SMARTSKILLS

2021-22

CLASS XII

BIOLOGY

CONTENTS

Chapter 1
REPRODUCTION IN ORGANISMS

REPRODUCTION IN ORGANISMS

Learning Outcome

After completing the given exercise student will be able to:

1. **Distinguish between different types of reproduction.**
2. **Understand difference between terms like continuous and seasonal breeders, juvenile and senescence phase.**
3. **Calculate the meiocytes**

1 mark each

1. What is the cause of variations in animals reproducing asexually?
2. Under which group of organisms is asexual reproduction more common?
3. Why are male gametes produced in large quantities in most organisms?
4. What do you understand by juvenile phase?
5. Why do zygotes in Fungi develop a thick wall?

2 marks each

1. Vegetative reproduction is a special kind of asexual reproduction. Justify
2. Name the 'Terror of Bengal'. Why is it called so?
3. What kind of reproduction is seen during favorable and unfavorable conditions? Explain.
4. Plant X is a monoecious plant with unisexual flowers. Give the meaning of the statement. Give one example of such a plant.
5. Discuss the process of reproduction in yeast.
6. Describe any 2 unusual flowering patterns in plants.
7. With the help of examples distinguish between seasonal and continuous breeders.
8. What is embryogenesis? Name the two processes that it involves.

3 marks each

1. Discuss the mechanism of vegetative propagation (natural and cultivated) in plants.
2. Define the following terms: heterothallic, meiocytes, syngamy, pericarp, cell differentiaton.
3. What are the disadvantages of external fertilization? Where do you find this phenomenon?

Chapter 2

SEXUAL REPRODUCTION IN FLOWERING PLANTS

Learning Outcome

After completing the given exercise student will be able to:

1. **Types of reproduction in plants**
2. **Different type of of a sexual reproduction**
3. **Difference between parthenocarpy and apomixis**
4. **Various types of pollinating agency, pollinating devices, inbreeding depression**

1 mark each

1. The chief advantage of vegetative propagation is _____
2. Monocots cannot be propagated by grafting because_____
3. The phenomenon by which plants reproduce by asexual means without fertilization or meiosis is known as _____
4. What is apomixes?_____
5. What is parthenogenesis?_____
6. Differentiate between parthenocarpy and parthenogenesis.
7. What are wind pollinated flowers called?_____
8. What does double fertilization mean?_____
9. _____
10. What is triple fusion?_____
11. The inability of the pollen grain to fertilize the egg in spite of belonging to the same species is called _____

2 marks each

1) The figure shows a part of the TS of an anther. Give the functions of the parts.

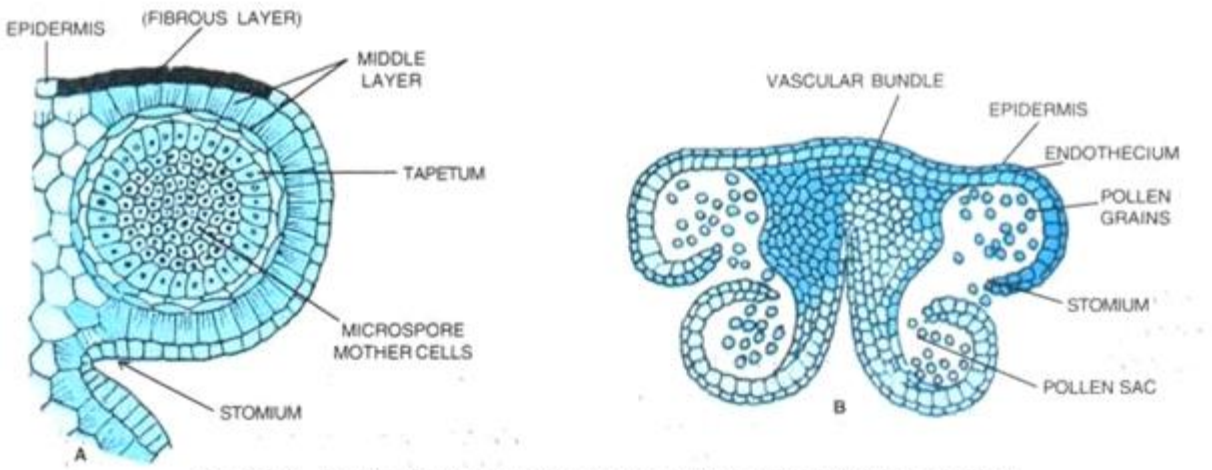


Fig. 2.5. A. Detailed structure of one young pollen sac; B. T.S. mature anther.

2) Name the parts of a pollen grain._____

3) Enlist the functions of the tapetum.

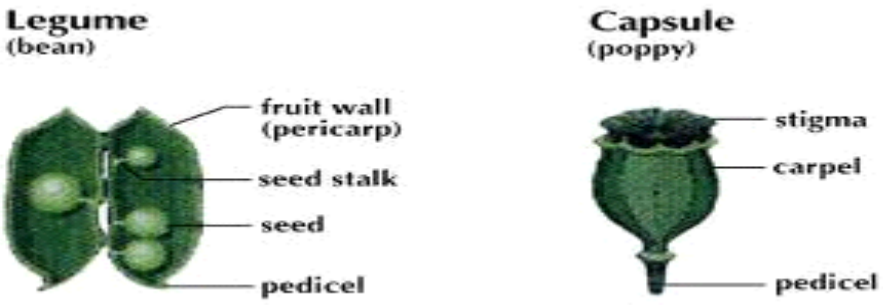
4) Name the parts of the ovule that are haploid._____

5) Enlist the characteristics of entomophilous flowers –

6) After penetrating the stigmatic tissues, how do the pollen tube grow towards the egg? _____

5 marks each

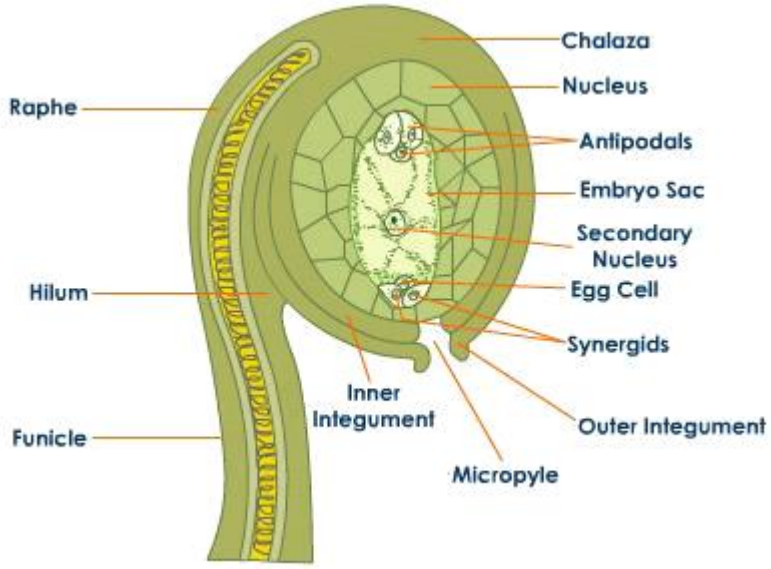
1)



a. Identify the structure drawn above.

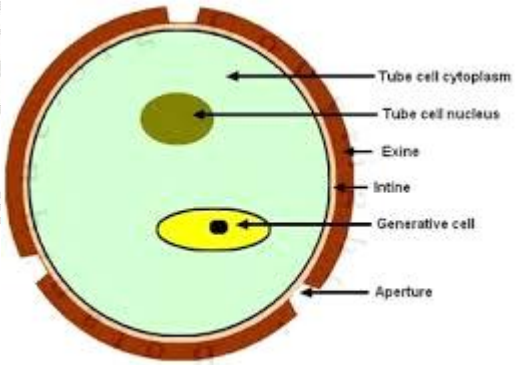
b. Along which area will the structure burst open to release the content? Under what condition will this happen?

2) The diagram shows the structure of an ovule.



a. What kind of ovule is shown here?
b. Label the parts after redrawing the diagram
c. Describe the detailed structure of female gametophyte.
d. Explain how the female gametophyte is formed.
f. Explain what happens when the male gametes are released.
What is the fate of the ovule, and other parts of the flower after fertilization?
g. What happens to polar nuclei after fertilization?
h. Give the ploidy of cells of chalaza, ovule and polar nuclei

4)

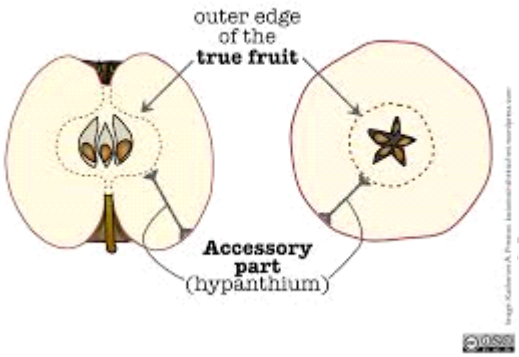


Pollen grain of Angiosperms

a) What are germ pores? What is its significance?
b) State the function of both the cells of pollen grain.
c) What happens to the nucleus of generative cell?
d) Name the hard and resistant substance that makes the exine.

5) What is the advantage of a seed to an angiosperm?

7)



a) Name the category of fruit the figure above belongs to.
b) Give reasons as to why these fruits have been classified as such.
c) Give 2 more examples of such fruits.

Chapter 3

HUMAN REPRODUCTION

Learning Outcome

After completing the given exercise student will be able to:

1. **Reproductive structure in human male and female**
2. **Gametogenesis and production of various hormones required for maturity and gamete formation**
3. **Menstrual cycle and production of various hormones**

1 mark each

1. Which parts in the male reproductive system stores sperms?————————
2. What is the site for spermatogenesis?————————————————
3. The gland which makes the semen alkaline is ————————————
4. The fluid that protects the embryo in the uterus is ————————————
5. Why are scrotal sacs present outside the abdomen?
6. Placenta secretes the hormones ————————————————————
7. Why Oxytocin is called the birth hormone?
8. Why is the human male referred to as heterogametic?
9. Name the organelles found in the neck of a human sperm.
10. Name the fluid from which fetal cells are obtained for chromosomal analysis.
11. Which part of the body secretes progesterone? State its function.
12. What is corona radiata?
13. Implantation occurs in the ————————stage of the embryo.
14. What is the ejaculatory duct in the human male?

2 marks each

1) Fertilization is a physicochemical process . Justify.
2) Match Column with Column B

A	B
Acrosome	Spermatid
Proliferative phase	Estrogens
Leydig cells	Earthworm
Spermiogenesis	Progesterone
Secretory phase	Spermatozoon
Bisexual animal	Testestorone
Endometrium	Menopause
Uterus	

4) A spermatogonial cell has 30 chromosomes. How many chromosomes will be found in a primary spermatocyte, spermatid and sperm?

6) Name the sperm lysine. Which organelle secretes it? What is its function?

7) What causes the corpus luteum to degenerate? Name the structure formed after it degenerates.

3 marks each

1. Where do spermatogenesis and oogenesis take place? Explain the stages of the process.
2. Name the hormones produced by the placenta.
3. Name the hormone produced by the corpus luteum. Why is this structure called so? How is it formed?

5 marks each

1) Explain the menstrual cycle.
2) Give an account of fertilization in human beings.
3) Explain human embryogenesis .Add a note on fetal ejection reflex.

Chapter 4
REPRODUCTIVE HEALTH

Learning Outcome

After completing the given exercise student will be able to:

1. **Need for in vitro fertilization**
2. **Various types of *in vitro* fertilization**
3. **natural methods of contraception use of pills and devices for contraception**
4. **prevention of sexually transmitted diseases**
5. **understanding of aminocentesis and female foeticide**

1 mark each

1. What is lactational amenorrhea?
2. Name the 'once a week' pill.
3. What is the advantage of 'Saheli' over other pills?
4. What are IUDs?
5. How do implants work?

2marks each

1. What is amniocentesis? Why has it been banned?
2. Expand MMR and IMR.
3. How do pills help in contraception?
4. State any 2 barrier methods of contraception and explain how they work.
5. Explain the principle of emergency contraceptives.

3 marks each

1. Enlist any 3 natural methods of contraception. Discuss their effectivity.
2. What is MTP? Till what time is MTP considered being safe? When was MTP legalized in India? Under what conditions is MTP prescribed?
3. Write a note on the types and dangers of STDs.
4. The diagram below shows a procedure in females. Name and describe the same. What is the parallel procedure in males called?

5 marks

1) Discuss the various methods that are employed to treat infertility.

Chapter 5
PRINCIPLES OF INHERITANCE AND VARIATION

Learning Outcome

After completing the given exercise student will be able to:

Difference between dominant/codominant/incomplete dominance
Inheritance of characters
Different types mutations and abnormalities
Genetic disorders

1mark each

1. Black coat color is dominant over white coat color in guinea pigs. A man who has a black guinea pig as a pet wants to know its genotype. Suggest a method by which the genotype of his pet can be ascertained.
2. Snapdragon plant with red flowers was crossed with another plant with white flowers. What would the offspring be like? Name the phenomenon.

2marks each

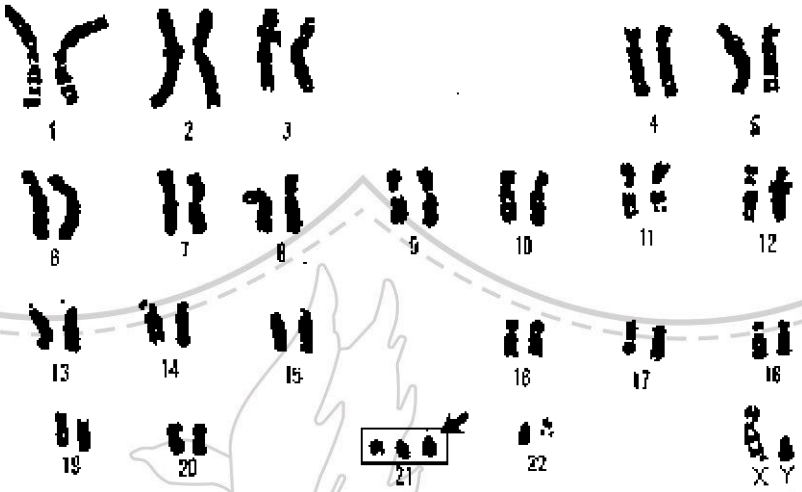
1. What is incomplete dominance? Explain with an example.
2. What is blending inheritance? Explain with an example.
3. What are linked genes? What offsprings would you get from a cross between a white eyed female and a red eyed male Drosophila?
4. In which of the following organisms is the male responsible for sex determination: Drosophila, grasshopper, birds or human beings? Give reasons.

3marks each

1. Explain co dominance.
2. Differentiate between co dominance and incomplete dominance.
3. Give any 2 genetic abnormalities in human beings that are a result opf aneuploidy.

4. Define point mutation. Describe the disease that is due to such a mutation in the gene coding for the structure of Hemoglobin.

5)



a) What kind of chromosomal abnormality is shown in the diagram?
b) Name the syndrome.
c) How is it related to the age of the mother?

5 marks each

1) Why is hemophilia usually observed in men? Explain the inheritance when a woman also shows the disease.
2) Explain in detail a dihybrid cross. What is the significance of standard dihybrid ratio?

Chapter 6
MOLECULAR BASIS OF INHERITANCE

Learning Outcomes

After completing the given exercise student will be able to:

1. **Understand the structure of DNA and RNA**
2. **Why DNA is the preferred genetic material**
3. **Making DNA copies, understanding of genetic code**
4. **Switch on and switch off mechanism of genes**
5. **How did the scientists decipher the human genome**
6. **Use of molecular biology in forensics, archaeology, phlogenetics and many more: DNA fingerprinting**

1mark each

1. Why is the ADA enzyme required in our body?
2. Which is not required for polypeptide synthesis: Termination codon, mRNA, peptidyl tranferase, rRNA?
3. Due to a mistake during transcription, ATG forms UAG in mRNA. What change would occur in the polypeptide chain translated by this mRNA?
4. What are introns?
5. Name the enzyme that can break and seal one strand of DNA.
6. Give the full form of YAC and BAC.

2marks each

1. What is aneuploidy? Give an example from human genetics which shows this problem.
2. In *Drosophila*, why do genes for white eyes and yellow body show less % recombination than white eyes and miniature wings?
3. The base sequence of a strand of DNA is
   TACTATTGCATAATT - - - -anti sense strand
   ATGATAACGTATTAA- - - - sense strand

a) Give the sequence of mRNA formed from this DNA.

b) What is the significance of the ATT sequence?

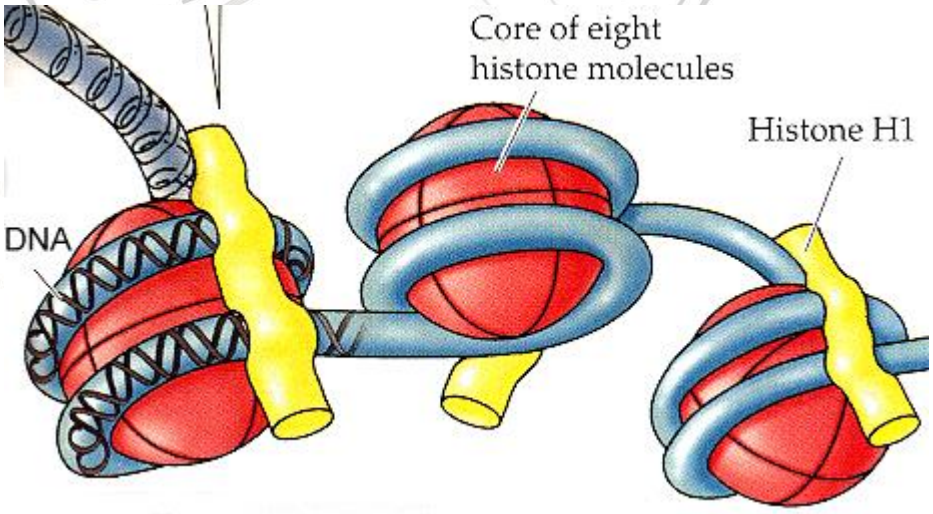
c) What would happen if base C (underlined) is deleted?

4. State the central Dogma. Give the features of a DNA helix.
5. Identify the protocol shown below and describe it briefly.

6. Describe the 2 processes unique to eukaryotic transcription.
7. State the role of DNA Polymerase in DNA replication
8. State the role of RNA polymerase in transcription, DNA replication.
9. Why the lac operon is called the inducible system?
10. What is a genetic code? Who proposed the triplet nature of Genetic Code. State any 2 other characteristics of the genetic code.
11. How can an XXY individual be born to a human?
12. What acts as the inducer in lac operon? How does it switch on the operon?
13. What are the components of an operon? State their functions.
14. Name the initiation and the termination codons.
15. Explain what happens in frame shift mutations. Name 1 disease that is caused by this kind of mutation.

3 marks each

1)

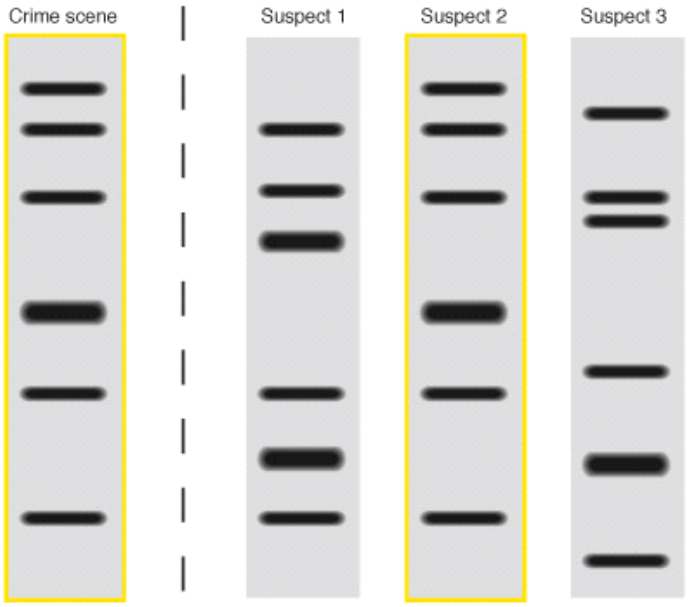


i. Identify and give the significance of the structure.

ii. What is the significance of this kind of coiling?

iii. What would happen to this structure later in the cell cycle in the M-phase?

5.



a) What is depicted in the diagram?
b) Give the principle of the technique.
c) Who is the real criminal? Why?

6. What are Okazaki fragments? Name 2 enzymes necessary for DNA replication. Enlist the functions of DNA polymerase.
7. List the steps involved in the elongation of polypeptide chain during protein synthesis.
8. What was the purpose of Griffith's experiment? Describe his protocol.
9. An mRNA strand has a series of codons out of which three are mentioned below. (i) AUG, (i) UUU, (iii) UAG.
   (a) What will these codons translated to?
   (b) What are the DNA sequences that would have transcribed these RNA codons?

5 marks each

1) What do you understand by an inducible system? Describe an inducible system that is operative in bacteria. What is another name for this kind of regulation?

2) Explain the principle of DNA fingerprinting.

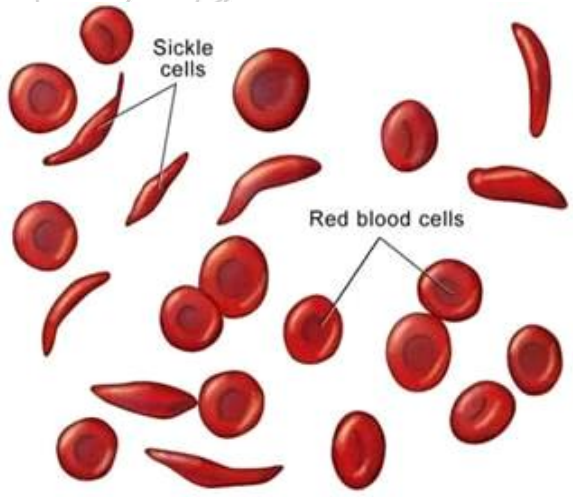
3) A segment of DNA, GCCAGGGGATG was translated into the oligopeptide arg-ser-pro-thr.

a) What was the base sequence in the mRNA transcribed from the DNA segment?

b) What are the codons for these amino acids?

c) If the first adenine in the DNA gets substituted by guanine what will the mRNA be, the anticodons on the tRNA be?

4) The diagram below shows a molecular disease.



a) Identify the disease and give its cause.

b) What are the symptoms of the disease?

c) In spite of this mutation being deleterious in the homozygous state, why has it not been eliminated?

5 Describe any 6 features of human genome.

6 Explain the following experiments along with the discovery that they were responsible for

a) Hershey and Chase

b) Griffith

c) Avery McLeod and McCarty

Chapter 7
EVOLUTION

Learning Outcomes

After completing the given exercise student will be able to:

1. **Understand the theory of origin of Life**
2. **Evolution of Life Forms**
3. **Evidences available to study the Evolution process**
4. **Distribution of genes and gene pool:Hardy Weinberg Law**
5. **Origin and Evolution of Man**

1mark each

1. Sickle cell anemia is a fatal disease. Why have its genes not been eliminated by natural selection as yet?
2. Which were the first mammals to inhabit the earth? Name a mammal that lives wholly in water.
3. Define convergent evolution.
4. Name the animal thought to ancestors of amphibians. When did the dinosaurs disappear?
5. Name the plant that De Vries worked with, on which he based his mutation theory.

2 marks each

1. Name any 2 organs from the plant kingdom that shows analogy.
2. How can reproductive isolation bring about the formation of a new species?
3. Write a short note on the evolution of man.
4. The following figure shows a diagrammatic representation of one the effects of natural selection. How would you explain the phenomenon?
5. How do homologous and analogous organs support the theory of evolution?

6. A chimp can hold objects with his hands but an elephant with his trunk. Are these structures homologous or analogous? Justify.
7. Explain the concept of Neo-Darwinism

3 marks each

1. Name any 3 organs homologous to the human hand.
2. Mutations cause evolutionary jumps. Justify the statement with the help of an example.
3. Explain the concept of adaptive radiation with the help of an example.
4. Explain Hardy Weinberg Law. State 3 factors that are known to affect the Hardy Weinberg equation
5. How did industrial melanism in *Biston betularia* (Moth) prove the genetic basis of adaptation?
6. Taking examples from anatomy and embryology, prove that evolution does take place.

5 marks each

1) Stanley and Miller performed an experiment by recreating in the lab the probable conditions of the atmosphere of the primitive earth.

(a) What was the purpose of the experiment?

(b) In what form was the energy supplied for the chemical reactions to occur?

(c) What were the energy forms available on primitive earth?

(d) For how long was the experiment run?

(e) What was the result of the experiment?

Chapter 8

HUMAN HEALTH AND DISEASES

Learning Outcomes

After completing the given exercise student will be able to:

1. **Diseases commonly occurring and affecting humans**
2. **Role of Immunity**
3. **Dreadful diseases like AIDS and Cancer**
4. **Alcohol and Drug abuse**

1mark each

1. Give the full form and function of MALT.
2. What are withdrawal symptoms?
3. Name the sources of Opioids and Cannabinoids.
4. What is the role of alpha Interferon in Cancer treatment?
5. Define Metastasis.

2 marks each

1. Describe briefly humoral immunity and CMI.
2. List the differences between active and passive immunity.
3. What are the nonspecific defense mechanisms in the body?
4. Define and give 1 example of an autoimmune disorder.
5. Why Hepatitis B vaccine is called a recombinant vaccine?
6. Differentiate between primary and secondary lymphoid organs.

3 marks each

1. What is meant by an Allergic response?
2. Discuss the harmful effects of Alcohol and drug abuse.
3. Describe along with a diagram the structure of an antibody molecule.

4. Discuss the causes and methods of detection of cancer.

5 marks each

1. Describe the life cycle of *Plasmodium vivax.*
2. Discuss the causal organism, symptoms, mode of spread, prevention and control of AIDS and cancer.
3. Describe the role of retrovirus in gene therapy.

Chapter 9

STRATEGIES FOR ENHANCING FOOD PRODUCTION

Learning Outcomes

After completing the given exercise student will be able to:

1. **Importance of self reliance in food production**
2. **Animal husbandry: Inbreeding and its consequence**
3. **Comparison between different types of hybridisation techniques**
4. **Importance of beekeeping, aquaculture and pisciculture**
5. **Plant Breeding: steps in making genetic varieties**
6. **Making disease resistance and High yielding varieties**
7. **Important and indigenously developed rice and wheat varieties of India: Contribution of Indian scientists**
8. **Genetically engineered varieties**

1mark each

1. Give the full form and 1 example of SCP.
2. Define Totipotency.
3. Name the causal organism for bird flu. How do we prevent its spread?
4. What is meant by out crossing?
5. Give the full form and location of IRRI.

2 marks each

1. Define and give reason for inbreeding depression.
2. Differentiate between Pisciculture and Aquaculture.
3. What is somatic hybridization? Why is it important?
4. Discuss the importance of MOET in cattle improvement program.

5. Taking an example discuss Biofortification.

3 marks each

1. Taking an example discuss how plant breeding was undertaken to introduced disease resistance in crops.
2. Explain Dairy farm management.
3. Describe the various steps of micropropogation.
4. Discuss the method and importance of mutation breeding.

5 marks each

1. Describe the various steps of a plant breeding program.
2. Discuss in detail Apiculture highlighting the various types of specialized knowledge that is required for this profession

Chapter 10

MICROBES IN HUMAN WELFARE

Learning Outcomes

After completing the given exercise student will be able to:

1. **Understand role of microbes in commodities used in day today life: domestic and industrial products**
2. **Role of microbes in cleaning sewage**
3. **Understanding the concept of: Biogas, Bio control and Bio fertilisers**

1mark each

1. What is Streptokinase?
2. Define and give 1 example of a methanogen.
3. Name any 2 alcoholic beverages that are produced without distillation.
4. What is Ganga action Plan?
5. Name the metabolic process of Yeast which is responsible for production of alcohol.

2 marks each

1. What is Mycorrhiza? Discuss their importance for crops.
2. Give the source and importance of Cyclosporin.
3. What are Statins? Give their source and mode of action.
4. Discovery of Penicillin was a chance discovery. Discuss.

3marks each

1. Taking examples discuss the role of microbes in household products.
2. Explain the importance of microbes as bio fertilizer.
3. What is biocontrol? What are its advantages? Discuss the role of microbes as biocontrol agent.

5 marks each

1. Describe along with a flow chart the role of microbes in sewage treatment.
2. Discuss in detail the construction, working and importance of a biogas plant.

Chapter 11

BIOTECHNOLOGY: PRINCIPLES AND PROCESSES

Learning Outcomes

After completing the given exercise student will be able to:

1. **Understand the basics of recombinant DNA technology**
2. **Use of restriction enzymes, cloning vectors and host.**
3. **Amplification and identification of the target DNA.**
4. **Downstream processing: Fermenters**

1mark each

1. How is plasmid different from a plasmid?
2. What is the role of a vector in Genetic Engineering?
3. What is a recombinant DNA?
4. Why are restriction endonucleases called so?
5. Name one artificial plasmid.
6. What is the function of 'ori' in a vector?
7. What are bioreactors?
8. How are plasmids suitable for use as a vehicle DNA?
9. Why are Restriction Endonuclease synthesized in bacteria?
10. A small amount of DNA is recovered from a crime scene. Name the method that can be used to get multiple copies of this DNA.
11. Define a recombinant protein and give 1 example of such protein

2 marks each

1. How are restriction enzymes named?
2. List the methods of introducing DNA into a host cell.
3. What is recognition sequence? Give an example.
4. What are the features of a vector?
5. Give the role of matrix in electrophoresis. From where is it obtained

6. All vectors are plasmids but not all plasmids are vectors. Discuss.
7. Does recombination occur naturally? When?
8. Define and give the importance of Palindromes in genetic engineering.
9. Why is gene gun more frequently used in plant transformations?
10. What is the role of primers in PCR?
11. Discuss briefly downstream processing.

3 marks each

1. What is meant by Endonuclease and Exonuclease? How are they different?
2. Name the molecular scissors and molecular glue of a cell. What is the nature of these biomolecules?
3. Enlist the steps of recombinant DNA technology
4. Name a few lysing enzymes in biotechnology. What is their function?
5. What is the principle and use of PCR?
6. What does a competent cell mean? How can we make a cell competent?

5 marks each

1) Describe the technique of gel electrophoresis.
2) State true or false with reasons.
   a. Eukaryotic cells have restriction enzymes.
   b. *A. tumefaciens* causes plant tumors.
   c. Plasmids are cDNA
   d. Sticky ends have to be produced in both the plasmid and gene if rDNA is to be formed.
   e. Genetic transfer is possible by the process of transformation.

Chapter 12

BIOTECHNOLOGY AND ITS APPLICATIONS

Learning Outcomes

After completing the given exercise student will be able to:

1. **Understand the applications of biotechnology in agriculture and medicine**
2. **Understand the designing of transgenic animals**
3. **Relate to the Ethical Issues**

1mark each

1) How are plasmids suitable for use as a vehicle DNA?
2) What does the BT in Bt cotton stand for?
3) *Spirulina* is used as a ———
4) The crystals of Bt toxin do not kill the bacteria. Give reasons?

2 marks each

1) How do cry proteins help in pest control?
2) Give 2 advantages that genetic engineering has over traditional plant breeding methods.

3 marks each

1) Give some applications of transgenic plants and animals
2) What is gene therapy? Illustrate, using the example of the ADA gene.

5 marks each

1) *Agrobacterium tumefaciens* is called a natural genetic engineer. Justify. How do scientists use these bacteria in their work?
2) Give an example of insertional inactivation. Why is this process preferred? Explain the process.
3) Explain the concept of gene therapy and RNAi with examples.

Chapter 13

ORGANISMS AND POPULATIONS

Learning Outcomes

After completing the given exercise student will be able to:

1. **Understand the distribution of Biome**
2. **Understand the response of organisms to abiotic factors:conformers and regulators**
3. **Understand the calculation of death rate and birth rate**
4. **Understand the significance of age pyramids**
5. **Understand the exponential and logistic growth models**
6. **Understand the population interactions**

1mark each

1) What is Allen's rule?
2) Define and give 1 example of a phytophagous organism.
3) Name 1 ectoparasite and 1 endoparasite.
4) What is commensalism?

2 marks each

1) Why is it that some organisms breed once in their lifetime whereas others breed every season?
2) Describe the Gause's exclusion principle.
3) What is brood parasitism?
4) Which attribute of population indicates the nature of population size? India is said to be an expanding population. Why?

3 marks each

1) Differentiate between conformers and regulators.

2) Explain mutualism highlighting the role of both partners in influencing the survival and evolution of each other.
3) dN/dT =N {K-N/K} .Describe and give importance of K.
4) Discuss the relationship between a lion and a deer highlighting the role of lion in energy transfer and effect on the population of deer.

5 marks each

1) Describe the importance of the major abiotic factors.

2) dN/Dt =rN. Discuss the equation and give its integral form. What type of growth curve is it? Is it possible in nature? Why/Why not?

Chapter 14

ECOSYSTEM

Learning Outcomes

After completing the given exercise student will be able to:

1. **Understand the components of ecosystem**
2. **Understand the calculation of energy flow through the trophic levels**
3. **Understand the ecological succession and ecosystem services**

1 mark each

1) What is Stratification?
2) Define an Ecosystem.
3) Give the full form and importance of PAR.
4) What is a trophic level?
5) Measurement of biomass in terms of dry weight is considered more accurate. Why?

2 marks each

1) GPP-R=NPP. Discuss.
2) Differentiate between Primary and Secondary succession.
3) In the ecosystems, energy flow is non cyclic whereas the flow of nutrients is cyclic. Discuss.
4) Differentiate between GFC and DFC.
5) Write a short note on ecosystem services.

3 marks each

1) Discuss the various steps of decomposition.
2) Taking an example discuss the concept and importance of ecological pyramids.
3) Discuss briefly: Pioneer species, Seral stage and climax community.

5 marks each

1) Define and give types of a biogeochemical cycle. Discuss in detail Carbon cycle.
2) Describe in detail Hydrarch.

Chapter 15

BIODIVERSITY AND CONSERVATION

Learning Outcomes

After completing the given exercise student will be able to:

1. **Understand the genetic, species and ecological diversity**
2. **Understand the global distribution of species**
3. **Understand the species area relationships**
4. **Understand the causes for biodiversity loss.**
5. **Understand the need for biodiversity conservation**

1mark each

1) What is endemism?
2) Define co extinction.
3) Give the name and importance of lung of the planet.
4) What are sacred groves?

2 marks each

1) What are the results of loss of biodiversity on a particular area?
2) Differentiate between narrowly utilitarian and broadly utilitarian argument for biodiversity conservation.
3) Discuss the Rivet popper hypothesis in the context of loss of biodiversity.

3 marks each

1) Discuss the 3 types of biodiversities.
2) Taking an example discuss the alien species invasion as a cause of loss of biodiversity.
3) Log S = log C + Z log A. Discuss and give the importance of the equation.

5 marks

1) What is the importance of conservation? Discuss in detail the 2 approaches.
2) Describe some traditional methods of biodiversity conservation. What is the importance of JFM?
3) Describe any 4 reasons of loss of biodiversity.

Chapter 16

ENVIRONMENTAL ISSUES

Learning Outcomes

After completing the given exercise student will be able to:

1. **Understand the environmental issues related to :**
   - **Air pollution, sound pollution and water pollution**
2. **Understand the ways to control the above**
3. **Understand the management of solid and radioactive wastes**
4. **Understand the global warming and biological magnification**
5. **Understand the significance of the stakeholders in conservation through specific examples**

1 mark each

1) What is Polybend?
2) Define a pollutant.
3) Give the source of thermal wastewater.
4) How is UV-B radiation harmful?
5) What is Dobson unit?

2 marks each

1) What are the 3 categories of solid waste? Why should one sort the garbage?
2) Differentiate between eutrophication and accelerated eutrophication.
3) Discuss the behavior of CFCs in the environment.
4) How are agrochemicals harmful? Discuss the alternative method to minimize their use.
5) Describe briefly the problem of e - waste.

3 marks each

1) Discuss the various sources of air pollution.
2) Taking an example discuss the harmful effects of noise pollution.

3) Describe the working of an electrostatic precipitator.
4) Define B O D. How does it indicate the level of pollution of a water body? Why is it an indirect measure of level of pollution?

5 marks

1) What is deforestation? Give its reasons. Discuss reforestation highlighting the importance of people's participation.
2) Taking the example of DDT, discuss the phenomenon of biomagnifications.

Academic Session: 2014-15

Pre Board Examination

Subject: Biology

Time: 3 Hrs. Max. Marks: 70

General Instructions:

The Question Paper has 5 sections A, B, C, D and E. Section A has 5 questions of 1 mark each, Section B has 5 questions of 2 marks each, Section C has 12 questions of 3 marks each, Section E has 1 value based question of 4 marks and Section D has 3 questions of 5 marks each.

The question paper has 4 printed sides and 26 questions.

Section A

1. What is a gaseous biogeochemical cycle? Give one example.

2. Define Ovipary. Give an example of such an organism.

3. What is the use of Chitinase in biotechnology?

4. Why is secondary immune response more intense than the primary response?

5. Give the use of Baculoviruses.

Section B

6. Explain briefly soil erosion and desertification as improper resource utilization Practices.

OR

How is slash and burn agriculture harmful for forests? Define Reforestation.

7. Discuss in brief any 2 adaptations of wind pollinated plants.

8. What is the importance of Mychorrhiza? Describe organic farming.

9. Define geitonogamy. Give its 1 similarity to autogamy and xenogamy.

10. Taking an example under each category differentiate between genetic and species diversity.

Section C

11. Explain how human Insulin was produced on an industrial scale.

OR

Describe in detail Gene Therapy.

12. Explain in detail the succession on a bare rock.

13. Name and describe the interactions shown by the following—
    a) Cuckoo laying eggs in the nest of crow
    b) Orchid growing on a Mango tree

14. Describe in detail the process of Oogenesis.

15. Explain in detail the post transcriptional modifications in the messenger RNA.

16. Draw a neat and well labeled diagram of an Anatropous ovule and label Microyle, funicle, integument, nucellus and embryo sac.

OR

Draw a neat and well labelled diagram of T.S. Anther and label epidermis middle layers, endothecium tapetum and pollen mother cell.

17. Describe in detail the logistic growth curve. Add a note on how is it a realistic representation of population growth.

18. Explain one reversible and one irreversible contraceptive method for men. Describe GIFT.

19. Describe the principle, procedure and applications of PCR.

20. Mention the compound and its use produced by the following—

a) *Streptococcus*

b) Lactobacillus

c) Saccharomyces

21. Describe the naming of ECoRI. Taking an example explain the use of marker gene.

22. Explain in detail Bio fortification. Describe the procedure and use of somatic hybridization.

Section D (Value Based)

23. One of your class mates Reema is the daughter of a HIV positive mother and is herself HIV positive. Most of the classmates do not mingle with her and

their parents also want the school to send her out. The principal tries and convinces the parents and Reema continues to study.

a) Do you agree with your classmates in not mingling with Reema? Why/Why not? Give 2 points.

b) What values are shown by the Principal? Give 2 points.

Section E

24. a) Define a molecular disease. Explain in detail how is it caused due to point mutation.

b) Give 2 differences between Down's syndrome and Turner's syndrome.

OR

a) Define Linkage and Recombination. Explain how recombination frequencies were used to map genes on the chromosome.

b) Describe the mechanism of sex determination in Insects.

25. Explain the principle, procedure and applications of DNA Fingerprinting.

OR

Describe the structure and functioning of Lac Operon.

26. a) Discuss in detail Convergent Evolution.

b) Describe the Hardy Weinberg equation and its significance.

OR

a) Taking an example describe how anthropogenic factors affect evolution.

b) Discuss in detail the experiment that provided proof for Chemical Evolution.

Sample Question Paper
Class XII (2017-18) Biology
(044)

Time allowed: 3hrs.
Maximum Marks: 70

General Instructions:

1) **There are a total of 26 questions and five sections in the question paper. All questions are compulsory.**
2) **Section A contains question number 1 to 5, Very Short Answer type questions of one mark each.**
3) **Section B contains question number 6 to 10, Short Answer type I questions of two marks each.**
4) **Section C contains question number 11 to 22, Short Answer type II questions of three marks each.**
5) **Section D contains question number 23, Value Based Question of four marks.**
6) **Section E contains question number 24 to 26, Long Answer type questions of five marks each.**
7) **There is no overall choice in the question paper, however, an internal choice is provided in one question of two marks, one question of three marks and all three questions of five marks. An examinee is to attempt any one of the questions out of the two given in the question paper with the same question number.**

Section – A

1. A tissue, of a tobacco plant, infected with TMV was used to obtain a new plant. Identify the technique used and reason out the possibility of obtaining a new healthy plant. 1
2. State a method of cellular defense which works in all eukaryotic organisms 1
3. In case of an infertile couple, the male partner can inseminate normally but the mobility of sperms is below 40 percent. Which kind of ART is suitable in this situation to form an embryo in the laboratory conditions, without involving a donor? 1
4. Write the two components of the first artificial recombinant DNA molecule constructed by Cohen and Boyer. 1
5. A cross was carried out between two pea plants showing the contrasting traits of height of the plant. The result of the cross showed 50% of parental characters. Name the type of cross. 1

Section B

6. The alarming population growth is leading to scarcity of basic requirements, other than contraception to address the situation. Suggest with reasons, any type population control measures to address the situation. 2

7. During a cytological study conducted on the chromosomes of the insects, it was observed that only 50% of the sperms had a specific structure after spermatogenesis. Name the structure and write its significance in sex determination of insects. 2

8. To reduce the percentage of population suffering from hunger and malnutrition, microbes are grown on a large scale to act as food supplements. Mention any two microbes used as food supplement and suggest their role. 2

OR

Success rate of artificial insemination in cattle is fairly low. Identify any other technique to improve the successful production of hybrids. State two advantages of this technique.

9. (a) A patient who had an organ transplant was given cyclosporin– A. Mention the microbial source and state the reason for administration of this bioactive molecule. 2

(b) Bottled fruit juices bought from the market are clearer as compared to those made at home. Give reason.

10. Evaluate the effect of loss of biodiversity in a region. Mention any four such effects. 2

Section C

11. Draw the diagram of microsporangium of an Angiosperm and label any four parts 3
State the function of its innermost wall layer.

12. Give reason : - 3
(a) A liverwort plant is unable to complete its life cycle in a dry environment.
(b) Number of male gametes produced is much more than the female gametes produced.
(c) Organisms exhibiting external fertilization show great synchrony between the sexes and release a large number of gametes into surrounding medium

13. (a) Name the different gases contained in the flask used as an experimental setup by S.L. Miller. 3
(b) On the basis of composition of gases in this experiment, what was the condition in the flask?
(c) Write the conclusion drawn from this experiment.

14. When a snapdragon plant bearing pink colour flower was selfed, it was found that, 69 plants were having red coloured flowers. What would be the number of plants bearing pink flower and white flower? Show with the help of Punnett square. Identity the principle of inheritance involved in this experiment 3

15. Refer to the figure given below and answer the questions that follow 1+1+1

Wolf Tasmanian wolf

(a) Explain the process by which Tasmanian wolf evolved.
(b) Name the process that has resulted in evolution of wolf and Tasmanian wolf.
(c) Compare and contrast the two animals shown?

16. Your classmate complains of headache and cough. On the basis of certain symptoms, the doctor confirms that he is suffering from Pneumonia and not common cold. List these symptoms. Mention any two precautions to be followed to prevent the spread of this disease. 3

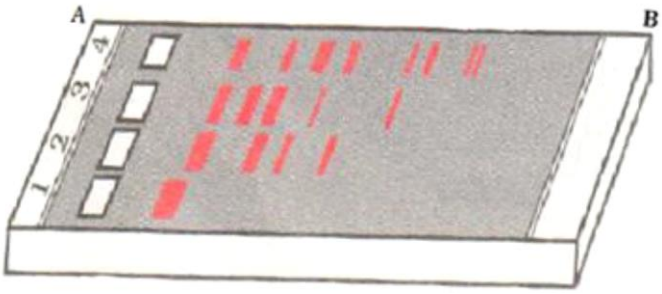
17. Cow dung and water is mixed and this slurry is fed into the biogas plant for digestion by microbes. The person performing the process shares that there is no need to provide any inoculum for it. Give reason. What is the role of microbes at the source? Under which condition will they be most active and effective? 3

18. A person is born with a weakened immune system due to deficiency of an enzyme which is a hereditary disease. Suggest a technique to completely cure this disease, identify the deficient enzyme and explain the technique used, for cure. 3

19. A doctor prescribed morphine as a sedative and pain killer to your cousin who had undergone a surgery. Even after recovery, he indiscriminately took the medicines and later craved for the same. What do you conclude about his condition? What measures will you suggest to him to overcome this problem? Briefly explain any two. 3

20. Given below is the diagram of agarose gel kept under UV light: 3

(a) Mention the positive and negative terminals.
(b) What is the charge carried by DNA molecule and how does it help in its separation?
(c) How are the separated DNA fragments finally isolated?

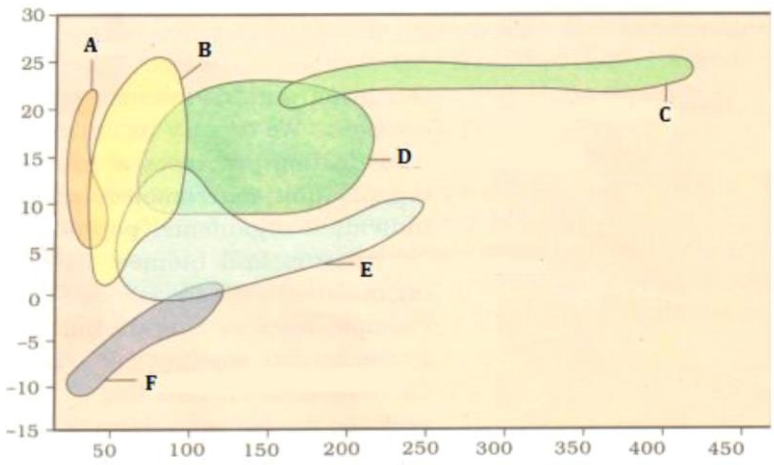


OR **1**

*CryIAb*is introduced in a plant to prevent infestation by corn borer. **1**
(a) What is the resultant plant referred as? **+**
(b) Summarize the action of the gene introduced **1**

21. (a) In pBR322, foreign DNA has to be introduced in tet^R region. From the restriction enzymes given below, which one should be used and why: PvuI, EcoRI, BamHI **½ +2½ 2**
b) Give reasons, why the other two enzymes cannot be used. **+ 1**

22. The graph given below shows the distribution of biomes: **1+1+1**



(a) What do the 'X' and 'Y' axis represent?
(b) Identify the 'grassland' and 'coniferous forest' biomes, from the above figure. (c) Why is 'F' located at the given position in the graph?

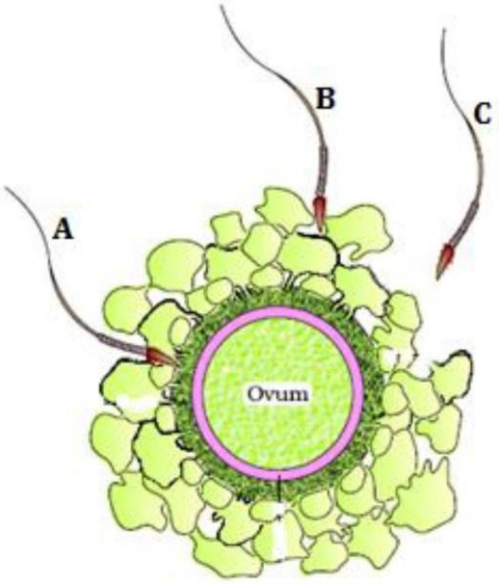
Section D

23. A son persuades his father to replace his old mobile phone with the latest model launched in the market. He also shares the latest features it has and explains how it can be of a help to him in the modern technological world. Father is reluctant in buying a new one and tries to explain about its environmental impact. How do you think, the biologist father would try to convince his son? Justify the arguments of father and son both, by 4

mentioning positive aspects of the behavior displayed by both of them in the situation concerned (three each).

Section E

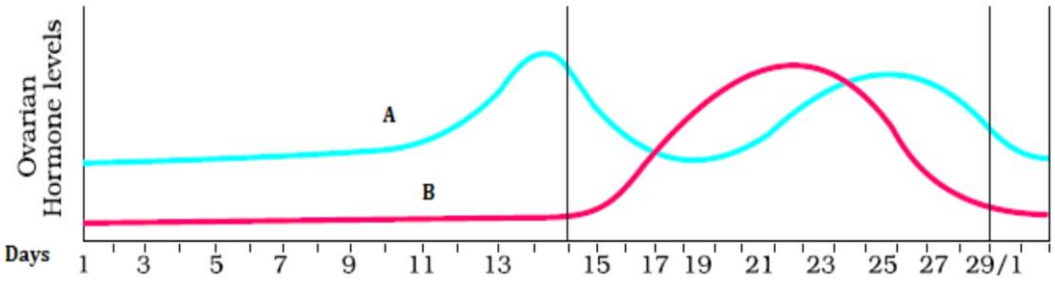
24. Given below is the diagram of a human ovum surrounded by a few sperms. Observe the diagram and answer the following questions: 5



(a) Compare the fate of sperms shown in the diagram.
(b) What is the role of zona pellucid in this process?
(c) Analyze the changes occurring in the ovum during the process.
(d) How is the entry of sperm into the ovum facilitated?
(e) Specify the region of female reproductive system where the event represented in the diagram takes place.

OR

The graph given below shows the variation in the levels of ovarian hormones during various phases of menstrual cycle



:

(a) Identify 'A' and 'B'.
(b) Specify the source of the hormone marked in the diagram.
(c) Reason out why A peaks before B.
d) Compare the role of A and B.(e) Under which condition will the level of B continue to remain high on the 28th day?

2. Explain the process of protein synthesis from processed m-RNA 5

OR

Which methodology is used while sequencing the total DNA from a cell? Explain it in detail.

26. Taking the example of a lake as a simple aquatic ecosystem, interpret how various functions of this ecosystem are carried out. Make a food chain that is functional in this ecosystem. 5

OR

a) Colonization of a rocky terrain is a natural process. Mention the group of organisms which invade this area first. Give an example. 1+3 ½ + ½

b) Over the years, it has been observed that some of the lakes are disappearing due to urbanization. In absence of human interference, depict by making a flowchart, how do the successional seres progress from hydric to mesic condition.

c) Identify the climax community of hydrarch and xerarch succession

Sample Question Paper Class XII (2017-18) CLASS: XII
Biology (044)

MARKING SCHEME

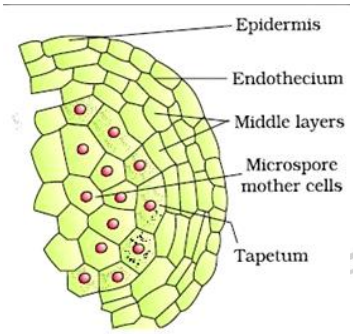
TIME: 3 HOURS **MM:70**

SECTION A

1.	Tissue culture using meristematic tissue as it is virus free	½+ ½ =1
2.	RNA interference	½+ ½ =1
3.	Intra Cytoplasmic Sperm Injection (No marks for abbreviation - ICSI)	½+ ½ =1
4.	The two components are –antibiotic resistant gene and plasmid vector of Salmonella typhimurium.	½+ ½ =1
5.	Test cross	1

SECTION B

6.	Population control measures other than contraception are: - Advertisements in the media, to generate awareness - Statutory raising of marriageable age of the female to 18 years and that of males to 21 years, to delay the number of births - Incentives given to couples with small families, to motivate others to comply (Any two of the above measures with explanation)	2
7.	X body/ X factor/ X chromosome In insects the sex chromosome consists of XX female; XO –Males	1+1 ½ + ½
8.	Spirulina – Produces large quantities of food rich in protein, minerals, fats, carbohydrates and vitamins. Methylophilus methylotrophus – 250 gm of this microorganism produces 25 tonnes of protein per day OR Multiple Ovulation Embryo Transfer Technology 1 increases herd size, in a short time.	2 1 x 2 = 2 ½ x 2 = 1
9.	a) Source – Trichoderma polysporum Reason – Immuno suppressive agent b) They are clarified by pectinases and proteases	2 ½ + ½

10.	- Decline in plant production/Decline in number of animal species - Lowered resistance to environmental perturbations such as drought - Increased variability in certain ecosystem processes such as plant productivity/ water use / pest & disease cycles	
		½x4=2
	- Species may become endangered/increased rate of species extinction	

SECTION C

11.	(Any four of the labels) ½ x 4 = 2 Tapetum nourishes the developing pollen grains 1	3
12.	a) They need water as a medium of gamete transfer for fertilization. b) A larger number of the male gametes fail to reach the female gametes c) To enhance the chances of syngramy	1+1+1
13.	a) CH_4, NH_3, H_2O and H_2 b) Anaerobic / Anoxygenic c) Life come from pro-existing non – living organic malecules and that formation of life was preceded by chemical evolution.	1+1+1
14.	a) There will be 138 pink flower bearning plants and 69 white flower bearing plants. b) Pink (Rr) selfing Gameter R r_R RR Rr Red Pink$_r$ Rr rr Pink White Phenotypic ratio : red : pink : white 1 : 2 : 1 c) Incomplete dominance	1+1+1

15.	a) Adaptive radiation - The process of evolution of different species in a given geographical area starting from a point and literally radiating to other areas of geography (habitats). 1 mark b) Convergent evolution1 mark c) Wolf is a placental mammal, whereas Tasmanian wolf is a marsupial mammal 1 mark	3
16.	Doctor confirms pneumonia on the basis of the following symptoms - fever/chills/grey - blue lips and finger nails (any two); and not common cold as the following symptoms are not observed - Nasal congestion/sore throat/hoarseness (any two) Precautions – 1) Cover the nose when near the patient 2) Do not share glasses and utensils / articles used by the infected person	3 ½+½ ½+½ ½+½
17.	Methanogens are present in Cow dung so there is need to add innoculum.1 mark Breakdown of cellulose1 mark Anaerobic conditions. 1 mark	3
18.	Gene Therapy ADA (Adenosine deaminase) deficiency Lymphocytes from the blood of the patient are grown in a culture, a functional ADA cDNA is introduced into these lymphocytes, which are subsequently returned to the patient. The permanent cure is done by introducing ADA cDNA into cells at early embryonic stages.2 marks	3 ½ mark ½ mark
19.	Drug dependence - is the tendency of the body to manifest a characteristic and unpleasant withdrawal syndrome if regular dose of drugs is abruptly discontinued / because of perceived benefits, drugs are frequently used repeatedly from which the person may not be able to get out. 1 mark Measures:-- Education and counseling - to face problems and stresses/ to channelize the energy into healthy pursuits like reading, music, yoga and other extracurricular activities - Seeking help from parents - to guide the person appropriately and immediately - Seeking professional and medical help – to help the person to get rid of the problem completely with sufficient efforts and will power (any two) 1 mark each	3

20.	a) Positive terminal - 'B' Negative terminal - 'A' b) DNA being negatively charged, moves towards the positive electrode (anode) ½ x 2 = 1 c) By elution - separated bands of DNA are cut out from the agarose gel and extracted from the gel piece ½ x 2 = 1 **OR** a) Bt corn ½ b) Cry I Ab/ Bt toxin gene codes for crystal protein; the Bttoxin protein exists as an inactive protein, but once an insect ingests it, it gets converted into an active form due to the alkaline pH of the gut which solubilizes the crystal. The activated toxin binds to the surface of mid gut and creates pores that cause swelling, lysis and eventually death of the insect	3 ½ x 2 = 1
21.	a) Bam HI should be used, as restriction site for this enzyme is present in tet^R region b) PvuI will not be used, as restriction site for this enzyme is present in amp^R region (not in tet^R) c) EcoRI will not be used, as restriction site for this enzyme is not present in selectable marker tet^R	3 1 mark 1 mark 1 mark
22.	a) 'X' axis - Mean annual precipitation (cm) ½ x 2 = 1 'Y' axis - Mean annual temperature (^0C) b) Grassland - B ½ x 2 = 1 Coniferous forest - E c) The mean annual temperature ranges from -12 to 20C (error accepted ± 2) and mean annual precipitation ranges from 10 - 125 cm, these are the optimum conditions in tundra biome ½ x 2 = 1	3
	SECTION -D	
23.	Father explains that it will lead to generation of e - waste; Difficulty in recycling e - waste / hazardous nature of recycling of e - waste /exposing workers to toxic substances present in e - waste (Any one)	4 1
	Son's wish to update his father with modern techniques, Awareness about trends and technologies, well versed with their applicability in daily life (any other similar / appropriate values) ½ x 3 = 1½	

	Concern for environment, scientific thinking, inquisitive nature, social awareness, judicious use of money, sense of responsibility (any other similar /appropriate values)	½ x 3 = 1½
	SECTION –E	
24.	a) A is able to penetrate/ fertilize the ovum, whereas B and C are unable to penetrate/ fertilize // B and C will degenerate b) Zona pellucida ensures the entry of only one sperm into the ovum c) Induces completion of meiotic division of the secondary oocyte, formation of second polar body and a haploid ovum d) Enzymes of acrosome help (½ mark if only 'acrosome' is written) e) Ampullary - isthmic junction of the fallopian tube **OR** a) A - Estrogen ½ x 2 = 1 B - Progesterone b) A - Maturing ovarian follicle / Graafian follicle ½ x 2 = 1 B - Corpus luteum c) Formation of Graaffian follicle (releases estrogen) is followed by the formation of corpus luteum (releases progesterone) 1 d) Role of A (Estrogen) - leads to changes in the ovary and uterus / regeneration of endometrium through proliferation ½ Role of B (Progesterone) - Maintenance of endometrium for implantation of the fertilized ovum/ maintenance of other events of pregnancy ½ e) In case of pregnancy	5 ½ x 2 = 1 ½ x 2 = 1 1 1 1

25.	For initiation, the ribosome binds to the mature m RNA at the start codon (AUG) that is recognized by the initiator t - RNA. During elongation, charged t RNA sequentially binds to the appropriate codon in m- RNA with the aniticodon present on tRNA. The ribosome moves from one codon to another adding amino acids one after the other to form polypeptide, i.e. translation. During termination, the release factor binds to stop codon (UAA, UAG, UGA), terminating translation and releasing the polypeptide chain. ½ x 10 = 5 **OR** Methodology used - Sequence Annotation - total DNA from a cell is isolated, ½ x 2 = 1 converted into random fragments of relatively smaller sizes ½ and cloned in suitable host using specialized vectors. ½ The cloning results in amplification of each piece of DNA fragment. ½ The fragments are sequenced using automated DNA sequencers, ½ these sequences are then arranged based on some overlapping regions (present in them). ½ This requires generation of overlapping fragments (for sequencing). ½ Specialized computer based programmes are developed, and ½ these sequences are subsequently annotated and assigned to each chromosome. ½	5
26.	i) Productivity - conversion of inorganic into organic material with the help of solar energy by the autotrophs ii) Energy flow - unidirectional movement of energy towards higher trophic level (and its dissipation and loss as heat to the environment) iii) Decomposition - fragmentation, leaching, catabolism, humification, mineralization by bacteria, fungi and flagellates (abundant at the bottom of lake) ½ x 2 = 1 iv) Nutrient cycling - decomposition of dead matter to release the nutrients back to be re-used by the autotrophs ½ x 2 = 1	5 ½ x 2 = 1 ½ x 2 = 1
	Food chain in aquatic ecosystem (lake) Phytoplanktons Zooplanktons Small fish Big fish (Any other appropriate example)	1
	OR a) Pioneer species, lichen ½ x 2 = 1 b) Phytoplankton - hydric ½ x 7 = 3½	

	Submerged plant stage Submerged free floating plant stage Reed swamp stage Marsh - meadow stage Scrub stage Forest stage – Mesic c) Forest ½	

BIOLOGY (Theory)

Time allowed : 3 hours *Maximum Marks : 70* 57/1 2

General Instructions :

*(i) There are a total of **26** questions and five sections in the question paper. **All** questions are compulsory.*

*(ii) Section **A** contains questions number **1** to **5**, very short-answer type questions of **1** mark each.*

*(iii) Section **B** contains questions number **6** to **10**, short-answer type I questions of **2** marks each.*

*(iv) Section **C** contains questions number **11** to **22**, short-answer type II questions of **3** marks each.*

*(v) Section **D** contains question number **23**, value based question of **4** marks.*

*(vi) Section **E** contains questions number **24** to **26**, long-answer type questions of **5** marks each.*

*(vii) There is no overall choice in the question paper, however, an internal choice is provided in one question of **2** marks, one question of **3** marks and all the three questions of **5** marks. In these questions, an examinee is to attempt any one of the two given alternatives.* 57/1 3 P.T.O.

1. Write the dual purpose served by Deoxyribonucleoside triphosphates in polymerisation.
2. Name two diseases whose spread can be controlled by the eradication of *Aedes* mosquitoes.
3. How do cytokine barriers provide innate immunity in humans ?
4. Write the names of the following :
   (a) A 15 *mya* primate that was ape-like
   (b) A 2 *mya* primate that lived in East African grasslands
5. Mention the chemical change that proinsulin undergoes, to be able to act as mature insulin.
6. Your advice is sought to improve the nitrogen content of the soil to be used for cultivation of a non-leguminous terrestrial crop.
   (a) Recommend two microbes that can enrich the soil with nitrogen.
   (b) Why do leguminous crops not require such enrichment of the soil?
7. With the help of an algebraic equation, how did Hardy-Weinberg explain that in a given population the frequency of occurrence of alleles of a gene is supposed to remain the same through generations ?

   OR

   Although a prokaryotic cell has no defined nucleus, yet DNA is not scattered throughout the cell. Explain.

8. How did a citizen group called Friends of Arcata Marsh, Arcata, California, USA, help to improve water quality of the marshland using Integrated Waste Water Treatment ? Explain in four steps.
9. You have obtained a high yielding variety of tomato. Name and explain the procedure that ensures retention of the desired characteristics repeatedly in large populations of future generations of the tomato crop.
10. (a) Name the source plant of heroin drug. How is it obtained from the plant ?
    (b) Write the effects of heroin on the human body.
11. Draw a diagram of a mature human sperm. Label any three parts and write their functions.
12. (a) Expand VNTR and describe its role in DNA fingerprinting.
    (b) List any two applications of DNA fingerprinting technique.
13. Differentiate between Parthenocarpy and Parthenogenesis. Give one example of each.
14. Medically it is advised to all young mothers that breastfeeding is the best for their newborn babies. Do you agree ? Give reasons in support of your answer.
    57/1 6
15. Explain the mechanism of 'sex determination' in birds. How does it differ from that of human beings ?
16. (a) How has the development of bioreactor helped in biotechnology ?
    (b) Name the most commonly used bioreactor and describe its working.
17. Explain the roles of the following with the help of an example each in recombinant DNA technology :
    (a) Restriction Enzymes
    (b) Plasmids
18. Explain out-breeding, out-crossing and cross-breeding practices in animal husbandry.
19. (a) Organic farmers prefer biological control of diseases and pests to the use of chemicals for the same purpose. Justify.
    (b) Give an example of a bacterium, a fungus and an insect that are used as biocontrol agents.
20. (a) Differentiate between analogous and homologous structures.
    (b) Select and write analogous structures from the list given below :

(i) Wings of butterfly and birds

(ii) Vertebrate hearts

(iii) Tendrils of bougainvillea and cucurbita

(iv) Tubers of sweet potato and potato

21. (a) "India has greater ecosystem diversity than Norway." Do you agree with the statement ? Give reasons in support of your answer.

(b) Write the difference between genetic biodiversity and species biodiversity that exists at all the levels of biological organisation.

OR

Explain the effect on the characteristics of a river when urban sewage is discharged into it.

22. How has the use of *Agrobacterium* as vectors helped in controlling *Meloidegyne incognitia* infestation in tobacco plants ? Explain in correct sequence. 57/1 8

SECTION D

23. Looking at the deteriorating air quality because of air pollution in many cities of the country, the citizens are very much worried and concerned about their health. The doctors have declared health emergency in the cities where the air quality is very severely poor.

(a) Mention any two major causes of air pollution.

(b) Write any two harmful effects of air pollution to plants and humans.

(c) As a captain of your school Eco-club, suggest any two programmes you would plan to organise in the school so as to bring awareness among the students on how to check air pollution in and around the school.

SECTION E

24. (a) Describe any two devices in a flowering plant which prevent both autogamy and geitonogamy.

(b) Explain the events upto double fertilisation after the pollen tube enters one of the synergids in an ovule of an angiosperm.

OR

(a) Explain menstrual cycle in human females.

(b) How can the scientific understanding of the menstrual cycle of human females help as a contraceptive measure ?

25. (a) Write the scientific name of the organism Thomas Hunt Morgan and his colleagues worked with for their experiments. Explain the correlation between linkage and recombination with respect to genes as studied by them.
(b) How did Sturtevant explain gene mapping while working with Morgan ?
OR
(a) State the 'Central dogma' as proposed by Francis Crick. Are there any exceptions to it ? Support your answer with a reason and an example.
(b) Explain how the biochemical characterisation (nature) of 'Transforming Principle' was determined, which was not defined from Griffith's experiments.

26. (a) Following are the responses of different animals to various abiotic factors. Describe each one with the help of an example.
(i) Regulate
(ii) Conform
(iii) Migrate
(iv) Suspend
(b) If 8 individuals in a population of 80 butterflies die in a week, calculate the death rate of population of butterflies during that period.
OR
(a) What is a trophic level in an ecosystem ? What is 'standing crop' with reference to it ?
(b) Explain the role of the 'first trophic level' in an ecosystem.
(c) How is the detritus food chain connected with the grazing food chain in a natural ecosystem ?

MARKING SCHEME

SECTION – A
(Q. Nos. 1 - 5 are of one mark each)

1. **Write the dual purpose served by Deoxyribonucleoside triphosphates in polymerisation.**
Ans. Acts as a substrate , provide energy (from the terminal two phosphates) = ½ + ½
[1 mark]

2. **Name two diseases whose spread can be controlled by the eradication of *Aedes* mosquitoes.**
Ans. Dengue , Chikunguniya // Yellow Fever / Eastern Equine Encephalitis / West Nile Fever / Zika / Zika Virus Disease ***(Any two)* = ½ + ½**
[1 mark]

3. **How do cytokine barriers provide innate immunity in humans ?**
Ans. Interferon (proteins) , secreted by virus infected cells (protect non - infected cells from further viral infection) =½ + ½
[1 mark]

4. **Write the names of the following :**
(a) A 15 *mya* primate that was ape-like
(b) A 2 *mya* primate that lived in East African grasslands
Ans. (a) *Dryopithecus* = ½
(b) *Australopithecines / Australopithecus / Homo habilis* = ½
[1 mark]

5. **Mention the chemical change that pro-insulin undergoes, to be able to act as mature insulin.**
Ans. Removal of C - peptide (from pro-insulin)
[1 mark]

MS-18 - 57/1/2/3 5
SECTION B
)Q. Nos. 2 - 10 are of two marks each)

6. **Your advice is sought to improve the nitrogen content of the soil to be used for cultivation of a non-leguminous terrestrial crop.**
(a) Recommend two microbes that can enrich the soil with nitrogen.
(b) Why do leguminous crops not require such enrichment of the soil ?
Ans. (a) *Azospirillum / Azotobacter / Anabaena / Nostoc / Oscillatoria / Frankia* (**Any two correct names of microbes**) = ½ + ½
(If cyanobacteria mentioned = ½ , but if along with cyanobacteria *Anabaena / Nostoc / Oscillatoria mentioned then* ***No mark*** on cyanobacteria)
(b) They can fix atmospheric nitrogen , due to presence of *Rhizobium* / N2 fixing bacteria in their root nodules = ½ + ½
[1 + 1 = 2 marks]

7. **With the help of an algebraic equation, how did Hardy-Weinberg explain that in a given population the frequency of occurrence of alleles of a gene is supposed to remain the same through generations ?**

Ans. In a population of diploid organisms
If frequency of allele A = p and frequency of allele a = q = ½
Expected genotype frequency under random mating are
AA = p^2 (for the AA homozygotes)
aa = q^2 (for the aa homozygotes)
Aa = 2pq (for the Aa heterozygotes) = ½
(In absence of selection , mutation , genetic drift or other forces allelic frequency p and q are constant through generation)
Therefore p2 + 2pq +q2 = 1 = 1
[2 marks]
MS-18 - 57/1/2/3 6
OR
Although a prokaryotic cell has no defined nucleus , yet DNA is not scattered throughout the cell. Explain.
DNA is negatively charged , positively charged proteins , hold it in places , in large loops (in a region termed as nucleiod) = ½ × 4
[2 marks]

8. **How did a citizen group called Friends of Arcata Marsh, Arcata, California, USA, help to improve water quality of the marshland using Integrated Waste Water Treatment ? Explain in four steps.**
Ans.- Water is treated by conventional method // sedimentation / filtration /chlorination
- Water flows to six connected marshes
- The water in marshes is seeded with appropriate plants / algae / fungi / bacteria
- Which helps to neutralise the pollutants / assimilate the pollutants / absorb pollutants / Remove heavy metals = ½ × 4
[2 marks]

9. **You have obtained a high yielding variety of tomato. Name and explain the procedure that ensures retention of the desired characteristics repeatedly in large populations of future generations of the tomato crop.**
Ans. - Tissue culture / micropropagation / somaclonal propagation / apomixis **= ½**
- Explant / any part of plant taken out and grown (in a test tube / vessel) ,
- under sterile condition ,
- in special nutrient medium (containing carbon source / sucrose , inorganic salt vitamins / amino acids and growth regulator) = ½ × 3
[½ + 1½ = 2 marks]

10. **(a) Name the source plant of heroin drug. How is it obtained from the plant ?**
(b) Write the effects of heroin on the human body.
Ans. (a) - *Papaver somniferum* / Poppy plant = ½

- Extracted from latex of the plant / acetylation of morphine (obtained from the latex of plant) = ½

MS-18 - 57/1/2/3 7

(b) Depressant , slows down body function = ½ + ½

[1 + 1 = 2 marks]

SECTION C

(Q. Nos. 11 - 22 are of three marks each)

11. Draw a diagram of a mature human sperm. Label any three parts and write their functions.

(Any three labelling) = ½ × 3

Plasma membrane - Envelope of the sperm

Acrosome - Filled with enzyme that help fertilization of ovum

Mitochondria - Energy source for swimming

Middle Piece - Possess mitochondria which is the energy source for swimming Tail - For movement of sperm

MS-18 - 57/1/2/3 8

Nucleus - Containing chromosomal material

(Functions of the parts labelled) = ½ × 3

[1½ + 1½ = 3 marks]

12. (a) Expand VNTR and describe its role in DNA fingerprinting.

(b) List any two applications of DNA fingerprinting technique.

Ans. (a) VNTR - Variable Number of Tandem Repeat(s) = ½

- used as a probe (because of its high degree of polymorphism) = ½

(b) Forensic science / criminal investigation (any point related to forensic science) / determine population and genetic diversities / paternity testing / maternity testing / study of evolutionary biology (***Any two***) = 1 + 1

[1 + 2 = 3 marks

13. Differentiate between Parthenocarpy and Parthenogenesis. Give one example of each.

Ans. Parthenocarpy Parthenogenesis

- Formation of fruit without fertilization = 1 - New organism develops without fertilization = 1

- e.g. banana / grapes / any other correct example = ½ - e.g. Drones /male honey bee / turkey / rotifers / some lizards / any other correct example = ½

[1½ + 1½ = 3 marks]

14. Medically it is advised to all young mothers that breastfeeding is the best for their

newborn babies. Do you agree ? Give reasons in support of your answer.

Ans.Yes = 1 ,

provides nutrition (calcium , fats , lactose) / provides (passive) immunity / provides antibodies / Ig A ***(Any two)*** = 1 + 1

[1 + 2 = 3 marks]

MS-18 - 57/1/2/3 9

15. Explain the mechanism of 'sex determination' in birds. How does it differ from that of human beings ?

Ans. In birds ;
Birds : female heterogamety / female produces (Z) type and (W) type of gametes = ½
Humans : male heterogamety / male produces (X) type and (Y) type of gametes = ½
[2 + 1 = 3 marks]

16. (a) How has the development of bioreactor helped in biotechnology ?
(b) Name the most commonly used bioreactor and describe its working.

Ans. (a) Larger biomass / large volume of culture can be processed leading to higher yields of desired specific products (protein / enzymes) , under controlled condition = ½ + ½
(b) Stirring type = ½
- Mixing of reactor contents evenly (with agitator system or a stirrer) = ½
- Facilitates oxygen availability = ½
- Temperature / pH / foam control // under optimum conditions = ½
[1 + 2 = 3 marks]

MS-18 - 57/1/2/3 10

17. Explain the roles of the following with the help of an example each in recombinant DNA technology:
(a) Restriction Enzymes
(b) Plasmids

Ans. (a) It recognises a specific sequence of base pairs / pallindromes, and cuts the DNA strand at a specific site = ½ + ½
eg. EcoRI / Hind II or any other correct example = ½
(b) Act as vectors / cloning of desired alien gene / foreign gene = 1
eg. pBR322 / plasmid of *Salmonella* / plasmid of *Agrobacterium* / Ti Plasmid / Tumour inducing Plasmid = ½
[1½ + 1½ = 3 marks]

18. Explain out-breeding, out-crossing and cross-breeding practices in animal husbandry.

Out breeding – Breeding of unrelated animals (which may be between individual of same breed or between individuals of different species) = 1
Out crossing – (a kind of out breeding) Mating of animals within the same breed but having no common ancestors on either side of their pedigree upto 4 –
6 generations = 1
Cross breeding – (another type of out breeding) Superior males of one breed are mated with superior females of another breed = 1
[1+1+1 = 3 marks

19. (a) Organic farmers prefer biological control of diseases and pests to the use of chemicals for the same purpose. Justify.
(b) Give an example of a bacterium, a fungus and an insect that are used as biocontrol agents.

Ans. (a) - Reduces dependence on toxic chemicals

- Protects our ecosystem or environment
- Protects and conserves non-target organisms / they are species - specific
- These chemicals being non-biodegradable may pollute the environment permanently
- These chemicals being non-biodegradable may cause biomagnification

(Any three) = ½ × 3

MS-18 - 57/1/2/3 11

(b) Bacteria – *Bacillus thuringiensis* = ½
Fungus – *Trichoderma* = ½
Insect – Ladybird / Dragonfly / Moth or any other correct example = ½
[1½+ 1½ = 3 marks]

20. **(a) Differentiate between analogous and homologous structures.**
(b) Select and write analogous structures from the list given below :
(i) Wings of butterfly and birds
(ii) Vertebrate hearts
(iii) Tendrils of bougainvillea and cucurbita
(iv) Tubers of sweet potato and potato

Ans. (a) Analogous - Anatomically not similar though perform similar functions / are a result of convergent evolution = 1
Homologus - Anatomically similar (but perform different functions) / are a result of divergent evolution = 1
(b) Option (i) Wings of butterfly and birds **/** (iv) Tubers of sweet potato and potato
(Any one) = 1
[2 + 1 = 3 marks]

21. **(a) "India has greater ecosystem diversity than Norway." Do you agree with the statement ? Give reasons in support of your answer.**
(b) Write the difference between genetic biodiversity and species biodiversity that exists at all the levels of biological organisation.

Ans. (a) Yes = ½
India / tropical region Norway / temperate region
- are less seasonal - more seasonal /
/ more constant / more predictable / less constant / less predictable
- promote niche specialisation - do not promote niche specialisation leading to greater bio-diversity leading to low bio-diversity

MS-18 - 57/1/2/3 12

- Species diversity increases as we - Species diversity decreases as we move towards equator move away from equator
- More number of species exist - Less number of species exist

(Any one) = ½
(b) Genetic diversity - Diversity / variation within a species over its distributional
range / same explained with the help of a correct example = 1
Species diversity - Diversity / variation at a species level / same explained with the help of a correct example = 1
[1 + 2 = 3 marks]

OR

Explain the effect on the characteristics of a river when urban sewage is discharged into it.

Ans. - Rise in organic matter , leads to increased microbial activity / growth of microbes = ½ + ½

- It results in decrease in dissolved oxygen / rise in BOD / rise in Biochemical Oxygen Demand = 1

- Leads to fish mortality / algal bloom / colour change / foul odour / increase in toxicity ***(Any two)*** = ½ + ½

[1 + 1 + 1 = 3 marks]

22. **How has the use of *Agrobacterium* as vectors helped in controlling *Meloidegyne incognitia* infestation in tobacco plants ? Explain in correct sequence.**

Ans. - Using *Agrobacterium* vector nematode specific genes introduced into host plant

- Sense and antisense strands of mRNA are produced
- ds RNA is formed
- ds RNA initiates RNAi
- Prevents translation of mRNA / silencing of mRNA of parasite / nematode
- Parasite will not survive

[½ × 6 = 3 marks]

MS-18 - 57/1/2/3 13

SECTION D

(Q. Nos. 23 is of four marks)

23. **Looking at the deteriorating air quality because of air pollution in many cities of the country, the citizens are very much worried and concerned about their health. The doctors have declared health emergency in the cities where the air quality is very severely poor.**

(a) Mention any two major causes of air pollution.

(b) Write any two harmful effects of air pollution to plants and humans.

(c) As a captain of your school Eco-club, suggest any two programmes you would plan to organise in the school so as to bring awareness among the students on how to check air pollution in and around the school.

Ans. (a) Vehicular discharge / smoke from industries / burning of agricultural wastes / smoke from incinerator / dust / smoke from thermal plants or any other correct cause

(Any two) = ½ + ½

(b) Reduces growth of plants / reduces yields of crops / premature death of plants / respiratory problems / acid rain / any other relevant point ***(Any two - one from plant and one from human)*** = 1 + 1

(c) Plantation drive / awareness programmes through posters / nukkad natak / film show / rallies / debates or any other ***(Any two)*** = 1 + 1

[1 + 1 + 2 = 4 marks]

SECTION E

(Q. Nos. 24 - 26 are of five marks each)

24. **(a) Describe any two devices in a flowering plant which prevent both autogamy and geitonogamy.**

(b) Explain the events upto double fertilisation after the pollen tube enters one of the synergids in an ovule of an angiosperm.

Ans. (a) - Dioecy / production of unisexual flowers (in different plants)
- Self incompatibility = 1 + 1
(b) - Pollen tube releases 2 male gametes in the cytoplasm of synergid
- One male gamete fuses with egg cell / syngamy , resulting in diploid zygote

MS-18 - 57/1/2/3 14

- Other male gamete fuses with polar nuclei / triple fusion , to form triploid PEN (Primary Endosperm Nucleus) / PEC (Primary Endosperm Cell) = 1 × 3
[2 + 3 = 5 marks]

OR

(a) Explain menstrual cycle in human females.

(b) How can the scientific understanding of the menstrual cycle of human females help as a contraceptive measure ?

Ans. (a) - Menstrual Phase - Menstrual flow occurs / due to breakdown of endometrial lining of uterus , when fertilization does not occur
- Follicular Phase - Primary follicles grow into mature graafian follicles and endometrium regenerates through proliferation , changes induced by pituitary and ovarian hormones
- Ovulatory Phase - LH surge , induces rupture of graafian follicle and release of secondary oocyte / ovum during middle of cycle (i.e. 14th day)
- Luteal phase - Ruptured graafian follicle transforms into corpus luteum which secrete large amount of progesteron , essential for maintaining endometrium = 1 × 4
(b) Because ovulation occurs during mid cycle chances of fertilisation are very high so , couples should abstain from coitus between day 10 - 17 = ½ + ½

25. (a) Write the scientific name of the organism Thomas Hunt Morgan and his colleagues worked with for their experiments. Explain the correlation between linkage and recombination with respect to genes as studied by them.

(b) How did Sturtevant explain gene mapping while working with Morgan ?

Ans. (a) *Drosophila melanogaster* = 1
They observed that two genes (located closely on a chromosome) did not segregate independently of each other (F2 ratio deviated significantly from 9 : 3 : 3 : 1) = ½
Tightly linked genes tend to show fewer (lesser) recombinant frequency of parental traits / show higher (more) frequency of parental type = ½
Loosely linked genes show higher percentage (more) of recombinant frequency of

MS-18 - 57/1/2/3 15

parental traits / lower frequency percentage of parental type = ½
Genes present on same chromosome are said to be linked and the recombinant frequency depends on their relative distance on the chromosome = ½
(b) He used the frequency of recombination between gene pairs on the same chromosome , as a measure of the distance between genes and mapped their position on the chromosome = 1 + 1

[3 + 2 = 5 marks]

OR

(a) State the 'Central dogma' as proposed by Francis Crick. Are there any exceptions to it ? Support your answer with a reason and an example.

(b) Explain how the biochemical characterisation (nature) of 'Transforming Principle' was determined, which was not defined from Griffith's experiments.

Ans. (a) = 1

Yes , in some viruses flow of information is in reverse direction / reverse transcription = ½ + ½

e.g. Any Retrovirus / HIV = ½

(b) Protein and DNA and RNA were purified from heat killed S strain / smooth

Streptococcus / Diplococcus pneumoniae **= ½**

Protein + Protease ✹ transformation occured (R cell to S type) = ½

RNA + RNA ase ✹ transformation occured (R cell to S type) = ½

DNA + DNA ase ✹ transformation inhibited = ½

Hence DNA alone is the transforming material = ½

[2 + 3 = 5 marks]

MS-18 - 57/1/2/3 16

26. **(a) Following are the responses of different animals to various abiotic factors.**

Describe each one with the help of an example.

(i) Regulate

(ii) Conform

(iii) Migrate

(iv) Suspend

(b) If 8 individuals in a population of 80 butterflies die in a week, calculate the death rate of population of butterflies during that period.

Ans. (a) (i) Regulate - Maintain constant internal temperature / osmotic concentration /homeostasis = ½

e.g. birds / mammals = ½

(ii) Conform - Do not maintain constant internal temperature / osmotic concentration / No homeostasis = ½

e.g. any one example of animal other than birds and mammals = ½

(iii) Migrate - Temporary movement of organisms from the stressful of habitats to hospitable areas and return when stressful period is over = ½

e.g. birds from Siberia / or any other correct example = ½

(iv) Suspend - Reducing / minimising the metabolic activities during unfavourable conditions = ½

e.g. Polar bear / amphibian / snails / fish / any other example of animals = ½

(b) Death rate = 0.1

80

8 ❢ , individuals per butterfly per week = ½ + ½

[4 + 1 = 5 marks]

OR

(a) What is a trophic level in an ecosystem ? What is 'standing crop' with reference to it ?

MS-18 - 57/1/2/3 17

(b) Explain the role of the 'first trophic level' in an ecosystem.

(c) How is the detritus food chain connected with the grazing food chain in a natural ecosystem ?

Ans. (a) Specific place of an organism in a food chain , mass of living material (biomass) at each trophic level at a particular time = 1 + 1

(b) First trophic level has producers / autotrophs , which trap solar energy / to produce food (photosynthesis) = 1 + 1

(c) Organisms of the Detritus food chain (DFC) are the prey to the Grazing food chain (GFC) organism , the dead remains of GFC are decomposed into simple inorganic materials which are absorbed by DFC organisms = ½ + ½

[2 + 2 + 1 = 5 marks] ween day 10 - 17 = ½ + ½

Academic Session: 2019-2020
Preboard Examination
Subject - Biology
M/1/1

Time: 3 Hrs.
Max. Marks: 70 General Instructions:

1. There are a total of 27 questions and five sections in the question paper. All questions are compulsory.
2. Section A contains question numbers 1 to 5, multiple choice questions of one mark each.
   Section B contains question numbers 6 to 12, short answer type I of two marks each.
   Section C contains question numbers 13 to 21, short answer type II of three marks each.
   Section D contains question numbers 22 to 24 case based short answer type questions of three marks each.
   Section E contains question numbers 25 to 27, long answer type questions of five marks each.
3. The question paper has4 printed sides.

Section A

1. Monoecious plant of *Chara* shows occurrence of:
   a) upper oogonium and lower antheridium on the same plant
   b) stamen and carpel of the same plant
   c) antheridiophore and archegoniophore on the same plant
   d) upper antheridium and lower oogonium on the same plant

   OR

   Which of the following statements is true of ginger?
   a) Germinating bud appears from the eye of stem tuber
   b) Germinating bud appears from the node of the rhizome
   c) Germinating bud appears from the notch of the leaf margin
   d) Germinating bud is formed at the leaf axis
2. A man with a certain disease marries a normal woman. They have eight children (3 daughters and 5 sons). All the daughters suffer from their father's disease but none of the sons are affected. Which of the following mode of inheritance do you suggest for this disease?
   a) Autosomal dominant
   b) Sex-linked recessive
   c) Sex-limited recessive
   d) Sex-linked dominant
3. The new varieties of plants are produced by:
   a) introduction and mutation
   b) selection and hybridization
   c) selection and introduction

d) mutation and selection

OR

From a cross AABbXaaBb the genotypes AaBB:AaBb:Aabb will be obtained in the ratio:

a) 1:1:2
b) 1:2:1
c) 2:1:1
d) 2:1:2

4. Microbe used for biocontrol of pest butterfly caterpillars is
   a) *Bacillus thuringiensis*
   b) Trichoderma sp.
   c) Streptococcus sp.
   d) *Saccharomyces cerevisiae*

5. Homeostasis is:
   a) disturbance of self regulatory system and natural controls
   b) tendency of biological systems to change with change in environment
   c) biotic materials used in homeopathic medicines.
   d) tendency of biological systems to resist change

Section B

6. Why are IUDs the most widely accepted methods of contraception in India? Which group of female population will benefit most from IUDs?

7. How does the gene 'I' control ABO blood groups in humans? Write the effect the gene has on the structure of Red Blood Cell.

8. Divergent evolution leads to homologous structures. Explain with the help of an example.

9. Differentiate between plasmid DNA and Chromosomal DNA.

10. With the help of suitable example show that the pyramid of biomass can be both upright as well as inverted.

11. a) What is a hotspot?
    b) Name any two exotic plant weeds that have threatened the local population.

12. Name the source of cyclosporine A. Explain its mode of action.

OR

Name the source of streptokinase. Explain its mode of action.

Section C

13. a) Describe the endosperm development in coconut.
    b) Why is tender coconut considered a healthy source of nutrition?
    c) How are pea seeds different from castor seeds with respect to endosperm?

OR

Double fertilization is reported in plants of both, castor and groundnut. However, the mature seeds of groundnut are non albuminous and castor are albuminous. Explain the post fertilization events that are responsible for it.

14. Draw a diagrammatic sectional view of a female reproductive system of human and label the parts:
    a) Where the secondary oocyte develops
    b) Which helps in collection of ovum after ovulation
    c) Where fertilization occurs
    d) Where implantation of embryo occurs
15. What is satellite DNA? How does it form the basis of DNA fingerprinting?

OR

What is VNTR? What is its use in forensic science?

16. How do Darwin and De Vries differ in their views on the mechanism of evolution of life on earth?
17. In the form of a flowchart show the working of the sewage treatment plant.
18. Draw a schematic sketch of pBR322 plasmid and label the following in it, also write the function of each part:
    a)One restriction site
    b)Ori
    c) An antibiotic resistant gene
19. How did Eli Lily synthesise the human insulin? Mention one difference between this insulin and the one produced by the human pancreas.
20. Construct an ideal pyramid of energy where 5000,000 J of sunlight is available. Label all its tropic level.
21. Since the origin of Life on Earth, there were five episodes of mass extinction of species.
    a)How is the sixth extinction, presently in progress different from previous episodes?
    b)Who is mainly responsible for the sixth extinction?
    c)List any four points that can help to overcome this disaster?

Section D

22. India displays significant biodiversity. One of seventeen megadiverse countries, it is

home to 7.6% of all mammalian, 12.6% of all avian, 6.2% of all reptilian, 4.4% of all amphibian, 11.7% of all fish, and 6.0% of all flowering plant species. What according to the evolutionary biologists and ecologists could be the reason for the rich biodiversity in India?

23. Plant breeding is the purposeful manipulation of plant species in order to create desired plant types that are better suited for cultivation. Plant breeding programmes are carried out in a systematic way worldwide in government institutions and commercial companies. Below are some of the important steps of the plant breeding programmes:
    (i) Germplasm collection
    (ii) Cross hybridization among the selected parents
    (iii) Selfing of recombinants

    Answer the following questions:
    a) Why is germplasm collection essential?
    b) Cross hybridization among the selected parents is the most tedious and time consuming process and may not yield the desired result. Comment.
    c) Why is selfing of recombinants carried out for several generations?

24. In a chromosome map of an organism the map unit between gene A and B is 6, between B and C is 2, between C and D gene is 8 and between B and D is 6. Based on this information
    a) Predict which of the genes will show a maximum recombination frequency? Why ?
    b) Mention two situations when 50% recombination can take place.
    c) Which law of inheritance does this demonstrate ?

Section E

25. Give reason :
    a) An anther with malfunctioning tapetum often fails to produce viable male gametophytes.
    b) Most zygotes in angiosperms divide only after certain amount of endosperm is formed.
    c) Micropyle remains as a small pore in the seed coat of a seed.
    d) integuments of an ovule harden and the water content is highly reduced,as the seed matures.
    e) Apple and cashew are not called true fruits.

OR

Read the following statements and answer the questions that follow:
"Fruit custard apple has 400 viable seeds"

a) What are viable seeds?
b) Write the total number of:
    (i) pollen grains

(ii) gametes that are producing 200 viable seeds

c) When a seed of an orange is squeezed, many embryos instead of one are observed. Explain how it is possible?

26. a) If the length of *E.Coli* DNA is 1.36 mm, Calculate the number of base pairs it contains

b) Describe the steps involved in the sequencing of a genome.

OR

a) Explain the process of DNA replication with the help of a schematic diagram.

b) What would happen if the cell division is not followed by the replication?

c) During the course of evolution why DNA was chosen over RNA as genetic material.

27. How do normal cells get transformed into cancerous neoplastic cells? Mention the differences between viral oncogenes and cellular oncogenes.

OR

a)Name the respective forms in which the malarial parasite gains entry into

(i) Human body

(ii) Body of female *Anopheles*

b) Name the hosts where the sexual and the asexual reproduction of malarial parasite occur respectively.

c) Name the toxin responsible for the appearance of symptoms of malaria in humans.

d)Why do these symptoms occur periodically ?

Time: 3 Hours **Maximum Marks: 70**

General Instructions:

(i) All questions are compulsory.

(ii) The question paper has four sections: Section A, Section B, Section C and Section D. There are 33 questions in the question paper.

(iii) Section–A has 14 questions of 1 mark each and 02 ase-based questions. Section–B has 9 questions of 2 marks each. Section–C has 5 questions of 3 marks each and Section–D has 3 questions of 5 marks each.

(iv) There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.

(v) Wherever necessary, neat and properly labeled diagrams should be drawn.

SECTION A

1. Why do you think the exine should be hard*?*
2. What is fruit production without fertilization called?
3. How does pollination take place in water hyacinth and water lily?
4. What do you think the doctor injects to induce delivery?
5. A woman with blood group O married a man with blood group AB. List the alleles involved in the inheritance of their progeny
6. Mention the combinations of sex chromosomes in a male and a female bird.
7. How does a degenerate code differ from an unambiguous code?
8. State the role of C-peptide in human insulin.
9. Which enzyme is used to digest walls of bacteria and fungi in genetic engineering?
10. Which forest is named as the 'Lungs of the Planet'?
11. **Assertion:** The uptake of DNA during transformation isenergy requiring process
    Reason: DNA is a hydrophilic molecule.
    a. Both assertion and reason are true, and reason is the correct explanation of assertion.
    b. Both assertion and reason are true, but reason is not the correct explanation of assertion.
    c. Assertion is true but reason is false.
    d. Both assertion and reason are false.

    OR

    Assertion: Split gene arrangement is the ancient feature of the genome
    Reason: Splicing represents the dominance of RNA world.
    a. Both assertion and reason are true, and reason is the correct explanation of assertion.
    b. Both assertion and reason are true, but reason is not the correct explanation of assertion.
    c. Assertion is true but reason is false.
    d. Both assertion and reason are false.

12. **Assertion:** *E. coli* having pBR322 with DNA insert at Bam HI site cannot grow in medium containing tetracycline.
    Reason: Recognition site for Bam HI is present in tet^R region of pBR322.

a. Both assertion and reason are true, and the reason is the correct explanation of the assertion.
b. Both assertion and reason are true, but the reason is not the correct explanation of the assertion.
c. Assertion is true but reason is false.
d. Both assertion and reason are false.

13. **Assertion:** Conserving the biological diversity of the ecological hotspots is very important component of efforts to safeguard the worlds biological heritage.
Reason: The hot spots of biodiversity cover a large percentage the land area of earth.

a. Both assertion and reason are true, and the reason is the correct explanation of the assertion.
b. Both assertion and reason are true, but the reason is not the correct explanation of the assertion.
c. Assertion is true but reason is false.
d. Both assertion and reason are false

14. **Assertion:** the weeds *Calotropis* growing in abandoned fields and that is why you never see any cattle or goats grazing on this plant.
Reason: the plant produces highly poisonous cardiac glycosides .

a. Both assertion and reason are true, and the reason is the correct explanation of the assertion.
b. Both assertion and reason are true, but the reason is not the correct explanation of the assertion.
c. Assertion is true but reason is false.
d. Both assertion and reason are false

15. *Read the following and answer any **four** questions from 15(i) to 15(v) given below:*

SEWAGE TREATMENT PLANT: -

Sewage treatment is a process in which the pollutants are removed. The ultimate goal of sewage treatment is to produce an effluent that will not impact the environment. In the absence of sewage treatment, the results can be devastating as sewage can disrupt the environment.

The general processes of sewage treatment are primary, secondary and tertiary treatment. Primary treatment involves physical separation of sewage into solids and liquid by using a settling basin. The liquid sewage is then transferred to secondary treatment which focuses on removing the dissolved biological compound by the use of micro-organisms. The micro-organisms usually use aerobic metabolism to degrade the biological matter in the liquid sludge. Then tertiary treatment is required to disinfect the sewage so that it can be released into the environment. The solid sewage separated from

primary treatment is transferred to a tank for sludge digestion which involves anaerobic degradation using micro-organisms

(i) The primary treatment of waste water involves the removal of--------

a. Dissolved impurities
b. Stable particles
c. Toxic substances
d. Harmful bacteria

(ii) A well oxidized sewage contains Nitrogen mainly as -----
a. Nitrates
b. Nitrites
c. Free ammonia
d. urea

(iii) Waste water treatment generates a large quantity of sludge, which can be treated by------
a. Anaerobic Digesters
b. Flocs.
c. Chemicals.
d. Oxidation.

(iv) BOD of waste water is estimated by measuring the amount of----------
a. Total organic matter
b. Biodegradable organic matter
c. Oxygen evolution
d. Oxygen consumption

(v) **Assertion:** The greater the BOD of waste water, less is its polluting potential.
Reason: The effluent from the primary treatment plant is generally released into natural water bodies like rivers and streams.

a. Both assertion and reason are true, and the reason is the correct explanation of the assertion.

b. Both assertion and reason are true, but the reason is not the correct explanation of the assertion.

c. Assertion is true but reason is false.

d. Both assertion and reason are false

16. *Read the following and answer any **four** questions from 16(i) to 16(v) given below:*

DNA fingerprinting is a laboratory technique used to establish a link between biological evidence and a suspect in a criminal investigation. A DNA sample taken from a crime scene is compared with a DNA sample from a suspect. ... DNA fingerprinting is also used to establish paternity

(i) DNA fingerprinting identifies differences in--------

a. Repetitive DNA

b. Bulk DNA

c. Satellite DNA

d. Both A and B

(ii) Satellite DNA classification is based on----------

a. Base composition

b. Length of segment

c. No of repetitive units

d.All of these

(iii) VNTR stands for:-

a. Variable Number of Tendon Repeats

b. Variable Number for Tendon Repeats

c. Variable Number of Tandem Repeats

d. Variable Number of Term Repeats

(iv) The size of VNTR varies from

a. 0.1 to 20 kb

b. 0.1 to 200kb

c. 1 to 20 kb

d. 0.10 to .20kb

(v) The technique of DNA fingerprinting involves the following events in the order:-

i. Isolation of DNA

ii. DNA separation

iii. Transferring (blotting) of separated DNA fragments

iv. DNA digestion by restriction endonuclease

v. Hybridization

vi. Autoradiography

Choose from below the correct events in the order.

a. i, iv, ii, iii, vi, v

b. i, vi, ii, iii, v, iv

c. ii, iii, iv, v, vi, i

d. i, iv, ii, iii, v, vi

17. What do you mean by contraception? Name the natural methods of contraception.

18. Karyotype of a child shows trisomy of chromosome number 21. Identify the disorder and state the symptoms which are likely to be exhibited in this case.

19. Name the microbes that help production of the following products commercially:
(a) Statin
(b) Citric acid
(c) Penicillin
(d) Butyric acid

20. Explain how *Agrobacterium tumefaciens* has been made a useful vector to transfer DNA to plant cells?

OR

What is a bioreactor used for? Name a commonly used bioreactor and any two of its components.

21. Write any four ways used to introduce a desired DNA segment into a bacterial cell in recombinant DNA technology experiments.

24. What are sticky ends? State their significance in recombination DNA technology.

OR

Why is the introduction of genetically engineered lymphocytes into an ADA- deficiency patient, not a permanent cure? Suggest a possible permanent cure.

23. What is the 'wise use' concept of Ramsar convention? Name any two types of wetlands included in its mission.

24. Certain species of wasps are seen to frequently visit flowering fig trees. What type of interaction is seen between them and why?

25. The Tropical regions are likely to have more biological diversity than the Temperate ones. Give two reasons to justify the statement.

SECTION C

26. Why is breast-feeding recommended during the initial period of an infant's growth? Give reasons in support your answer.

27. Work out a cross between true-breeding red and white-flowered dog-flower plants(snapdragon) up to F_2 progeny. Explain the results of F_1 and F_2 generations.

28. Draw a well-labelled diagram of an antibody molecule.

29. A farmer noticed that nematode infection in tobacco plants has resulted in the reduction in the yield. Suggest a strategy which provides cellular defense for providing resistance to this pest. Explain the technique.

30. (a) "Organisms may be conformers or regulators." Explain this statement and give one example of each.

(b) Why are there more conformers than regulators in the animal world?

OR

Give reasons for the following:

a. Very small animals are rarely found in polar regions
b. Mammals from colder climates generally have shorter ears and limbs.

c. Initially we feel nausea and fatigue when we reach a high altitude such as Rohtang Pass and then, gradually we feel normal.

(a) Explain the menstrual phase in a human female. State the levels of ovarian and pituitary hormones during this phase.

(b) Why is follicular phase in the menstrual cycle also referred as proliferative phase ? Explain.

(c) Explain the events that occur in a Graafian follicle at the time of ovulation and thereafter.

(d) Draw a Graafian follicle and label antrum and secondary oocyte.

OR

(a) As a senior biology student you have been asked to demonstrate to the students of secondary level in your school, the procedure(s) that shall ensure cross-pollination in a hermaphrodite flower. List the different steps that you would suggest and provide reasons for each one of them.

(b) Draw a diagram of a section of a megasporangium of an angiosperm and label funiculus, micropyle, embryo sac and nucellus.

(a) How are the following formed and involved in DNA packaging in a nucleus of a cell?

(i) Histone octamer

(ii) Nucleosome

(iii) Chromatin

(b) Differentiate between Euchromatin and Heterochromatin.

OR

Evaluate the suitability of DNA and RNA as genetic material and justify the suitability of the one that is preferred as an ideal genetic material.

(a) Name the group of genes which have been identified in normal cells that could lead to cancer and how do they do so.

(b) Cancer is one of the most dreaded diseases of humans. Explain 'contact inhibition' and metastasis with respect to the disease.

(c) Name any two techniques which are useful to detect cancer of internal organs.

(d) Name the different methods of treatment of cancer.(any two)

OR

A patient had tested positive to ELISA Test. Identify the disease and the pathogen responsible, give reasons for the reduced/ weak immunity of the patient and trace the path, spread and effects of this pathogen in the human body.

QUESTION BANK

1. What are chasmogamous flowers?
2. Define a clone. How would variations occur in such individuals?
3. Does the human blastocyst have zona pellucida? Give reasons.
4. Name the pregnancy hormone. Why is it called so?
5. The cells of a morula are totipotent but that of the ICM of a blastocyst are not. Justify.
6. A flower is brightly coloured and has a sweet smell. Name its pollinating agent. What other features would these flowers have to ensyre pollination?
7. What is the target organ and functions of LH in a male and FSH in a female?
8. What are the neuroendocrine mechanisms that bring about parturition.
9. Name the male accessory glands State their role in keeping the sperms active.
10. What do you understand by floral rewards? Give examples. Who or what are pollen robbers? Why are they called so?
11. Castor is an albuminous , dicot seed. Explain the underlined words. How does seed dormancy help?
12. Describe the organization of a unisexual monoecious organism with an example.
13. Explain how gamete transfer would occur among gametes that are both nonmotile.
14. What does the picture depict? What are the advantages and disadvantages of using this structure?
15. Expand MTP. What are the government rulings regarding MTP in our country? Draw a labeled diagram of a mature male gametophyte.
16. Describe the process of fertilization in a plant. What are the post fertilization events that take place in order to form a mature seed. Give diagrams wherever necessary. Explain the process of fertilization in humans and describe briefly with diagrams, the post fertilization events that occur to form a mature foetus.

17. Why do internodal segments of sugarcane fail to propagate vegetatively even when they are in contact with damp soil?
18. Mention any two probable reasons for rapid rise of population in our country from about 350 million at the time of independence to about 1 billion by the year 2000.
19. The gene I that controls the ABO blood grouping in human beings has three alleles IA, IB and i .(a) How many different genotypes are likely to be present in the human population? (b) Also, how many phenotypes are possibly present?
20. State any one reason to explain why RNA viruses mutate and evolve faster than other viruses.
21. Mention any two measures for prevention and control of alcohol and drug abuse among adolescents.
22. What would be the impact on the environment around a thermal power plant if its electrostatic precipitator stops functioning? Give a reason.
23. Why is thermoregulation more effectively achieved in larger animals than in smaller ones?
24. A plasmid and a DNA sequence in a cell need to be cut for producing recombinant DNA. Name the enzyme which acts as molecular scissors to cut the DNA segments.
25. Even though each pollen grain has two male gametes, why are at least 10 pollen grains and not 5 pollen grains required to fertilise 10 ovules present in a particular carpel?
26. Draw schematically a single polynucleotide strand (with at least three nucleotides). Provide labels and directions. 2
27. Choose and rearrange any four of the following groups of plants in an ascending evolutionary scale.
    Cycads; Gnetales; Monocotyledons; Rhynia-like plants; Cholorophyta ancestors; Dicotyledons; and Seed ferns.
28. In which parts of the body of the hosts do the following events in the life cycle of Plasmodium take place? Name both, the body part and the host.

a) Fertilization
b) Development of gametocytes
c) Release of sporozoites
d) Asexual reproduction

29. A person injured in a road accident and requiring an urgent immune response was brought to a doctor.
(a) What did the doctor immediately do?
(b) What kind of an immunity was he providing to the patient?

30. Define this kind of immunity.
31. Why does a beekeeper keep beehives in crop fields during the flowering periods?
32. State any two advantages.
33. List any four advantages of genetically modified crop plants over their wild/ domesticated relatives.
34. Which one out of the eurythermal or stenothermal species is likely to survive in increased global temperatures? Give one reason for your answer.
35. Explain why ecological succession will be faster in a forest devastated by fire than on a bare rock? Also compare succession in case of an abandoned land after floods with that on a bare rock?
36. What is the cause of adenosine deaminase deficiency in a person? Why is it that even after infusion of genetically. engineered lymphocytes into the patient suffering from deaminase deficiency, the cure is not permanent?
37. A policeman finds a very small piece of body tissue from the site of a crime and takes it to the forensic department.
38. By which technique will they amplify the DNA collected from the tissue sample?
39. Mention in a sequence, the 3 steps involved in each cycle of this technique;
40. What is the role of thermostable DNA polymerare in this technique?

41. In case of Bt cotton, how does the toxic insecticide protein produced by the bacterium kill the insect pest but not the cell of Bacillus thuringiensis where the toxic protein is generated?
42. You have been deputed by your school principal to train local villagers in the use of biogas plant. With the help of a labelled sketch explain the various parts of the biogas plant.
43. Illustrate schematically the process of initiation. elongation and termination during transcription of a gene in a bacterium
44. How did Louis Pasteur successfully demolish the popular theory of spontaneous generation? What were his conclusions?
45. If a true breeding homonzygous pea plant with green pod and axial flower as dominant characters is crossed with a recessive homonzygous pea plant with yellow seeds and terminal flowers, then what would be the:
    (a) genotypes of the two parents;
    (b) phenotype and genotype of the F1 offspring;
    (c) phenotypic distribution ratio in F2 population?
46. With the help of labelled diagrams, depict the stages of a microspore maturing into a pollen grain.
47. (a) Draw a longitudinal sectional view of a typical anatropous ovule to show the site where double-fertilization takes place. Label any four major parts of the ovule.
    (b) How do the male gametes that are present in the pollen grains reach the site mentioned by you in part (a) to cause double fertilization?
48. (a) When and where does spermatogenesis in a human male begin to take place?
    (b) With the help of schematic labelled diagrams trace the development of mature spermatozoa in a human male.
    (c) Describe the structure of a human sperm.
49. (a) Describe the experiment conducted by Alfred Hershey and Martha Chase for identification of genetic material.
    (b) Why is it considered pathbreaking in the field of Molecular Biology?

47) (a) What could be the series of events when an inducer is present in the medium in which E.coli is growing?

(b) Name the Inducer.

48) (a) Write an equation for Verhulst Pearl logistic Growth Where

N = Population density at a time t

r = Intrinsic rate of natural increase and

K = Carrying Capacity

Draw a graph for a population whose population density has reached the carrying capacity.

Why is this logistic growth model considered a more realistic one for most animal populations?

Draw a growth curve where resources are not limiting to growth of a population