
79. Scion bears the reproductive parts, the egg cells will have half the number of the chromosomes present in the scion, the stock has 48 chromosomes, the scion has 24 chromosomes ($2n$) and the eggs will have 12 chromosomes (n).
82. 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 ($2n$).
A seedling is a young plant So, the chromosome number in the cells of the seedlings will be 24 ($2n$), which will further give rise to new diploid individual.
83. A pistil has three parts, i.e., stigma, style and ovary. Ovary, the swollen part of the pistil contains ovule. Inside ovary ovule is attached to the placenta, either single or in cluster.
84. 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.
85. The whole plant body of maize including shoot tip cells remains in diploid ($2n$) 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., $2n = 20$. These microspore mother cells are further responsible for producing male gametes, i.e., haploid (n) by reduction division.

Input-Text Based Answers

I.	1. (c)	2. (b)	3. (a)	4. (a)	5. (d)
II.	1. (d)	2. (c)	3. (b)	4. (c)	5. (b)