

BIOLOGY (Theory)*Time Allowed: 3 hours**Maximum Marks: 70***General Instructions:**

- (i) *All questions are compulsory.*
- (ii) *This question paper consists of four Sections A, B, C, D and E. Section A contains 5 questions of **one** mark each, Section B is of 5 questions of **two** marks each,*
- (iii) *Section C has 12 questions of **three** marks each and Section D is of 1 questions of **four** marks each Section E is of 3 questions of **five** marks each.*
- (iv) *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 the three questions of **5** marks weightage. A student has to attempt only one of the alternatives in such questions.*
- (v) *Wherever necessary, the diagrams drawn should be neat and properly labelled.*

Section A

1. Which metabolic process causes a reduction in the Gross Primary Productivity? 1
2. Tapeworms possess both male and female reproductive organs. What is the name given to such organism? Give two more examples of such organisms. 1

3. What is 'saltation' according to de Vries? 1
4. Identify the **two** correct statements from the following:
- a. Apiculture means apical meristem culture.
 - b. Spinach is iron-enriched.
 - c. Green revolution has resulted in improved pulse-yields.
 - d. Aphids cannot infest rapeseed mustard. 1
5. Identify the sex of organism as male or female in which the sex chromosome are found as
- a. ZW in bird
 - b. XY in *Drosophila*
 - c. ZZ in birds.
 - d. XO in grasshopper. 1

Section B

6. A sugarcane plant is infected with a virus. Name and explain a method to obtain virus-free plants from it. 2
7. List four causes of biodiversity loss. 2

OR

- Why is 'starter' added to set the milk into curd? Explain. 2
8. List four features which enable the Xeric plants to survive in the desert conditions. 2

9. Bryophytes and Pteridophytes produce a large number of male gametes but relatively very few female gametes. Why? 2
10. Why is charging of *t*-RNA necessary during translation process? 2

Section C

11. a. Explain the events that occur during fertilization of an ovum in humans. How is it that only one sperm enters the ovum?
b. Name an IUD that you would recommend to promote the cervix hostility to the sperms. 3
12. a. Name two metals used in a catalytic converter. How do they help in keeping the environment clean?
b. Where is good ozone present? Why is it called so? 3
13. a. Name the drug obtained from *Cannabis sativa* and write its effects on the human body.
b. A boy has been diagnosed with ADA-deficiency. Suggest any one possible treatment.
c. What is the role of histamine in inflammatory response? 3
14. In snapdragon (*Antirrhinum majus*) a plant with red flowers was crossed with a plant with white flowers. Work out all the possible genotypes and phenotypes of F1 and F2 generations.

- Comment on the pattern of inheritance in this case. 3
15. A tRNA is charged with the amino acid methionine. 3
- Give the anti-codon of this tRNA.
 - Write the Codon for methionine.
 - Name the enzyme responsible for binding of amino acid to tRNA.
16. a. State the Hardy-Weinberg principle. 3
- When there is a disturbance in the Hardy-Weinberg equilibrium, what would it result in?
 - According to this principle, what is the sum total of all allelic frequencies?
17. a. What are Single celled Proteins? 3
- Give two advantages.
 - Give two examples of micro-organisms cultured on an industrial scale as source of good protein.
18. Draw a labeled sketch of a bacteriophage. 3

OR

- Name the causative organisms for the following diseases:
 - Typhoid
 - Pneumonia
 - Common cold
- How can personal hygiene help control such diseases? 3

19. Rohan watched a TV program based on life in desert region. She observed that many animals in desert region possess smaller size. He asked about this surprising fact to his friends. Being her friend, how can you satisfy his curiosity? 3
20. What will be the fate of following structures in the angiospermic plant? Ovary wall, Ovule, zygote, outer integument Inner integument and primary endosperm nucleus. 3
21. In recombinant DNA technology, vectors are used to transfer a gene of interest in the host cells. Mention any three features of vectors that are most suitable for this purpose. 3
22. A bacterium *Bacillus thuringiensis* produces a toxic protein named .cry protein. that is lethal to certain insects but not to bacterium
- a. Why this toxin does not kill the bacteria?
 - b. What type of changes occurs in the gut of insects on consuming this protein?
 - c. How man has exploited this protein for his benefit? 3

Section D

23. PANV is a multinational company that is using bioresources for commercial benefits, without proper authentication and compensation to concerned authorities. Ankit is concerned

about its long term effect.

- a. Give the term for this unauthorised act.
- b. Suggest any two ways to get rid of this.
- c. Name any two values that Ankit exhibits.

4

Section E

24. What is meant by semi conservative replication? How did Meselson and Stahl prove it experimentally?

5

OR

- a. The human male never passes on the gene for haemophilia to his son. Why is it so?
- b. A woman with O blood group marries a man with AB blood group
 1. Work out all the possible phenotypes and genotypes of the progeny.
 2. Discuss the kind of dominance in the parents and the progeny in this case.

5

25. a. T.S. of mammalian testis revealing seminiferous tubules show different types of cell.
1. Name the two types of cells of germinal epithelium.
 2. Name of cells scattered in connective tissue and lying between seminiferous tubules.
- Differentiate between them on the basis of their functions.
- b. Give the function of

1. Corpus luteum

2. Endometrium

5

OR

a. Differentiate between microsporogenesis and megasporogenesis. What type of cell division occurs during these events? Name the structure formed at the end of these two events.

b. Outer envelope of pollen grain made of a highly resistant substance. What is that substance? At which particular point the substance is not present?

5

26. Detrivores like earthworm are involved in the process of decomposition of dead plants and animals. Describe the different steps involved in the process of decomposition.

5

OR

Describe at least two approaches each for ex-situ conservation and in situ conservation as a strategy for biodiversity conservation.

5

ANSWERS

Section A

1. Respiration.
2. Hermaphrodite; Examples: Earthworm, Leech.
3. It is a single step large mutation deVries believed mutation caused speciation and called it saltation.
4. a, b.
5.
 - a. Female
 - b. Male
 - c. Female
 - d. Male

Section B

6. By meristem culture virus-free plants can be obtained. The apical and axillary **meristem** is free of virus. Hence, one can remove the meristem and grow it *in vitro* to obtain virus-free plants.
7.
 - a. Habitat loss and fragmentation
 - b. Over-exploitation:
 - c. Alien species invasions:
 - d. Co-extinctions:

OR

The inoculum or starter contains millions of LAB which at suitable temperatures multiply and convert milk to curd. It also improves its nutritional quality by increasing vitamin B12.

8.
 - a. Thick cuticle
 - b. Stomata in deep pits
 - c. Stomata closed during day time
 - d. Leaves reduced to spines (CAM photosynthetic pathway).

9. Because male gamete need medium (water) to reach egg/female gamete.
A large number of the male gametes fail to reach the female gamete.

10. Translation is a process of polymerisation of amino acids to form a polypeptide.
Charging of tRNA or aminoacylation of tRNA is the first phase of translation during which amino acids are activated in the presence of ATP and linked to their cognate tRNA. When two such charged tRNAs are brought close enough there is formation of peptide bond between them.

Section C

11.
 - a. The following events occur during fertilization of an ovum in humans:

The motile sperms swim rapidly and reach the ampullary-isthmic junction of the fallopian tube.

The ovum is also transported to the ampullary-isthmic junction where fertilisation takes place.

Fertilisation can only occur if the ovum and sperms are transported simultaneously to the ampullary isthmic junction.

When a sperm comes in contact during fertilisation with the *zona pellucida* layer of the ovum it induces changes in the membrane that block the entry of additional sperms hence only one sperm enters the ovum.

b. Progestasert, LNG-20

12. a. The two metals used in a catalytic converter are

1. Platinum-palladium
2. Rhodium

They help in keeping the environment clean by reducing emission of poisonous gases by

1. Converting unburnt hydrocarbons into carbon dioxide and water
2. Changing Carbon monoxide and nitric oxide to carbon dioxide and nitrogen gas, respectively.

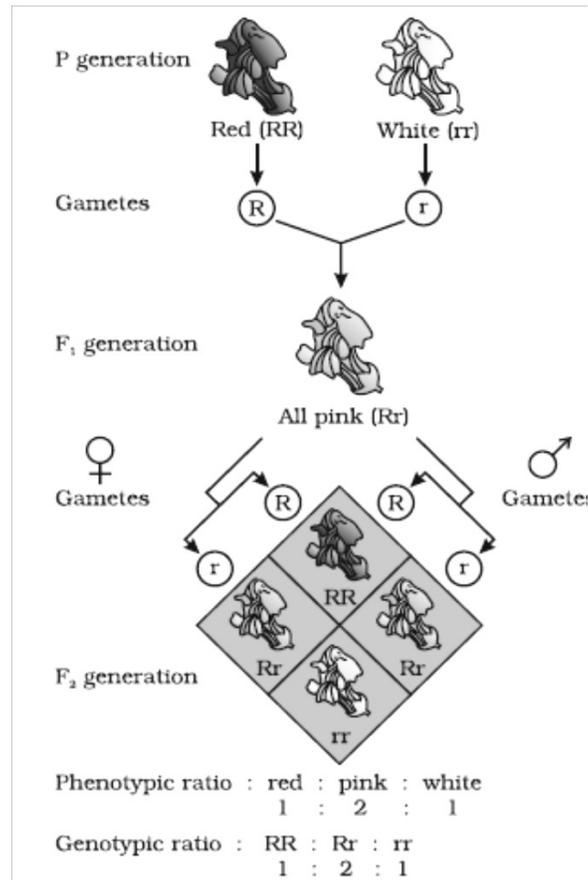
b. Good ozone is present in the stratosphere. It acts as a shield absorbing ultraviolet radiation from the sun.

13. a. Cannabinoids are obtained from *Cannabis sativa* and are used to produce marijuana, hashish, charas and ganja. It affects the cardiovascular system of the body.

b. Gene Therapy

- c. Histamine acts as allergy-mediator which cause blood vessels to dilate. It is released by mast cells.

14.



15. a. U A C

b. A U G

c. tRNA Amino acyl t-RNA Synthetase

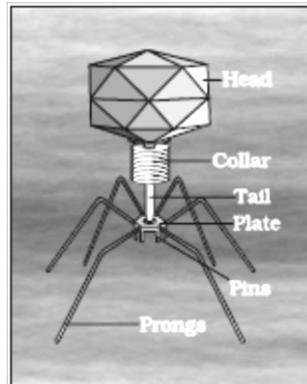
16. a. The allele frequencies in a population are stable and constant from generation to generation.

b. Evolution.

c. One.

17. a. Single called protein (SCP) are alternate sources of proteins for animal and human nutrition
- b. Advantages:
1. It can serve as food rich in protein, minerals, fats, carbohydrate and vitamins.
 2. Utilisation of waste materials helps to reduces environmental pollution.
- c. *Spirulina and Methylophilus methylotrophus.*

18.



OR

- a. Name the causative organisms for the following diseases :
1. *Salmonella typhi*
 2. *Streptococcus pneumoniae* and *Haemophilus influenza*
 3. Rhino Virus
- b. Consumption of clean drinking water, food, vegetables, fruits can prevent spread of *Salmonella typhi*
Avoid close contact with the infected persons or their belongings in case of Pneumonia and common cold.

19. Because smaller animals have larger surface area relative their volume so they lose body heat very fast when it is hot outside. They do not have to expense lot of energy to loose body heat.
20. Ovary wall = Pericarp
Ovule = Seed
Zygote – Embryo
Outer integument = Testa
Inner integument = Tegmen
Primary endosperm nucleus = Endosperm
21. a. Have origin of replication (Ori)
b. Have a selectable marker
c. Have at least one recognition site.
22. a. Produced in inactive form as Prototoxins.
b. Prototoxin becomes active toxin in alkaline pH of gut of insects. Toxins bind to surface of midgut and cause perforation, swelling, lysis of cells ultimately leading to death.
c. Specific Bt toxin genes isolated from *Bacillus thuringiensis* and incorporated into several crop plants such as cotton and corn which become pest resistant against certain insects.

Section D

23. a. Biopiracy

- b. 1. Benefits of bioresources should be shared between developed and developing nations
2. Laws should be developed to prevent unauthorised exploitation of them bioresources.

Section E

24. Meselson and Stahl, performed an experiment using *E.coli* to prove that DNA replication is semi conservative.
- a. They grew *E.coli* in a medium containing $^{15}\text{NH}_4\text{Cl}$.
 - b. Then separated heavy DNA from normal (^{14}N) by centrifugation in CsCl density gradient to ^{14}N medium, had an intermediate density.
 - c. The DNA extracted after two generations consisted of equal amounts of light and hybrid DNA.
 - d. They proved that DNA replicates in a semi conservative manner.

OR

- a. The gene for haemophilia is present on X chromosome. A male has only one X chromosome which he receives from his mother and Y chromosome from father. The human male passes the X chromosome to his daughters but not to the male progeny (sons).
- b. 1. Blood group AB has alleles as I^A , I^B and O group has i which on cross gives the both blood groups A and B while the genotype of progeny will be $I^A i$ and $I^B i$.
2. I^A and I^B are equally dominant (co-dominant). In multiple allelism, the gene I exists in 3 allelic forms, I^A , I^B and i .

25. a. 1. Germinal epithelium has two types of cell.

i. Spermatogonium.

ii. Sertoli cells

2. Leydig cells or Interstitial cells.

Functions

Spermatogonium undergoes meiotic division leading to sperm formation.

Sertoli cell : Nourishes germ cells

Leydig cell : Synthesise and Secrete hormone androgen.

b. **Corpus luteum** : It secretes progesterone which prepares endometrium of uterus for implantation and normal development of foetus.

Endometrium : It undergoes cyclic changes during menstrual cycle and prepares itself for implantation of blastocyst.

OR

a. **Microsporogenesis**. Process of formation of microspore from a Pollen mother cell.

Megsporogenesis. Process of formation of megaspore from megaspore mother cell.

Meiotic division in both

Microsporogenesis results in the formation of pollen grain while megasporogenesis results in the formation of megaspore.

b. **Sporopollenin**: Sporopollenin is absent at germ pore.

26. The dead remains of plants and animals called detritus undergo decomposition and are converted into simpler substances. The steps of this process are:
- a. **Fragmentation:** Breakdown of detritus into smaller pieces by detritivores like earthworm.
 - b. **Leaching:** Water soluble inorganic nutrients go down into soil horizon and get precipitated as unavailable salts.
 - c. **Catabolism:** Bacterial and fungal enzymes degrade detritus into simpler inorganic substances.
 - d. **Humification:** It leads to accumulation of dark colored amorphous substance called humus which is highly resistant to microbial action so decomposes at slow rate and is rich in nutrients.
 - e. **Mineralization :** Humus is further degraded by some microbes and release of inorganic nutrients occurs.

OR

In situ conservation:

- a. Identification and maximum protection of hot spots.
- b. Legal protection to ecologically rich areas.
- c. Biosphere reserves, national parks and sanctuaries
- d. Sacred groves.

Ex situ Conservation:

- a. Creation of zoological parks, botanical garden, wild life sanctuary
- b. Cryopreservation
- c. Seed bank.