

Nagaland Board
Class XII
Biology
Sample Paper 2 – Solution

PART A

1. (b)
The exine is made of two major layers—the outer sexine and the inner nexine. The sexine is further divided into the outer tectum and the inner endosexine. The nexine is made of the inner endexine and the outer foot layer.
2. (a)
To adapt (an animal or plant) to life in intimate association with and to the advantage of humans is called domestication.
3. (b)
The gene (*cry* gene) responsible for the production of toxin (Bt toxin) has been isolated from *Bacillus thuringiensis* and introduced into a new number of crop plants using *Agrobacterium* Ti plasmid mediated transformation. The new genetically modified Bt cotton is resistant to the bollworm complex.
4. (d)
Sacred grooves are the forest trees that are worshipped by the native tribal of the forest which are maintained by the state government or central government. The reason for the protection and conservation of sacred grooves is that the grooves are rich in endemic species, which are very rare and face the risk of extinction if encroached.
5. (d)
Adventitious buds are subnormal buds found at points along the stem. The stem is the trunk portion of the plant. The stock is the rooted supporting portion of one plant which is used for grafting.
6. The cross between two individuals of different species of the same genus is called interspecific hybridisation.
Resistance to yellow mosaic virus in Okra plant (*Abelmoschus esculentus*) was transferred from a wild species and resulted in a new variety of *Abelmoschus esculentus* called *Prathani Kranti*.
One advantage is that a disease-resistant variety is obtained

7.

First trophic level of detritus food chain	First trophic level of grazing food chain
Decomposers are the first trophic level.	Producers are the first trophic level.
They break down complex organic matter into a simpler form by secreting enzymes.	They prepare complex organic molecules from simple organic material by using sunlight.

8. The ecological importance of biodiversity are-

- (a) Biodiversity is required for maintaining and sustainable use of goods and services from ecosystem.
- (b) Various insects help in pollination.
- (c) Various micro-organisms help in the decomposition of organic matter thereby increasing the soil fertility.
- (d) Various drugs and medicines are extracted from plants.

9. The species that have been introduced from another geographic region to an area outside its natural range are called alien species or exotic species.

For example

- (i) Parthenium, Lantana and Eicchornia are the alien species of plants that have invaded the native species of India and caused environmental damage.
- (ii) Introduction of African catfish *Clarias gariepinus* for aquaculture purpose is posing threat to many indigenous catfish.
- (iii) Nile perch introduced into Lake Victoria in East Africa led to the extinction of cichlid fish.

10. If the rate of reproduction of phytoplankton slows down, then the net primary productivity decreases. As a result, the flow of energy will also decrease in the successive trophic level. The two factors which cause a reduction in phytoplankton reproduction are

- (a) Less water availability
- (b) Less nutrient availability

Or

The pyramid of biomass in a pond is generally inverted because the biomass of fish exceeds that of phytoplankton and the number of big fish eating the small fish is also greater than the small ones.

Also, in the pyramid of numbers, the number of insects feeding on a big tree is far greater than the tree. Now the number of small birds depending on the insects and the number of larger birds eating the smaller ones also increases in the order.

- 11.** As the anther develops, the cells of the sporogenous tissue undergo meiotic divisions to form microspore tetrads. As each cell of the sporogenous tissue is capable of giving rise to a microspore tetrad, each one is a potential pollen or microspore mother cell. The process of formation of microspores from a pollen mother cell (PMC) through meiosis is called microsporogenesis. As the anthers mature and dehydrate, the microspores dissociate from each other and develop into pollen grains. Inside each microsporangium, several thousands of microspores or pollen grains are formed that are released with the dehiscence of the anther.

- 12.** Ovary wall: Pericarp

Ovule: Seed

Zygote: Embryo

Outer integument: Testa

Inner integument: Tegmen

Primary endosperm nucleus: Endosperm

Or

- (i) Endosperm is the food laden tissue formed during the development of angiospermous seed which provides essential nutrients to the growing embryo and also the young seedling at the time of seed germination. So, most zygotes in angiosperms divide only after certain amount of endosperm is formed.
- (ii) The seeds in which the endosperm is used up are called exalbuminous seeds. In groundnut, the endosperm is used and the reserve food material is stored in cotyledons. So, groundnut seeds are exalbuminous. The seeds having ample amount of endosperm tissue are called albuminous seeds. Castor seeds have persistent endosperm. So, castor seeds are albuminous.
- (iii) Double fertilisation in angiosperms brings about some changes in the ovule during the development of seed. The micropyle remains in the form of a fine pore on the surface of seed to allow the entry of water during seed germination.
- (iv) Integuments of an ovule harden and the water content is highly reduced as the seed matures to ensure the survival of seeds.

13. The process of fusion of protoplasts of somatic cells obtained from different varieties or species of plant on a suitable nutrient medium *in vitro* to develop a somatic hybrid is called somatic hybridisation.

Various steps involved in somatic hybridisation are

(i) Single cells are isolated from a single plant.

(ii) The cell walls are digested by enzymes such as pectinase and cellulase to liberate the protoplasts.

(iii) Naked protoplasts surrounded only by plasma membranes are isolated.

(iv) The isolated protoplasts are fused to obtain hybrid protoplasts under sterile conditions in a nutrient medium.

(v) The hybrid protoplasts are cultured in a suitable media to form new plants.

Two uses of somatic hybridisation are

(i) Somatic hybrids may be produced.

(ii) Healthy plants can be recovered from diseased plants

Or

An algal bloom is a rapid increase or accumulation in the population of algae (typically microscopic) in an aquatic system. Algal blooms may occur in freshwater or marine environments. The fertility of a lake in an industrial area increases with inorganic chemicals and sewage, causing an increase of primary productivity and leading to an increased growth of algae. The decomposition of algae leads to reduction in oxygen quantity and death of aquatic life. This excessive richness of nutrients in a lake or other body of water, frequently due to run-off from the land, causes a dense growth of plant life called eutrophication.

14.

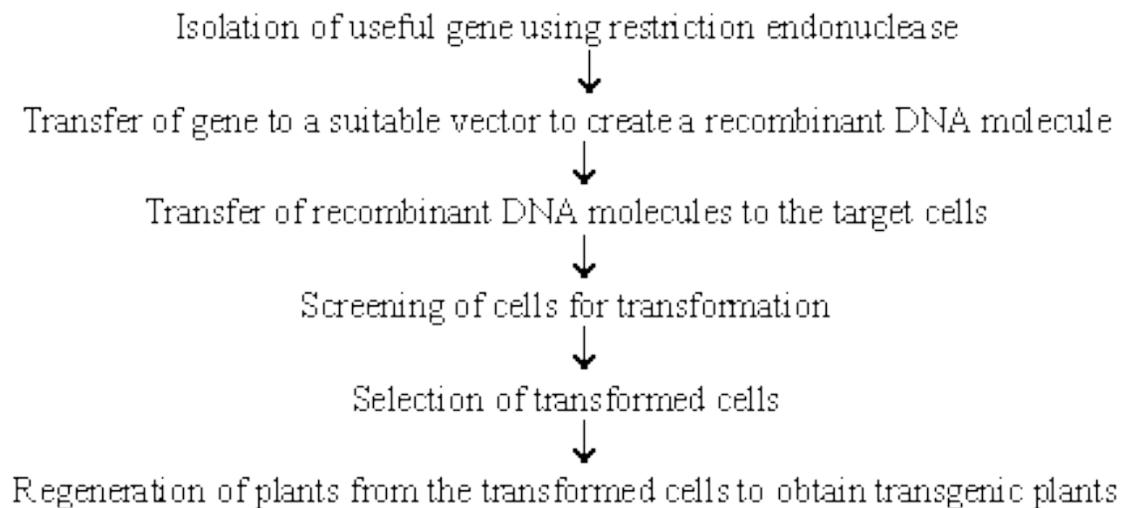
(a) Embryogenesis: The process of development of the embryo from the zygote is called embryogenesis. Development of the offspring from reproductive units such as buds or fragments in asexual reproduction is called blastogenesis. Both embryogenesis and blastogenesis have the same target - to develop a new individual by the process of cell division and differentiation.

(b) Syngamy: Syngamy is the process of fusion of one male gamete and one female gamete to form a zygote. It involves close association of gametes and all their acts resulting in the formation of a zygote including

the fusion of nuclei. The fertilisation, however, includes all the associated events which ultimately lead to syngamy.

Or

After identifying a useful gene in bacteria, following steps should be undertaken to transfer the gene to a plant:



PART B

- 1.** (c)
ZP3 receptors are glycoproteins found on the zona pellucida which recognise and bind the sperms and induce the acrosome to release hydrolytic enzymes.
- 2.** (c)
Propionibacterium sharmanii is used in the production of Swiss cheese. The bacterium gives the cheese its characteristic flavour and is responsible for the large holes in the cheese body.
- 3.** (c)
The baby produced by conceiving in a culture dish and nursing in the uterus is called a test-tube baby. The ovum is fertilised externally and thereafter it is implanted in the uterus.
- 4.** (a)
Psilocybin is obtained from the fruiting body of the Mexican mushroom *Psilocybe mexicana*. It is used as a hallucinogenic agent.
- 5.** (a)
The lists of endangered species are made in a Red Data Book that is maintained and released by International Union of Conservation Union.
- 6.** Cyanobacteria are the first oxygenic photoautotrophic organism. The effect of evolved oxygen on methane and ammonia of reducing atmosphere was oxygen oxidized methane to carbon dioxide and ammonia to nitrogen.
- 7.** *Streptococcus* bacterium produces streptokinase. It is used for removing clots from the blood vessels of a patient suffering from myocardial infarction or in a heart patient.
- 8.** Biopiracy refers to the use of bioresources by multinational companies and other organisations without proper authorisation from the countries and people concerned without compensatory payment. It can be prevented by developing laws to obtain proper authorisation and by paying compensatory benefits.
- 9.** The funnel-shaped proximal part of the fallopian tube is called infundibulum. Its margin bears motile, finger-like processes called fimbriae. The fimbriae bear cilia that beat towards the operature (called ostium) to direct the release of egg (from ovary) into the infundibulum

- 10.** Chorionic villus sampling (CVS) is a new technique which can be used during the 8th to 10th week of pregnancy when abortion is safe for the woman. For CVS, cells are sucked into a catheter passed through the vagina and cervix. This technique provides a mass of rapidly dividing foetal cells, thus facilitating the examination of chromosomal disorders

Or

The three major classes of RNA include tRNA, mRNA and rRNA. The function of tRNA is to transfer specific amino acids to a growing polypeptide chain during the ribosomal site of protein synthesis. The main function of the mRNA is to send the information of how to assemble the amino acids found to form protein in the ribosomes. rRNA are involved in protein synthesis.

- 11.** When more than one adaptive radiation appeared to have occurred in an isolated geographical area and two or more groups of unrelated animals resemble each other for similar mode of life or habitat is called convergent evolution. Example- Australian marsupials, placental mammals.

The evolutionary process which produces new species diverged from a single ancestral form and adapted to new invaded habitats is known as divergent evolution or adaptive radiation. Example- Forelimbs of man, whales, bats, cheetah perform different functions as they have similar anatomical structure.

- 12.** The different population attributes which an individual does not possess are population density, population growth, mortality rate, natality rate, sex ratio and age distribution.

(i) Population density: It is the number of individuals of a species per unit area or volume.

(ii) Population growth: Increase in the number of population which resides in a particular geographical area.

(iii) Mortality rate: It is expressed as the number of deaths per 1000 individuals of a population per year.

(iv) Natality rate: It is expressed as the number of births per 1000 individuals of a population per year.

(v) Sex ratio: The ratio of males to females in a population.

(vi) Age distribution: The proportionate numbers of persons in different age categories in a given population.

(Any four)

Or

The chromosomal theory of inheritance was proposed independently by Walter Sutton and Theodore Boveri in 1902. According to this theory,

1. As the sperm and the egg cells serve as a connecting link from one generation to the other, all the hereditary characters must be carried in them.
 2. The hereditary factors are present in the nucleus of cells.
 3. Like Mendelian alleles, chromosomes are also found in pairs.
 4. The sperm and egg having haploid sets of chromosomes fuse to re-establish the diploid state.
 5. The genes are carried on the chromosomes.
 6. Homologous chromosomes synapse during meiosis and get separated to pass into different cells. This forms the basis of segregation and independent assortment.
- 13.** Reproductive health means total well-being in all aspects of reproduction, i.e. physical, emotional, behavioural, social and physiological. Following measures are to be taken to make people aware of reproductively healthy society:
- (i) Providing infrastructural facilities and professional expertise to attain reproductive health.
 - (ii) Educating people about birth control methods, care of pregnant mothers, importance of breast feeding, safe and hygienic sexual practices and safeguards against STDs.
 - (iii) Introduction of sex education in schools to give proper information to young minds about sex-related aspects.
 - (iv) Help of audio-visual and print-media to create awareness among people about reproduction-related aspects.
 - (v) Awareness of problems due to population explosion, social evils such as sex abuse and sex-related crimes.
 - (vi) Statutory ban on amniocentesis to legally check female foeticides

Or

GEAC (Genetic Engineering Approval Committee) was set up by the Ministry of Environment and Forests to regulate research, testing and commercial release of GM crops, foods and organisms.

The objectives of GEAC are:

1. To permit the use of GM organisms and their products for commercial purposes
2. To adopt procedures for restriction, production, scale, import, export and applications of GM organisms
3. To approve for conduct of large scale field trials and release of transgenic crops in the environment
4. To authorise agencies or persons to have large scale production and release of GM organisms into the environment or curb and take strict actions against them

14. Functions of human placenta:

1. Nutritive organ: Food materials pass from the mother's blood into the foetal blood through the placenta.
2. Digestive organ: The trophoblast of the placenta digests proteins before passing them into foetal blood.
3. Respiratory organ: Oxygen diffuses from the maternal blood into foetal blood through the placenta. Carbon dioxide diffuses from the foetal blood into the maternal blood also through the placenta for elimination by the mother's lungs.
4. Excretory organ: Nitrogenous wastes pass from the foetal blood into the maternal blood through the placenta for elimination by mother's kidneys.
5. Endocrine organ: Placenta secretes (hCG), estrogen, progesterone and human placental lactogen.
6. Storage organ: The placenta stores glycogen for the foetus before liver is formed.
7. Barrier: Many substances pass from the mother to the foetus via placenta and cause abnormal development in the developing foetus.

Or

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