CHAPTER 1

Reproduction in Organisms

1.0 Introduction

1. 'Nothing lives forever, but life continues'. What does it mean?
(a) Older die but new are produced due to reproduction.
(b) Nothing can produce without death.
(c) Death has nothing to do with the continuation of life.
(d) Parthenogenesis is must for sexual reproduction. *(1995)*

1.1 Asexual Reproduction

2. Offsets are produced by
(a) meiotic divisions (b) mitotic divisions
(c) parthenocarpy (d) parthenogenesis. *(NEET 2018)*

3. Which one of the following statements is not correct?
(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. *(NEET-II 2016)*

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

	Mode of reproduction	**Example**
(a)	Binary fission	*Sargassum*
(b)	Conidia	*Penicillium*
(c)	Offset	Water hyacinth
(d)	Rhizome	Banana *(2015)*

5. In ginger, vegetative propagation occurs through
(a) bulbils (b) runners
(c) rhizome (d) offsets. *(2015 Cancelled)*

6. Which one of the following is correctly matched?
(a) Onion–Bulb
(b) Ginger–Sucker
(c) *Chlamydomonas*–Conidia
(d) Yeast–Zoospores *(2012)*

7. Which one of the following pairs is wrongly matched while the remaining three are correct?
(a) *Penicillium* – Conidia
(b) Water hyacinth – Runner
(c) *Bryophyllum* – Leaf buds
(d) *Agave* – Bulbils *(Mains 2011)*

8. The "eyes" of the potato tuber are
(a) root buds (b) flower buds
(c) shoot buds (d) axillary buds. *(2011)*

9. Vegetative propagation in *Pistia* occurs by
(a) stolon (b) offset
(c) runner (d) sucker. *(Mains 2010)*

10. Vegetative propagation in mint occurs by
(a) offset (b) rhizome
(c) sucker (d) runner. *(2009)*

11. During regeneration, modification of an organ to other organ is known as
(a) morphogenesis (b) epimorphosis
(c) morphallaxis (d) accretionary growth. *(2001)*

12. Vegetative reproduction of *Agave* occurs through
(a) rhizome (b) stolon
(c) bulbils (d) sucker. *(1991)*

13. For union between stock and scion in grafting which one is the first to occur?
(a) Formation of callus
(b) Production of plasmodesmata
(c) Differentiation of new vascular tissues
(d) Regeneration of cortex and epidermis *(1990)*

1.2 Sexual Reproduction

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

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

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

17. Match column I with column II and select the correct option using the codes given below.

	Column I		**Column II**
A.	Pistils fused together	(i)	Gametogenesis
B.	Formation of gametes	(ii)	Pistillate
C.	Hyphae of higher ascomycetes	(iii)	Syncarpous
D.	Unisexual female flower	(iv)	Dikaryotic

(a) A-(iv), B-(iii), C-(i), D-(ii)
(b) A-(ii), B-(i), C-(iv), D-(iii)
(c) A-(i), B-(ii), C-(iv), D-(iii)
(d) A-(iii), B-(i), C-(iv), D-(ii) *(NEET-II 2016)*

18. Flowers are unisexual in
(a) China rose (b) onion
(c) pea (d) cucumber. *(2015)*

19. Product of sexual reproduction generally generates
(a) new genetic combination leading to variation
(b) large biomass
(c) longer viability of seeds
(d) prolonged dormancy. *(NEET 2013)*

20. Meiosis takes place in
(a) gemmule (b) megaspore
(c) meiocyte (d) conidia.
(NEET 2013)

21. Which one of the following is monoecious?
(a) *Marchantia* (b) *Cycas*
(c) *Pinus* (d) Date palm
(Mains 2010)

22. Which one of the following plants is monoecious?
(a) *Pinus* (b) *Cycas*
(c) Papaya (d) *Marchantia* *(2009)*

23. Why is vivipary an undesirable character for annual crop plants?
(a) It reduces the vigour of the plant.
(b) It adversely affects the fertility of the plant.
(c) The seeds exhibit long dormancy.
(d) The seeds cannot be stored under normal conditions for the next season. *(2005)*

24. 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 non-motile male gamete
(d) large motile female gamete and a small non-motile male gamete. *(2004)*

25. The process of series of changes from larva to adult after embryonic development is called
(a) regeneration (b) growth
(c) metamorphosis (d) ageing. *(1999)*

26. The oestrous cycle is a characteristic of
(a) human females only
(b) mammalian females other than primates
(c) human males only
(d) mammalian males other than primates. *(1995)*

27. The sexual reproduction is absent in
(a) *Spirogyra* (b) *Nostoc*
(c) *Ulothrix* (d) *Volvox.* *(1995)*

28. Parthenogenesis is
(a) development of embryo without fertilisation
(b) development of fruit without fertilisation
(c) development of fruit without hormones
(d) development of embryo from egg without fertilisation. *(1988)*

ANSWER KEY

1.	(a)	**2.**	(b)	**3.**	(c)	**4.**	(a)	**5.**	(c)	**6.**	(a)	**7.**	(b)	**8.**	(d)	**9.**	(b)	**10.**	(c)
11.	(b)	**12.**	(c)	**13.**	(a)	**14.**	(a)	**15.**	(a)	**16.**	(c)	**17.**	(d)	**18.**	(d)	**19.**	(a)	**20.**	(c)
21.	(c)	**22.**	(a)	**23.**	(d)	**24.**	(b)	**25.**	(c)	**26.**	(b)	**27.**	(b)	**28.**	(d)				

Hints & Explanations

1. (a) : Death is a natural process by which the individuals die either naturally or due to illness, accident, etc. But, before dying generally, individuals leave new individuals of their own kind through reproduction and thus the life continues.

2. (b) : Offset is a vegetative part of a plant formed by mitosis. Meiotic division occurs in reproductive organs during formation of gametes. Parthenogenesis is the formation of embryo from ovum or egg without fertilisation. Parthenocarpy is the fruit formed without fertilisation.

3. (c) : Potato, banana and ginger propagate vegetatively by their modified stems. Potato propagates by tuber which has buds over its eyes or nodes. These buds produce new plantlets. Banana and ginger propagate with the help of rhizomes which also have buds on nodes for the formation of new plantlets.

4. (a) : *Sargassum* is a brown alga. In brown algae, asexual reproduction occurs by means of spores and sexual reproduction varies from isogamy, anisogamy to oogamy.

5. (c) : The rhizome is a thickened, underground, dorsiventral stem that grows horizontally at a particular depth within the soil. It is brown in colour and shows cymose branching. It can be distinguished from the modified root by the presence of nodes, internodes, terminal buds, axillary buds and scale leaves. The rhizome are perennial and propagate vegetatively. They store food materials and appear tuberous. *E.g., Zingiber officinale* (ginger), *Curcuma longa* (turmeric), *Canna indica,* etc.

6. (a) : Yeast and other ascomycetes characteristically produce ascospores. *Chlamydomonas* is an alga and conidia are not found in algae. Ginger propagates by rhizome not by sucker. Onion propagates by bulb which is an underground, modified stem.

7. (b) : The examples of runners are doob grass, *Oxalis, Centella,* etc. These plants have long and thin internodes and branches creep over the surface of soil. Such plants develop adventitious roots at nodes on lower side. When long branches breakup by any method they form new plants.
Water hyacinth (*Eichhornia*) is the example of offset. This is sub aerial modification of stem. It is like runner but internodes are thick and short.

8. (d) : Potato is the common example of stem-tuber. It stores starch as reserve food material. The potato-tubers are used for vegetative propagation. These possess axillary buds over their nodes or eyes. The buds produce new plantlets when a stem-tuber or a part of it having an eye is placed in the soil.

9. (b) : In *Pistia* (water lettuce), vegetative propagation occurs by offset where one internode long runners grows horizontally along the soil surface and gives rise to new plants either from axillary or terminal buds.

10. (c) : Vegetative propagation in mint occurs through sucker.

11. (b) : There are two mechanisms of regeneration: morphallaxis and epimorphosis.
(i) Morphallaxis - It involves the reconstruction of the whole body from a small fragment by reorganising the existing cells. The regenerated organism is smaller than the original one, *e.g.*, *Amoeba*. However, after the completion of the process it grows and attains normal size after some time.
(ii) Epimorphosis - It replaces a lost organ of the body by proliferating new cells from the surface of the wound or injured part. Regeneration of an appendage in an arthropod, arm in a starfish and tail in a lizard occurs by the process of epimorphosis.

12. (c) : Vegetative reproduction in *Agave* occurs through bulbils. Bulbils are the specialised buds vegetative or floral that modify into a swollen structure. It separates from the parent plant and on approach of favourable condition gives rise to new plant.

13. (a) : Grafting is a technique in which cambium bearing shoot (scion = graft) of one plant is joined to cambium bearing stump (root system = stock) of a related plant through different unions like tongue grafting, wedge grafting, etc. In grafting, union between stock and scion produces undifferentiated mass of cells called callus. Therefore, for union between stock and scion in grafting, first to occur is the formation of callus. Callus is more or less corky secondary tissue developed by woody plants over a wound. It is derived from cambium.

14. (a) : Parthenogenesis is the spontaneous development of an embryo from an unfertilised egg cell. It naturally occurs in variety of plants, where parthenogenesis usually is found in combination with apomeiosis (the omission of meiosis) and pseudogamous (with or without central cell fertilisation), endosperm formation, together known as apomixis (clonal seed production). Parthenocarpy is development of fruit without fertilisation.

15. (a) : Certain bamboo species are monocarpic, *i.e.*, flower generally only once in their lifetime (after 50-100 years). Other plants (jackfruit, mango and papaya) are polycarpic, *i.e.*, produce flowers and fruits many times during their lifetime.

16. (c) : Sexual reproduction involves formation and fusion of male and female gametes. Gamete formation is accomplished through meiotic cell division which involves crossing over between non-sister chromatids of homologous chromosomes leading to new genetic recombination in gametes. Random fusion of these male and female gametes lead to the genetic variability in the offspring which although resemble their parents but also exhibit new traits of their own.

17. (d)

18. (d) : In cucumber, unisexual flowers, *i.e.,* separate male and female flowers are present on the same plant (monoecious plant).

19. (a) : Sexual reproduction always involves meiosis (zygotic in case of haploid individuals and gametic in case of diploid individuals). Meiosis results in crossing over between chromosomes during prophase I generating new recombinations. Besides, sexual reproduction generally involves combination of genes from two different organisms. Thus, sexual reproduction generates new genetic combinations leading to variations.

20. (c) : Gemmule and conidia are asexual propagules thus, no meiosis takes place in them. Megaspores are haploid which are formed as a result of meiosis of diploid megaspore mother cell. Meiocyte is any cell that undergoes meiosis.

21. (c) : Monoecious plants have separate male and female flowers on the same plant. *Pinus* have both the male and female cones or strobili on the same tree.

22. (a) : Monoecious plants have separate male and female flowers on the same plant. *Pinus* have both the male and female cones or strobili on the same tree.

23. (d) : An annual plant is one that completes its life cycle in a single season, *i.e.*, a seed germinates and the mature plant so produced dies, having produced seeds, within the season. Vivipary on the other hand is the phenomenon of germination of seed or spore *in situ* on mature plant even before it release. It is not possible for annual plants because in these plants, the mature plant cannot store seeds as it dies after producing seeds.

24. (b) : Oogamy is the sexual reproduction involving the formation and subsequent fusion of a large, usually stationary, female gamete and a small motile male gamete. The female gamete may contain nourishment for the development of the embryo, which is often retained and protected by the parent organism.

25. (c) : Metamorphosis is a process of series of changes of form from larva to adult after embryonic development. Regeneration is defined as replacement, repair or restoration of the lost or damaged structures or reconstitution of the whole body from a small fragment of it during the post-embryonic life of an organism. Growth is the result of greater anabolic (synthetic) processes over the catabolic (destructive) processes in the organism. Ageing may be defined as the progressive deterioration in the structure and functions of the cells, tissues and organs of an organism with the advancing age.

26. (b) : Oestrous cycle comprises cyclic changes in female reproductive system of non-primate mammals like cows, dogs, etc. The oestrous cycle consists of a short period of oestrous or 'heat' (*e.g.*, 18 hours in cow) followed by the rest of period of anoestrous or 'passive'. During oestrous, the female receives the male for copulation. During anoestrus, the female becomes passive and does not receive the male. Although the break down of tissues takes place in the female reproductive tract at the end of an oestrous cycle, yet there is no menstruation.

27. (b) : *Nostoc* belongs to Cyanophyceae. In this entire class sexual reproduction is completely absent. It reproduces by colony formation, hormogonia, akinetes, heterocysts and endospores. However genetic recombination has been observed. It may be probably through transformation or conjugation.
The other three algae- *Spirogyra*, *Ulothrix* and *Volvox* belong to Chlorophyceae. The members of this class show isogamous, anisogamous and oogamous type of sexual reproduction.

28. (d) : Development of an organism from female gamete/egg without involving fertilisation is parthenogenesis and when a fruit is developed by this technique it is called parthenocarpy.

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