

Kerala Board
Class X Biology
Sample Paper – 7 (Solution)

Section A

1. The endosperm in maize seed is surrounded by aleurone sheath. It consists of proteins.
2. These are jumping genes which are capable of changing their locations from one place to another.
3. Thymus, lymph nodes and spleen.
4. Plasmids are largely used as vectors because they can move from one cell to another and make several copies of itself without affecting the bacterium.
5. It is the technique of genetic engineering to replace 'a faulty gene' by a normal healthy functional gene in humans.
6. Golden rice is a variety of rice (*Oryza sativa*) produced through genetic engineering to biosynthesize the precursors of beta-carotene (provitamin - A).
7. Organ system, Population, Community, Ecosystem, Biosphere.
8. Steller's sea cow and passenger pigeon.

Section B

9. The human ejaculate carries sufficient number of sperms in order to increase the probability of fertilization. The sufficient number of sperms die before they reach they reach the vicinity of an ovum and only one sperm is able to penetrate the ovum.

10.

Monohybrid cross	Dihybrid cross
(a) It is a cross where two forms of a single trait are hybridized.	(a) It is a cross differing between two traits.
(b) It reveals the Mendel law of segregation.	(b) It reveals the Mendel law of independent assortment of genes.

11. Point mutation (single based substitution) converting GAG codon to GUG. Hence, Glutamic acid in the original code is changed to valine after mutation. This is an autosomal recessive trait in humans. Sickle cell anaemia is caused due to this mutation.
12. Test cross is a cross between F1 hybrid and recessive parent. It confirms the purity of F1 hybrid whether it is homozygous or heterozygous.

Reciprocal cross is a second cross involving the same strains but carried by sexes opposite to those in the first cross. This is able to distinguish between nuclear, chromosomal and sex linked inheritance.
13. Limitations:
 - (i) ELISA test shows the reasonable degree of false positivity and fails to detect about 1.5 percent cases of true possibility.
 - (ii) The sign of the presence of HIV-virus is detected after few weeks. So, it creates difficulty in diagnosis and treatment of the HIV.
14. PCR stands for polymerase chain reaction.

Uses:
 - (i) PCR is routinely used to detect HIV in suspected AIDs patients.
 - (ii) It is used to detect mutations in genes in suspected cancer patients.
15. These people have physiological adaptation of having higher red blood cell count than people living in the plains. Their body remains adapted to low oxygen availability by increasing red blood cell production, decreasing the binding capacity of hemoglobin and by increasing breathing rate.
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.

Grazing Food Chain	Detritus Food Chain
(i) First trophic level organisms are detritivores and decomposers. (ii) It is based on energy from the sun.	(i) First trophic level organisms are producers. (ii) It is based on energy present in the detritus.

18. Production of CO_2 during fermentation gives the puffed appearance to the dough. Bacteria or yeast undergoes anaerobic pathway and produce the CO_2 gas for making the dough to rise.

Or

- (i) *Penicillium notatum*.
 (ii) *Trichoderma polysporum*

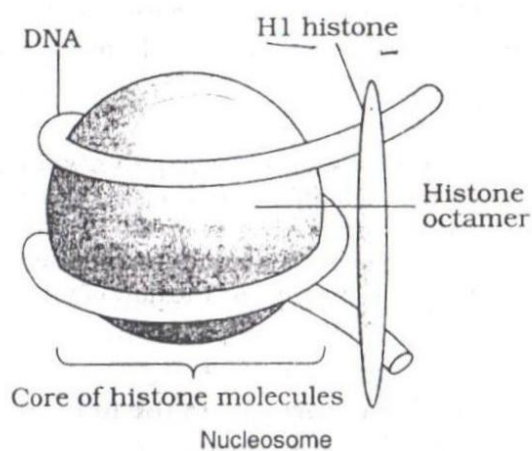
Section C

19. It is considered to be superior because:

- (i) It ensures about new genetic recombination and variability.
- (ii) It produces new and improved offspring.
- (iii) The defective and undesired characters are also removed by cross-pollination.
- (iv) It increases the adaptability of the offspring.
- (v) Plants produced by cross-pollination are more resistant to diseases.
- (vi) Plants formed by this method are high yielding.

20. At the age of puberty, a hypothalamic hormone called gonadotropin releasing hormone (GnRH) is secreted which acts at the anterior pituitary gland and stimulates secretion of two gonadotropins-luteinizing hormone (LH) and follicle stimulating hormone (FSH). LH acts at the Leydig cells and stimulates synthesis and secretion of androgens. Androgens stimulate the process of spermatogenesis. FSH acts on the Sertoli cells and stimulates secretion of some factors which help in the process of spermiogenesis.

21. In prokaryotes (E.coli), there is no definite nucleus but the DNA is not scattered throughout the cell. DNA is negatively charged which is held with some proteins (Positively charged) in a region called nucleoid. The DNA in the nucleoid is organized in large loops held by proteins. In eukaryotes, there are positively charged proteins called histones. It carries basic amino acid residues like lysines and arginines which have positive charges in their side chains. Histones are organized to form a unit of eight molecules called as histone octamer. The negatively charged DNA wraps around the positively charged histone octamer to form a structure called nucleosome. Nucleosomes constitute the repeating unit of a structure in nucleus called chromatin. The nucleosomes in chromatin are seen as beads-on-string structure under electron microscope. These are further packaged to form chromatin fibres and chromosomes. The packaging of chromatin at higher level requires additional set of protein called as non-histone chromosomal (NHC) protein.



22. Parents ... Pink flowers ' Pink flowers
- Genes ... Rr Rr
- Gametes ... R, r R, r
- Progeny:

	R	r
R	RR Red	Rr Pink
r	Rr Pink	rr White

Result = Red = 1; Pink 2; White = 1

Ratio = 1:2:1

23. Fever is caused by the toxin released by pathogens or pyrogens compounds released by WBCs in order to regulate temperature of the body. Fever is a natural defence mechanism because it stimulates the phagocytes and inhibits the growth of pathogens. Very high fever is risky and it must be lowered down by giving antipyretics and by applying cold treatment.

24. (i) Fish production can be increased by developing indoor hatcheries, nurseries, rearing and stocking methods. Fish eggs are introduced into nurseries where young ones hatched from the eggs are fed, nursed and harvested when fully grown.

(ii) Aquaculture techniques of induced breeding by the administration of pituitary hormones have helped in the seed fish in pure form.

(iii) These days, agriculturists culture the fish in their paddy fields. This is called paddy cum pisciculture.

25. These are:

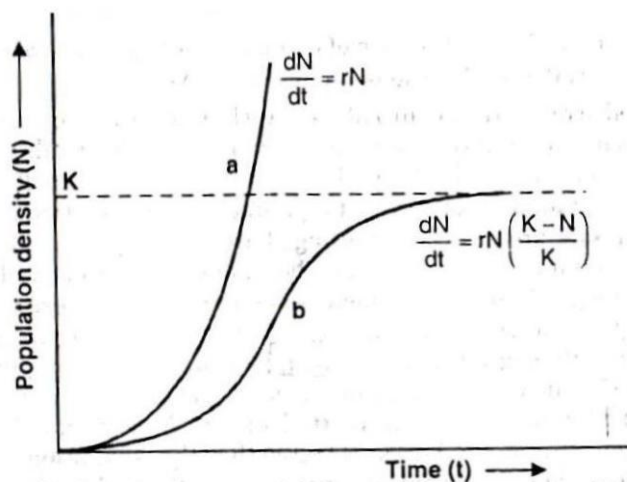
(i) Providing the best catalyst in the form of improved organism usually a microbe or pure enzyme.

(ii) Creating optimal conditions through engineering for a catalyst to act.

(iii) Downstream processing technologies to purify the protein or an organic compound.

26. The 'J' shaped growth (exponential) curve is obtained when the environment resistance does not exist in the natural predator free environment. The presence of plenty of food in the environment causes the organisms to grow exponentially and thus, no zero population growth is attained.

The 'S' shaped (sigmoid or logistic) growth curve is obtained when the environmental resistance exists in nature. Due to the presence of limited resources, the population firstly grows slowly and then exponentially until the individuals become so numerous. Then, the multiplication is checked by the factors of environmental resistance (limited resources) and population growth declines until zero population growth is obtained.



27. The factors affecting the rate of decomposition are:

- (i) **Temperature:** Detritus decomposes very rapidly within a few weeks or months in a climate characterized by higher temperature $> 25^{\circ}\text{C}$ and moist conditions. Low temperature $< 10^{\circ}\text{C}$ sharply reduces decomposition rate even if moisture is in plenty. For example, in regions of high latitude or altitude complete decomposition of detritus may require several years or decades.
- (ii) **Soil moisture:** Decomposition rate is slow under prolonged soil dryness even if the temperature remains high. High soil moisture fastens the decomposition rate.
- (iii) **Accumulation of substances:** The relative proportions of water-soluble substances including sugars, polyphenols. Lignin and nitrogen determine the chemical quality of detritus. Under the same climatic conditions, decomposition rate is lower if the detritus is rich in substances like lignin and chitin. The nitrogen rich detritus having low amounts of lignin decomposes relatively rapidly.

Or

Characteristics of Population:

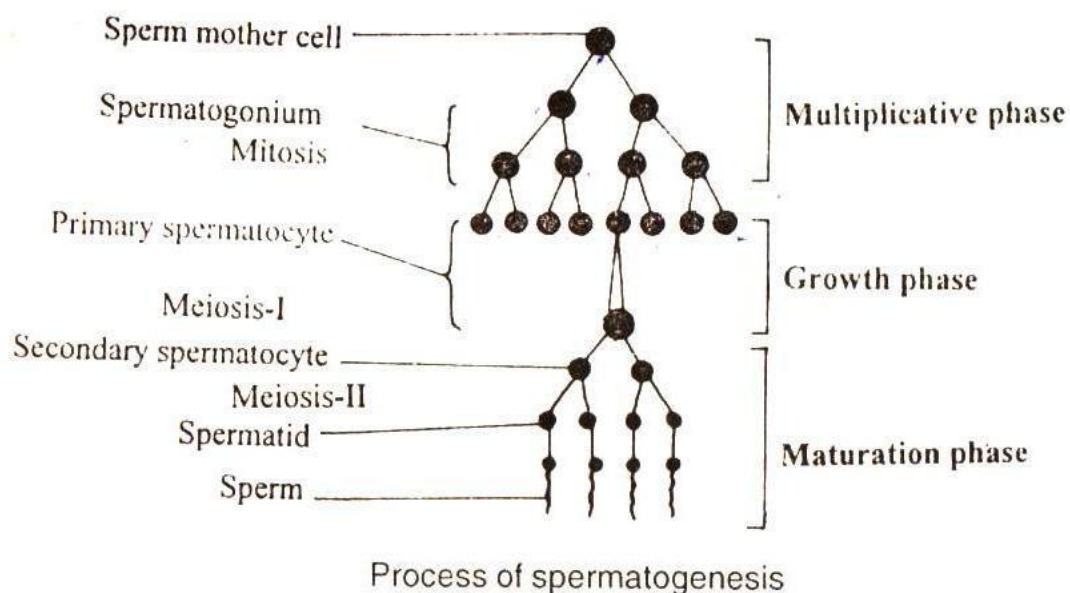
- (i) **Density:** It is expressed as total number of individuals per unit area or volume at a given time. The size-of the population is determined by the available resources like nutrients, water, etc. at a given time and other group properties such as natality, mortality and age structure.
- (ii) **Natality:** It is increase in number of individuals in a population under given environmental conditions. Birth, hatching, germination and even vegetative propagation cause. Increase in number of individuals.
- (iii) **Mortality:** The loss of individuals due to death in a population under given environmental conditions is called mortality.

Section D

28. **Spermatogenesis:** It is the process where sperm mother cells in seminiferous tubules of testes change into the haploid spermatozoans. It occurs in the seminiferous tubules of testes in males.

Stages of spermatogenesis:-

- (i) **Multiplicative phase:** During this phase, the sperm mother cells (spermatogonial cells) are differentiated from the germinal epithelium of the seminiferous tubules of testes. They divide repeatedly by number of mitotic divisions to form several daughter cells. They are called as spermatogonia diploid number of chromosomes. (2N)



- (ii) Growth phase: During this phase, the diploid spermatogonia undergo the process of spermatocytogenesis where they derive nourishment from the nursing cells. They grow and increase in their size due to accumulation of nutritive material. Then, each spermatogonium is called as primary spermatocyte bearing diploid number of chromosomes. In this phase, the primary spermatocyte prepares itself for entering into the maturation phase.
- (iii) Maturation phase: During this phase, the primary spermatocytes undergo two maturation divisions; the first meiotic division differentiates the diploid primary spermatocyte into two haploid (N) secondary spermatocytes. The second meiosis II differentiates each secondary spermatocyte into two spermatids. Thus, four haploid spermatids are formed by each spermatocyte. Later, spermatids are transformed into flagellated sperms by the process of spermiogenesis.

Or

Foetal Membranes – The developing foetus in the uterus of the mother forms four membranes and these are called as foetal membranes. These include chorion, amnion, allantois and yolk sac.

- (i) Chorion: It consists of outer ectoderm and inner mesoderm. This layer forms the placental villi and completely envelops the foetus to provide protection.
- (ii) Amnion: It consists of outer mesoderm and inner ectoderm. A space is formed between amnion and the foetus and is called as amniotic cavity. This cavity gets filled up with a clear watery fluid secreted by foetus and the membrane, an amniotic fluid. This fluid provides protection to the developing foetus against dessication, mechanical injury and shock etc.
- (iii) Allantois: It is sac like structure consisting of inner endoderm and outer mesoderm layer. It originates from primitive gut of an embryo nearby the yolk sac. It supplies blood vessels to the placental villi.
- (iv) Yolk sac: It is considered as vestigial in human beings. It consists of inner endodermal layer and outer mesodermal layer. In macrolecithal eggs of birds, the vitelline arteries and veins connect the yolk sac with the heart of an embryo. The enzymes of the yolk sac digest the yolk into a soluble form. The vitelline vein carries these soluble forms of yolk to the heart from where these are circulated to all parts of the developing embryo.

- 29.(i) Euploidy will occur. Wheat is an example of polyploidy (hexaploid) with 42 chromosomes (6 times multiple of normal haploid, $N = 7$).
- (ii) Aneuploidy will occur. It may be trisomic when diploid organism bears one chromosome extra ($2N + 1$) or a monosomic when the diploid has the loss of one chromosome ($2N - 1$). Down's syndrome is best known example of aneuploidy.
- (iii) Deletion. Cri-du chat syndrome.
- (iv) Translocation will occur. In certain leukemia, such as chronic myeloid leukemia (CML), the malignant cells have the chromosome 22 shortened due to translocation of a piece of its long arm.
- (v) Inversion will occur. It produces unbalanced meiotic products, thus leading to sterility.

Or

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.

30. (a) Water tanks, flowerpots and stagnant water.
 (b) Dengue and malaria.
 (c) Gambusia and dragon fly.
 (d) Values:

- i. Observation.
- ii. Sensitivity towards health.