Class 10 Questions on Asexual reproduction and reproduction in flowering plants

1. **Why do offspring produced by asexual reproduction show minimal genetic variation compared to sexually produced offspring?**

   Answer: Asexual reproduction involves a single parent and relies exclusively on mitotic cell division. DNA copying mechanisms replicate the parental genome with high fidelity, introducing only minor copying errors (mutations). Because there is no fusion of gametes or crossing over of chromosomes, offspring are genetically identical to the parent (clones).

2. **Why does *Amoeba* resort to encystment and multiple fission during unfavorable conditions instead of standard binary fission?**

   Answer: Binary fission requires favorable conditions (water, food, temperature) for normal growth and division. Under unfavorable conditions (drought, extreme temperatures), *Amoeba* secretes a hard protective three-layered wall (cyst) around itself to survive. Inside the cyst, the nucleus divides repeatedly by mitosis followed by cytoplasm division, forming many tiny amoebae (pseudopodiospores) that are released simultaneously when favorable conditions return.

3. **Why can a simple organism like *Planaria* regenerate its entire body from a severed fragment, whereas complex animals like mammals cannot regenerate lost limbs?**

   Answer: *Planaria* possesses a high concentration of specialized stem cells called neoblasts throughout its body. When cut, these unspecialized cells proliferate, migrate to the wound site, and differentiate into all required tissue types. Mammals have specialized, highly organized tissues and organs with limited stem cell populations, allowing only localized tissue repair (wound healing or scar tissue) rather than complete organogenesis.

4. **Spores of *Rhizopus* are present everywhere in the air, yet bread mold only develops on a moist slice of bread at room temperature, not on dry toast. Why?**

   Answer: Spores are dehydrated, dormant reproductive structures protected by thick walls. For spore germination, metabolic enzymes must be activated, which requires free water (moisture), organic nutrients (carbohydrates in bread), and optimal enzymatic temperature (room temperature). Dry toast lacks the moisture required to hydrate the protoplasm and initiate metabolic activity.

5. **Differentiate between fragmentation in *Spirogyra* and regeneration in *Hydra* based on cellular complexity and intent.**

   Answer:

   - **Fragmentation in *Spirogyra*:** Occurs in simple multicellular organisms with minimal tissue differentiation. The filament breaks naturally upon maturation into pieces, and each piece grows into a new individual as a dedicated mode of reproduction.
   - **Regeneration in *Hydra*:** Occurs in organisms with distinct tissue layers using specialized regenerative cells. It is primarily an accidental injury-repair mechanism rather than a routine method of reproduction.

6. **Why is vegetative propagation preferred by farmers for growing crops like banana, rose, and jasmine?**

   Answer:

   - These plants have lost the capacity to produce viable seeds or take a long time to mature from seeds.
   - It ensures **genetic uniformity**, preserving desirable traits (like fruit sweetness or flower fragrance) across generations.
   - Plants raised by vegetative propagation bear flowers and fruits much earlier than those raised from seeds.

7. **How does budding in single-celled Yeast differ structurally from budding in multicellular *Hydra*?**

   Answer: In Yeast (unicellular fungus), a bud arises as a small protuberance directly on the parent cell wall, followed by nuclear division, often forming long chains of attached buds (pseudomycelium). In *Hydra* (multicellular animal), a bud forms due to repeated mitotic cell division at a specific site on the body wall, developing miniature tentacles and a mouth before detaching as an independent organism.

8. **A farmer cuts a sugarcane stalk into several nodes and plants them in soil. Only nodes with an intact "eye" (axillary bud) produce new shoots. Why?**

   Answer: Axillary buds located at the nodes contain active meristematic tissue capable of cell division and differentiation into shoots and roots. The vegetative internode tissue consists mainly of parenchymatous storage cells that lack embryonic meristematic activity needed to initiate new growth.

9. **What would happen during wind or insect dispersal if pollen grains lacked the *exine* layer?**

   Answer: The exine is the tough outer coat of a pollen grain composed of **sporopollenin**, one of the most resistant biological materials known. Without it, pollen grains would quickly desiccate (dry out), degrade under environmental UV radiation, or be digested by ambient microbial enzymes before reaching a receptive stigma.

10. **A pollen grain from a mango tree lands on the stigma of a hibiscus flower but fails to form a pollen tube. What prevents cross-species fertilization?**

    Answer: The stigma secretes specific chemical signals (proteins and carbohydrates) that interact with surface receptors on the pollen grain. This **pollen-stigma compatibility dialogue** ensures species-specific recognition. Mango pollen is recognized as foreign ("incompatible") by the hibiscus stigma, inhibiting hydration and germination of the pollen tube.

11. **Trace the chemotropic movement of the pollen tube. How does it locate the ovule inside the ovary?**

    Answer: After a compatible pollen grain lands on the stigma, it germinates and produces a pollen tube. The tube secretes enzymes to penetrate the style tissue and grows down the style toward the ovary, guided by a chemical gradient (chemotropism) secreted by the **synergids** located inside the embryo sac at the micropylar end of the ovule.

12. **Why is the fertilization event in angiosperms described as "Double Fertilization"?**

    Answer: Angiosperms undergo two distinct fusion events inside the embryo sac from a single pollen grain carrying two male gametes:

    - **Syngamy:** One male gamete (n) fuses with the egg cell (n) to form a diploid zygote (2n).
    - **Triple Fusion:** The second male gamete (n) fuses with two polar nuclei (2n) to form the triploid Primary Endosperm Nucleus (PEN, 3n).

13. **If a leaf cell of a mustard plant has 24 chromosomes (2n = 24), calculate the chromosome number in its:**
    (a) Pollen grain cell
    (b) Zygote
    (c) Endosperm cell

Answer:

- (a) Pollen grain cell is haploid (n): **12 chromosomes**
- (b) Zygote is diploid (2n): **24 chromosomes**
- (c) Endosperm cell is triploid (3n): **36 chromosomes**

14. **In some bisexual flowers, the stamens mature and shed pollen days before the stigma of the same flower becomes receptive. How does this benefit the plant species?**

    Answer: This mechanism (known as protandry) prevents **self-pollination** (autogamy) and enforces **cross-pollination** (xenogamy). Cross-pollination combines genetic material from two different parent plants, increasing genetic variation in offspring, which enhances disease resistance and adaptability to environmental changes.

15. **Cross-pollination requires significant metabolic energy to produce colorful petals, nectar, and fragrances. Why do most angiosperms still favor it over self-pollination?**

    Answer: Continuous self-pollination leads to **inbreeding depression**, where harmful recessive alleles accumulate, reducing fertility, vigor, and environmental adaptability. Cross-pollination introduces fresh genetic combinations, boosting offspring fitness despite its higher initial energy cost.

16. **Why does the primary endosperm cell divide to form endosperm tissue slightly before the zygote starts dividing into an embryo?**

    Answer: The developing embryo requires a continuous supply of nutrients for cell division and organogenesis. The endosperm acts as a nutritive tissue rich in carbohydrates, proteins, and lipids. Pre-developing the endosperm ensures that adequate nutrition is available the moment the zygote begins embryonic development.

17. **What is the fate of the following floral parts post-fertilization?**
    (a) Ovary wall
    (b) Ovule
    (c) Petals and Sepals

    Answer:

    - (a) Ovary wall develops into the **pericarp** (fruit wall).
    - (b) Ovule develops into the **seed**.
    - (c) Petals and Sepals wither, dry up, and fall off (or occasionally persist as in brinjal/tomato sepals) as energy redirects toward seed and fruit maturation.

18. **Why is a dry, sealed seed dormant inside a storehouse, but germinates within days when exposed to moist soil and air?**

    Answer: Dry seeds have a low water content (10–15%) and extremely low metabolic activity. Water absorption (imbibition) hydrates tissues, softens the seed coat, and activates hydrolytic enzymes (e.g., amylase) that break down stored food into soluble sugars. Combined with oxygen for cellular respiration and favorable temperature, metabolic pathways restart, driving cell elongation and germination.

19. **How do unisexual flowers (e.g., papaya, cucumber) prevent autogamy, and can they prevent geitonogamy?**

    Answer: Unisexual flowers lack either stamens or carpels, completely preventing **autogamy** (pollen transfer within the same flower). However, if male and female unisexual flowers occur on the *same plant* (monoecious, e.g., cucumber), **geitonogamy** (transfer between flowers on the same plant) can still occur. If male and female flowers are on *different plants* (dioecious, e.g., papaya), both autogamy and geitonogamy are prevented.

20. **Parthenocarpic fruits (like commercial seedless bananas) develop without fertilization. What is the source of the fruit tissue in these plants?**

    Answer: The fruit tissue originates directly from the wall of the unfertilized ovary, stimulated by high endogenous levels of plant hormones (auxins and gibberellins). Because fertilization never takes place, no zygote or endosperm forms, resulting in a seedless fruit.