

CBSE Board
Class XII Biology
Sample Paper – 5 (Solution)

Section A

1. Immature fruits remain green in colour so that they are not easily spotted by animals.
2. It is concerned with the production of enzyme induced by an inducer so that latter can be metabolized.
3. Pyrogens are released by WBCs in order to set the body's thermostat at a higher temperature.
4. It is the capacity of organisms to blend with the surroundings.
5. *Agrobacterium tumifaciens*.
6. Gene therapy is the technique of replacement or alteration of a defective gene responsible for a hereditary disease.
7. In xeric plants, the leaves are reduced to spines, stems become fleshy, and stomata remain closed during the daytime and open at night.
8. Mutualism.

Section B

9. The presence of mitochondria in the middle piece of sperm provides energy to sperms for its movement. The absence of mitochondria makes the sperms immobile, which, in turn, cause no fertilization in the fallopian tube.

10.

| Monohybrid cross | Reciprocal cross |
|--|--|
| (a) It is a cross where two forms of a single trait are hybridized. | (a) It is a second cross involving the same strains but carried by sexes opposite to those in the first cross. |
| (b) It is one sided or both sided cross which deals with the transmission of a single trait. | (b) It is both sided cross which deals with the transmission of one, two or more traits. |

11. (a) DNA is the nucleic acid while DNase is the enzyme which digests nucleic acid.

(b) Following Griffith's study on the transforming principle, Avery, MacLeod and McCarty used DNase to infer that DNase are inhibiting transformation therefore it should be DNA responsible for transformation.

12. (a) The figure shows homologous organs depicting divergent evolution.

(b) It tells about common ancestry of the organisms which may look structurally different. This phenomenon is due to different adaptations to varying conditions of groups of common ancestral organism.

13. During the isolation of DNA in recombinant DNA technology, the fungal cell is heated with an enzyme called chitinase. The chitinase enzyme dissolves the chitin membrane to open the cell for release of DNA along with other macromolecules such as RNA, proteins, polysaccharides and lipids.

14. Gene gun is the new technology where vectorless direct gene transfer occurs in organisms. DNA coated onto microscopic pellets is directly shot into target cells. This technique is used to insert genes that promote tissue repair into cells near wounds, leading to a reduction of healing time.

15. Effect of UV Radiation on Humans:

- (i) It increases the incidence of snow-blindness cataract. It is caused due to inflammation of cornea in the presence of high dose of UV-B.
- (ii) It diminishes the functioning of immune system.
- (iii) It produces harmful mutations in humans.
- (iv) It causes aging of skin, damage to skin cells and various types of skin cancer.

16. Diapause is a stage of suspended development. Many zooplankton species in lakes and ponds undergo in this suspended development under unfavourable conditions. Hibernation is the winter sleep of an animal where it suspends its metabolic activities or maintain low metabolic rate.

17. If a predator is too efficient and overexploits its prey, the prey might become extinct and obviously, the predator will also become extinct for lack of food. That is why; the predators in nature are prudent.

18. (i) Sexual contact with infected person.

(ii) By transfusion of contaminated blood and blood products.

(iii) By sharing infected needles as in the case of intravenous drug abusers.

(iv) From infected mother to her child through placenta.

Or

The meristem is the part of the plant which is free of virus. The meristem of the plant is removed and grown in vitro to obtain virus-free plants. The scientists have been successful in culturing meristems of banana, sugarcane, potato, etc.

Section C

19. During fertilization, the pollen tube reaches into the ovule through the micropyle. One of the two gametes joins with the egg cell resulting in the production of zygote. This is called syngamy and other with the two polar nuclei producing a triploid primary endosperm nucleus. This is called as triple fusion. This completes the process of fertilization.

After fertilization, the ovule converts into the seed and the whole ovary develops into a complete fruit. The ovary wall forms the pericarp of the fruit. The integument of the ovule is converted into seed coat. The egg of the ovule divides mitotically and forms the multicellular diploid embryo.

20. (i) Each primary oocyte undergoes two maturation divisions (Meiosis I & II) and produces one ovum and three polar bodies with half the number of chromosomes.
- (ii) Polar bodies contain minute quantity of cytoplasm as they allow the ovum to have sufficient cytoplasm for extra chromosomal inheritance as well as for early development of embryo.
- (iii) During meiosis I, crossing over takes place which provides new combination of genetic material. This brings about variation and through them evolution takes place.
21. (i) It carries specific amino acids from the cytoplasm to the ribosomal sites for the formation of polypeptide chain according with the sequence specified by m-RNA.
- (ii) The t-RNA charged with the amino acid serves as an adaptor molecule to decode the information on the m-RNA.
- (iii) It elongates the polypeptide chain by the addition of several newly synthesized amino acids.

| | | | | |
|-----|---------|-----|--|-------------------|
| 22. | Parents | ... | Pure tall white | Pure dwarf red |
| | Genes | ... | DDrr | ddRR |
| | Gametes | ... | <div style="text-align: center;"> <hr style="width: 100%;"/> <div style="display: flex; justify-content: center; align-items: center;"> <div style="width: 10px; height: 20px; background-color: black; margin-right: 5px;"></div> <div style="text-align: center;"> DdRr </div> </div> </div> | |
| | | | | ...100% Tall pink |

F₁ generation:

On self fertilization: F₁ × F₁

| | | | | |
|---------|-----|----------------|---|----------------|
| Genes | ... | DdRr | × | DdRr |
| Gametes | ... | DR, Dr, dR, dr | × | DR, Dr, dR, dr |

| | | | | |
|----|-------------------|--------------------|--------------------|---------------------|
| | DR | Dr | dR | dr |
| DR | DDRR Tall Red | DDRr Tall pink | DdRR Tall Red | DdRr Tall pink |
| Dr | DDRr Tall pink | DDrr Tall white | DdRr Tall pink | Ddrr Tall white |
| dR | DdRR Tall Red | DdRr Tall pink | Ddrr Dwarf Red | ddRr Dwarf pink |
| dr | DdRr Tall pink | Ddrr Tall white | ddRr Dwarf pink | ddrr Dwarf white |

Phenotypic ratio: Tall Red = 3; Tall white = 3;
 Tall Pink = 6; Dwarf Red = 1;
 Dwarf white = 1; Dwarf Pink = 2.

Genotypic ratio:

DDRR = 1; DdRR = 2; Ddrr = 1; Ddrr = 2;
 DDRr = 2; DdRr = 4; ddRR = 1; ddrr = 1;
 ddRr = 2.

23. Pathogen: *Entamoeba histolytica*.

Mode of transmission: It spreads through ingesting contaminated cysts with food and water (faecal or route).

Symptoms:

(i) Pathogen erodes the mucus membrane of intestine and produces bleeding ulcers.

(ii) Mucus and blood comes along with stools.

24. (i) Chemical pesticides are quite expensive and its synthesis needs large amount of energy.

(ii) Their production pollutes the atmosphere.

(iii) Most of the chemical pesticide are washed away with the rain water and pollute the soil and water resources.

25. *Agrobacterium tumefaciens* is a wonderful plant pathogenic bacterium which can transfer part of its plasmid DNA as it infects host plants. Species of *Agrobacterium* produce tumor in almost all dicotyledonous plants. These bacteria contain large T_1 plasmids which pass on their tumor causing gene into the genome of the host plant. Gall is formed on the host plant. Therefore, these bacteria are known as 'natural genetic engineers' of plants as gene transfer takes place without human interference.

T_1 plasmid based vectors are now commonly used for genetic transformation.

26. Succession differences in terrestrial and aquatic systems:

| Terrestrial succession | Aquatic succession |
|---|---|
| (a) Lichens and mosses constitute the pioneer community. (b) This succession begins on a bare rock. (c) The climax community is generally dominated by trees. | (a) Phytoplankton and zooplankton constitute the pioneer community. (b) This succession begins in ponds. (c) The climax community is established with shallow water which later transformed into a terrestrial habitat. |

27. They undergo two types of adaptations i.e. lowering of water loss and adapting to arid conditions e.g., the kangaroo rat conserves water by excreting solid urine and can live from birth to death without even drinking water. The camels show unique adjustments to desert conditions, being very economical in water use, tolerant to wide fluctuations in body temperature and are able to maintain blood stream moisture even during extreme heat stress.

Or

The interaction of populations of two or more different species is known as population interaction.

No species on earth can live alone. Even a plant species which makes its own food, cannot survive alone and it needs soil microbes to break down the organic matter in the soil. In nature, animals, plants and microbes do not live in isolation but interact in various ways to form a biological community. These interactions may be beneficial, detrimental or neutral.

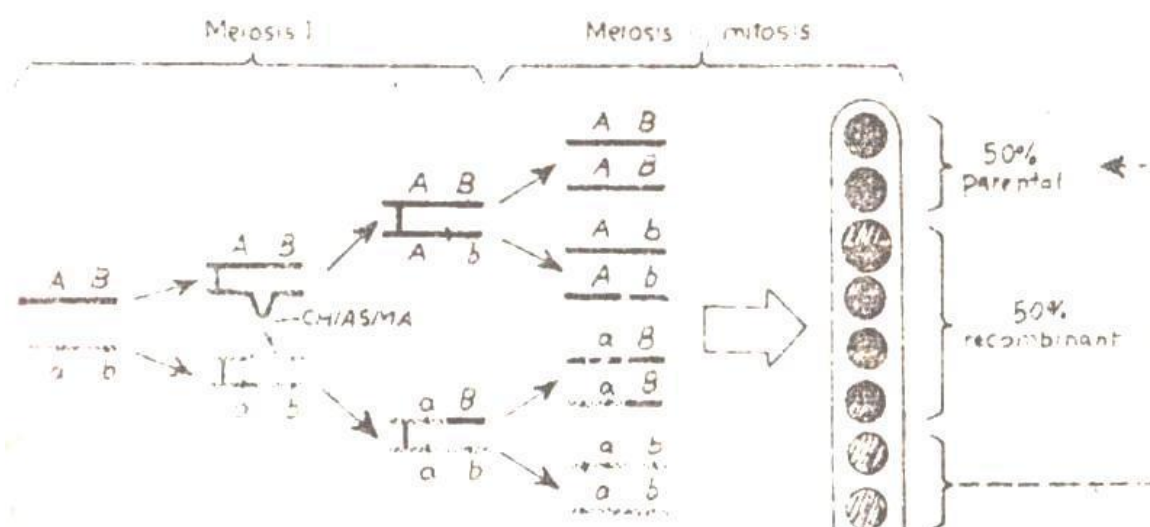
Section D

28. The goals of human genome project are:

- (i) To develop ways of mapping the human genome at increasing fine level of precision.
- (ii) Identify all the genes in human DNA.
- (iii) Determine the sequence of the 3 billion chemical base pairs that make up human DNA.
- (iv) To store this information in database and tools for data analysis.
- (v) To address the ethical, legal social issues that may arise from the project.

Or

The linked genes show recombination if they undergo crossing over. The crossing over always depends upon the distances between the various genes on the chromosome. If the genes are closely placed, then there are fewer chances of genes to get separated and hence no crossing over occurs. In this case, two types of gametes are produced, one carrying the paternal and other maternal linkage. If the distance between the genes is more, then the chances of crossing over and recombination are more. For example, if there are two genes A and B and their alleles a and b are found on the homologous chromosomes. If these genes undergo crossing over, then one chromatid of each homologous chromosome exchange its fragment while the other chromatid remains unaffected. In this case, four gametes are produced – two of the parental types AB and ab and two of the recombinant types Ab and aB.



Formation of 50% parental and 50% recombinants after a cross over.

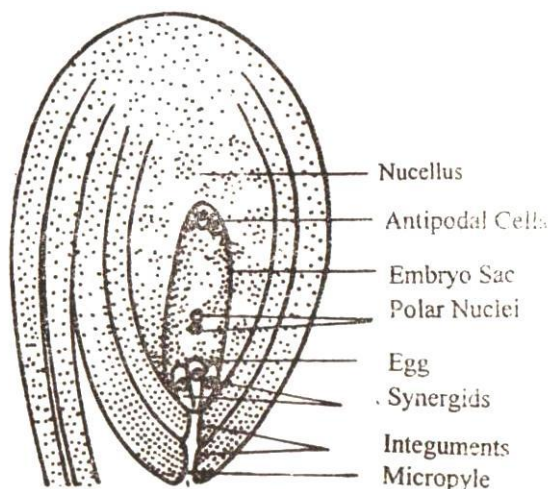
The 50% recombination occurs under two situations:

- (i) If the genes occur on separate chromosomes.
- (ii) If the genes are widely placed on the same chromosome, so that they may get separated due to cross-over.

29. (a) **Corpus luteum:** It secretes progesterone hormone that inhibits the production of gonadotropin hormone from the pituitary. This prevents the sloughing off uterine lining and supports to pregnancy.
- (b) **Endometrium:** It provides a place for implantation of the fertilized ovum. If fertilization fails to occur then sloughing off the endometrium lining takes place, leading to menstrual flow.
- (c) **Acrosome:** The acrosome carries the sperm lysin which facilitates the sperm to penetrate the ovum during fertilization.
- (d) **Sperm tail:** It provides mobility to the sperm with the head forward in the fluid medium.
- (e) **Fimbriae:** It increases the surface area for catching ovum during ovulation.

Or

The ovule is composed of a multilayered cellular tissue called the nucellus. The ovule is surrounded by one or two protective layers called integuments, leaving a small opening at one end termed as micropyle. The basal part of the ovule where nucellus, integuments and funicle merge is called as chalaza. The nucellus contains the embryo sac containing eight nuclei that arrange themselves into three groups. Three nuclei migrate at the micropyle end and form the egg apparatus, consisting of two synergids and a round egg cell. The synergids are special cellular thickenings at the micropylar tip called filiform apparatus. The other three nuclei arrange themselves at the chalaza end and form the antipodal cells. The remaining two nuclei come together as polar nuclei in the centre of the embryo sac.



30. (a) Water tanks, flowerpots and stagnant water.
(b) Dengue and Malaria.
(c) Gambusia and dragonfly.
(d) Values:
- a. Observation
 - b. Sensitivity towards health.