Class – XII
SUB – BIOLOGY

General Instruction:

1. All the questions are compulsory.
2. There are 26 questions in total. The question paper consists of 5 sections, A, B, C, D and E. Section **A** contains 5 questions of **one** mark each, Section B contains 5 questions of **two** marks each, Section **C** contains 12 questions of **three** marks each, Section **D** contains one question of **four** marks and Section **E** contains 3 questions of **five** marks each.
3. There is no overall choice. However, an internal choice has been provided in **one** question of 2 marks, **one** question of 3 marks and all **three** questions of 5 marks weightage. A student has to attempt only **one** of the alternatives in such questions.
4. Wherever necessary, labelled diagrams should be neat, drawn and labelled properly.

SECTION A

1. Mention the work carried out by Boyer and Cohen that contributed in biotechnology.

2. The base sequence in one of the strands of DNA is GGGATTACCTA. Give the base sequence of its complementary strand.

3. Do eukaryotes possess restriction enzymes? Why?

4. What is passive immunization?

5. Why is *Eichhornia crassipes* named as Terror of Bengal?

SECTION B

6. a) Name the pioneer organisms on a bare rock.
b) How do pioneer species help in establishing the next type of vegetation?

7. How Rosie differs from normal cows?

8. Explain GPP and NPP.

9. Explain the two factors responsible for conferring stability to double helical structure of DNA.

10. How is cleavage different from mitosis although both are equational divisions?

OR

A mother of one year old son wanted to space her second child. The doctor suggested her Saheli. Explain its contraceptive action.

SECTION C

11. a) Where do the signals for parturition originate in humans?
b) Why is it important to feed the newborn babies on colostrum?

12. Give one variety of following plants with disease resistance.
a) Wheat - Hill blunt
b) *Brassica* - White rust
c) Cauliflower - Curl blight black rot
d) Cowpea - Bacterial blight

OR

a) Describe any two methods to force an alien DNA or recombinant DNA into a host cell.
b) A recombinant DNA constructed with human DNA was introduced into a bacterial cell, but the transgenic cell did not produce the desired protein. What could be the reason for it?

13. Hemophilia victims are mostly men. Very rarely women are affected by it. Explain.

14. How does transmission of each of the following diseases take place?
a) Amoebiasis
b) Ascariasis
c) Pneumonia

15. What is DNA fingerprinting? Mention its applications.

16. State in what ways Stanley Miller simulated the conditions of:
a) Primitive atmosphere on earth
b) Energy source at the time of origin of life and
c) Formation of organic molecules of life to prove the theory of chemical evolution.

17. a) State Hardy-Weinberg principle. Name any two factors which affect it.
b) Draw a graph to show that natural selection leads to directional change.

18. What are with drawl symptoms? List the common with drawl symptoms of drug abuse.

19. Write short notes on ecological pyramids.

20. Define–
a) Convergent evolution,
b) Divergent evolution,
c) Progressive evolution

21. What is pedigree analysis? Why pedigree analysis is done in humans to detect genetic diseases?

22. a) Mention the benefits of using CNG over petrol and diesel.
b) Define metastasis

OR

a) Expand BOD.
b) At a particular segment of a river near a sugar factory, the BOD is much higher than the normal level. What is it indicative of? What will happen to the living organisms in this part of the river?

SECTION D

23. Give reasons for-
a) Both strands of DNA are not copied during transcription
b) Transcription and translation in bacteria can be coupled
c) Differentiate between process of transcription in prokaryotes and eukaryotes.

OR

One chromosome contains one molecule of DNA. In eukaryotes the length of the DNA molecule is enormously large. Explain how such a long molecule fits into the tiny chromosomes at Metaphase.

24. Name the genes that constitute an operon. How does lac operon get switched on in the presence of lactose?

OR

What is a genetic code? What are its main properties?

25. Explain the following-
a) Elephantiasis
b) Ringworm

OR

What are the evidences of evolution? Categorize them and explain briefly with examples. Explain how natural selection and branching with descent are involved in evolution?

SECTION E

26. Neelam went to a fair. After a day she was unwell, when she went to the doctor it was diagnosed to be Amoebiasis.
a) What is Amoebiasis?
b) How it is transmitted?
c) What are its symptoms?

(Answers)
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SECTION A

1. Cohen and Boyer were the first to produce a recombinant DNA by attaching an antibiotic resistance gene to plasmid of *Salmonella typhi*.

2. CCCTAATGGAT

3. No. Due to the complexity of their genome structure and absence of plasmids in them.

4. Passive immunization deals with the injection of antibodies, antitoxins and antivenoms to patients when quick response is required such as due to snake bite

5. It is an invasive aquatic weeds growing in large numbers in water bodies of Bengal and consume dissolved oxygen of water bodies killing aquatic animals.

SECTION B

6. Lichens in temperate areas and blue green algae in tropical areas. These pioneer species settle down over rock surface and secrete carbonic acid which cause etching of rock surface creating small pores for gathering of organic matter, dust and water. These invite the next type of vegetation.

7. Rosie produces milk having high protein content to the extent of 2.4 gm/litre than normal cows. Also it has high lactation period.

8. The total amount of energy captured by the producers during photosynthesis per unit time per unit area is GPP. NPP is the amount of energy or biomass stored by the producers per unit area per unit time.
NPP = GPP- R

9. Huge number of hydrogen bonds and phosphodiester linkage.

10. In cleavage size of daughter cells decreases while that in mitosis remains the same. In cleavage interphase is of shorter duration while in mitosis interphase is of longer duration.

OR

Saheli- Instead of using the hormone estrogen to prevent pregnancy, it contains a drug that blocks estrogen. By blocking estrogen in the uterus, Saheli alters the uterus' lining, which prevents a fertilised egg from implanting.

SECTION C

11. a) Signals for parturition originate from fully formed foetus and placenta.

b) Because it has proteins, lactose and antibodies with little fat content.

12. a) Himgiri
b) Pusa swarnim
c) Pusa Shubhra and
d) Pusa Komal

OR

a) Micro injection – Here recombinant DNA is directly injected into the nucleus of an animal cell.
Biolistics – Here cells are bombarded with high velocity micro particles of gold or tungsten coated with DNA. This method is suitable for plants.

b) The recombinant DNA constructed out of human DNA will not survive because bacteria DNA is mostly in the form of plasmids and circular while human DNA is linear and is present in the nucleus which is absent in bacteria. Further human DNA is more complex while bacterial genome is relatively simple.

13. It is a sex linked recessive disorder in which human females are generally carrier of this disorder and remain normal throughout their life. If double recessive condition appears in a female, the same dies before birth. Human males suffer from this disorder because of the hemizygous nature of most sex linked traits. The defective males are either given blood transfusion or required clotting factor for leading a healthy life.

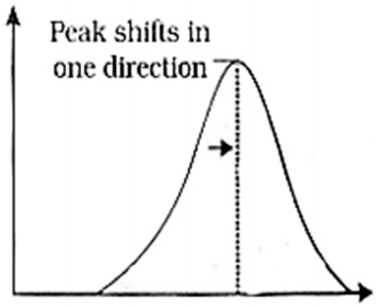
14. a) Amoebiasis is transmitted through the cysts present in the stool of the infected person. Some animals like cat, dog carry the infection also. Faulty disposal of faeces causes pollution of water and eatables through the agency of houseflies.
b) Ascariasis is spread through improper disposal of human stool containing roundworm eggs. Dirty hands may spread the disease directly. Children get the infection from ingestion of contaminated soil.
c) Pneumonia is transmitted through droplets, used tissues or handkerchief of infected person, sharing needles and utensils.

15. DNA fingerprinting is the technique that is used for detection of nucleotide sequences in certain areas of DNA that are unique to every individual. DNA fingerprinting is used in the following cases-
Identification of criminals involved in crimes.
To solve disputes relating to paternity-maternity disputes.
To establish the closeness of relation of an intending immigrant.
To gather information regarding human lineage and relationship with other apes.

16. a) In a closed flask containing NH_3, CH_4, H_2 and Water Vapour to simulate primitive atmosphere
b) Electric discharge to simulate on primitive earth
c) Formation of compounds like amino acids from simple molecules like NH_3, CH_4, H_2.

17. a) Hardy-Weinberg principle states that "Allele frequencies in a population are stable and is constant from generation to generation".

b)



18. If regular dose of alcohol/drug is withdrawn, the side effects (characteristic and unpleasant) observed in the body of the addict is known as with drawl symptoms. These include anxiety, shakiness, nausea and sweating. In some cases withdrawal symptoms is severe and even life threatening.

19. The graphical relationship between the different biotic components of an ecosystem are known as ecological pyramids. The base of a pyramid is broad and it narrows down at the apex. The base of each pyramid represents the producers or first trophic level while the apex represents the top level consumers. Ecological pyramids are of three types – Pyramid of number, Pyramid of biomass and Pyramid of energy. Pyramid of number takes into account the number of organisms at each trophic level while pyramid of energy depicts the energy flow at different trophic levels.

20. a) Divergent evolution in that evolution in which same structure developed along different directions due to adaptations to different needs.

b) Convergent evolution in that evolution in which different structures evolve for same functions and hence shoe similarity.

c) Progressive evolution is moving forward in a particular direction showing specialization of structures already in existence.

21. An analysis of traits in several generations of a family is called pedigree analysis. Here the inheritance of a particular trait is represented in the family tree over generations. Due to complexity of genes and huge structure of the human genome, control crosses are not possible in human, so pedigree analysis is the only alternative for detecting genetic disorders.

22. a) Advantages of using CNG over petrol and diesel are

i) It is cheaper.

ii) Burns very efficiently to completion and hardly any residue is left behind.

iii) CNG cannot be siphoned off by thieves.

iv) It cannot be adulterated and very few pollutants can be released.

b) Malignant tumors are dislodged from their original places and migrate through blood and lymph and tissue fluid to reach and infect newer organs of the body. This phenomenon is called metastasis.

OR

a) Biological/Biochemical Oxygen Demand
b) It is indicative of water pollution at that concerned place due to discharge of wastes from sugar factory directly into the river bodies. This will deplete the dissolved oxygen content of water leading to mortality of fish and other aquatic organisms.

SECTION D

23. a) Because that would produce complementary RNAs with a tendency to form double stranded structure which would not be functional. Even if both RNA strands are functional, they would produce two kinds of proteins with opposite sequence of amine acids. Only of the proteins will be functional
b) This is because in bacterial cells there is no compartmentalization between nucleus and cytoplasm so mRNA after formation need not be transported out of the nuclear region. The genome in bacterial cell is also polycistronic.
c)

Prokaryotic Transcription	Eukaryotic Transcription
It occurs in the cytoplasm	It occurs inside the nucleus and other semi-autonomous organelles.
Only one polymerase is involved	Three types of polymerases are involved
Splicing is not required	Splicing is required.

OR

In eukaryotes DNA is packaged with the help of a set of positively charged basic proteins called histones which are rich in basic amino acids, lysine and arginine. Therefore they carry positive charges on their side chains. Histones and DNA are organized to form nucleosomes. Nucleosomes are formed of 4 pairs of histone molecules which contain positive charge. They attract negatively charged DNA. DNA of about 200 bp makes 1.75 turns over the octamer to form a Nucleosome. Nucleosome DNA appearance is like a beaded string under the electron microscope.

24. An operon consists of minimum four types of genes—regulator, promoter, operator and structural.
In the presence of inducer, lactose the lac operon remains functionally active. The inducer binds to the repressor and makes it inactive changing its shape. Due to inactivity of the repressor the operator gene becomes active and allows the RNA polymerase to pass over the promoter and reach the structural genes for transcription. Consequently the products of the structural genes are formed.

OR

Genetic code is the genetic information present in the nucleotide sequences of DNA with three consecutive nucleotides functioning as a codon in anon-overlapping fashion.
Characteristics include-
a) Genetic code is triplet code where three adjacent nitrogenous bases specify one amino acid.
b) Three successive nitrogenous bases code for only one amino acid. None of these becomes part of any other codon.

c) Same codon specifies the same amino acid from bacteria to human beings with exceptions in viral and mitochondrial genes.
d) The total codons are 64. Most of them specify amino acids with some functioning as start and stop codons.
e) Out of 64 codons only 3 are stop codons. Rest specifies amino acids.

25. a) **Elephantiasis** is a helminthic disease where the parasite lives inside lymph nodes or connective tissues but the young ones migrate to blood vessels for being picked up by mosquito to turn them into infective form. It is due to a nematode *Wuchereria bancrofti*. The pathogen is spread from one huma being to another through mosquitoes like *Culex* and to a less extent by *Anopheles* and *Aedes.* Symptoms include increase eosinophils, enlarged lymph nodes, filarial fever followed by permanent swelling of feet. Thighs, genitals etc. This disease can be cured by drugs like hetrazan, diethyl carbamazine etc.

b) **Ringworm** are fungal infection caused by species of *Microsporum*, *Trichophyton* and *Epidermophyton*. There are dry scaly lesions on skin, nails and scalp that causes itching. Heat and moisture promote growth of these fungi especially in skin folds. Common source of infection are soil and towels, clothes, combs of infected person.

OR

The different evidences of evolution are Paleontological evidences, Evidences from Morphology and Anatomy, Embryological evidences, Cytological evidences and Biochemical evidences.

Paleontological evidences mainly deals with fossils and fossil impressions and is the study of past life. Fossils are of several types like impressions, compressions etc.

Morphological and anatomical evidences deal with homologous organs, analogous organs, vestigial organs etc. These organs provide us information about convergent or divergent evolution by comparing the structure and functions of different organs.

Embryology is the development of embryo from zygote till it becomes an offspring. Embryology provides a number of evidences in support of evolution.

Cytological evidences such as cellular nature, organelle structure, methods of cell division etc. provides evidences of evolution of various forms from common ancestors.

Biochemical evidences deals with comparative studies of metabolic processes, enzymes, hormones, blood and various other biomolecules which show a close similarity amongst various organisms.

Two key concepts of Darwin's theory of Evolution are branching descent (adaptive radiation) and natural selection (convergent evolution). Natural selection operates through interaction between environment and variability found in populations naturally. Formation of new species in the same or different geographical aread is not so straight. Environment does not remain stable. It shows so many vageries that many individuals perish and a new set of variations become established. It changes the path of evolution forming newer species of same or different kind within the same geographical area.

SECTION E

26. a) It is an acute infectious disease caused by a bacterium known as *Salmonella typhi*.

b) Typhoid spreads through milk, food and water contaminated with intestinal discharges and urine either directly or through flies and faulty personal and public hygiene.

c) Sustained high fever, loss of appetite, stomach pain, constipation, headache and weakness are some of the common symptoms of typhoid.