



**RJ VISION PVT. LTD.**  
(MOST STABLE & INNOVATIVE INSTITUTE)

**GSEB**  
**BPT – 2B**

**BIOLOGY**  
**TEST**

**COURSE NAME: 12<sup>TH</sup>**

**Marks : 100 marks**

**Topic : FULL SYLLABUS**

**DATE : 28-12-2023**

**PART – A**

**Instructions:**

- (1) There are 50 objective type (**M.C.Q**) questions in **part-A** and all questions are compulsory.
- (2) The questions are serially numbered from 1 to 50 and each carries 1 mark.
- (3) Read each question carefully, select proper alternative and answer in the O.M.R. sheet.
- (4) The OMR sheet is given for answering the questions. The answer of each question is represented by (A) O, (B) O, (c) O, (D)O. Darken the circle of the correct answer with ball-pen.
- (5) Rough work is to be done in the space provided for this purpose in the test booklet only.
- (6) Set No. of question paper printed on the upper-most right side of the Question paper is to be written in the column provided in the OMR sheet.

**PART- A**

1. Find odd one out with respect two biopesticide?  
(1\*) *Xanthomonas campestris* (2) *Bacillus thuringiensis*  
(3) *Trichoderma harzianum* (4) Nuclear Polyhedro Virus (NPV)
2. Division of \_\_\_\_\_ in angiosperms leads to formation of male gamete.  
(1\*) Generative cell (2) Microspore  
(3) Vegetative cell (4) Microspore mother cell
3. In the human female, menstruation can be deferred by the administration of  
(1) FSH only (2) LH only  
(3) Combination of FSH and LH (4\*) Combination of estrogen and progesterone
4. Parthenocarpic tomato fruits can be produced by  
(1) Raising the plants from vernalized seeds  
(2) Removing androecium of flowers before pollen grains are released  
(3) Treating the plants with phenylmercuric acetate  
(4\*) Treating the plants with low concentrations of gibberellic acid and auxins
5. The formula for exponential population growth is  
(1)  $dt/dN = rN$  (2)  $dN/rN = dt$  (3)  $rN/dN = dt$  (4\*)  $dN/dt = rN$
6. Both sickle cell anemia and Huntington's chorea are  
(1) Pollutant – induced disorders  
(2\*) Congenital disorders  
(3) Virus-related diseases  
(4) Bacteria-related diseases

7. Long filamentous threads protruding at the end of a young cob of maize are  
 (1\*) Styles (2) Ovaries (3) Hairs (4) Anthers
8. Choose the correct combination with respect to their use in genetic engineering  
 (1) Diplococcus sp. and Pseudomonas sp.  
 (2) Vibrio cholera and a tailed bacteriophage  
 (3\*) Escherichia coli and Agrobacterium tumefaciens  
 (4) Crown gall bacterium and Caenorhabditis elegans
9. Antibodies in our body are complex  
 (1) Lipoproteins (2) Steroids (3) Prostaglandins (4\*) Glycoproteins
10. Which of the following is considered a hot-spot of biodiversity in India?  
 (1) Eastern Ghats (2\*) Western Ghats (3) Aravalli Hills (4) Indo-Gangetic Plain
11. The unequivocal proof that DNA is the genetic material came from the experiments of  
 (1) Griffith (2) Avery, Macleod & McCarty  
 (3\*) Hershey and Chase (4) Watson and Crick
12. Adenine is 30% then what would be the % of guanine  
 (1) 10% (2\*) 20% (3) 30% (4) 40%
13. Fatty liver syndrome is due to  
 (1) Cigarette smoke (2\*) Alcoholic drinks  
 (3) Opiate narcotics (4) Psychedelic drugs
14. Humulin is a:  
 (1) Natural insulin (2\*) Human insulin synthesized by genetically engineered *E. coli*  
 (3) Human insulin synthesized by pancreas (4) Chemically synthesized insulin
15. When body encounters pathogen for this first time, it is called \_\_\_\_\_.  
 (1\*) Primary response (2) Secondary response  
 (3) Allergic response (4) Side effect
16. Virus-infected cells secrete proteins called \_\_\_\_\_ which protect non-infected cells from further viral infection.  
 (1) Antigen (2) Antibody  
 (3\*) Interferons (4) Immunoglobulins
17. A good producer of citric acid is:  
 (1\*) Aspergillus (2) Pseudomonas  
 (3) Clostridium (4) Saccharomyces
18. GFC is a major conduit for energy flow in  
 (1) Terrestrial ecosystem  
 (2\*) Aquatic ecosystem  
 (3) Both (1) and (2)  
 (4) None of the above
19. Which of the following is used as biofertilizer?  
 A. Cyanobacteria  
 B. Yeast  
 C. Symbiotic bacteria  
 D. Free living bacteria  
 (1) A, B, C (2) A, C, D (3\*) A, C, D (4) A, B, D

20. The nutritive media for growing bacteria and other microorganisms in the laboratory is called-

- (1) Colonies (2\*) Culture media  
(3) Baking media (4) Fermentation

21. Eyes of potato is

- (1\*) Axillary bud (2) Terminal bud  
(3) Offset (4) Internode

22. Which of the following is not a structural feature of pistil?

- (1) Stigma (2) Ovary  
(3\*) Filament (4) Style

23. A nitrogenous base is linked to a pentose sugar through:

- (1\*) N-glycosidic linkage  
(2) Hydrogen bond  
(3) Peptide bond  
(4) Phosphodiester linkage

24. Which of the following sequences is correct for microsporogenesis?

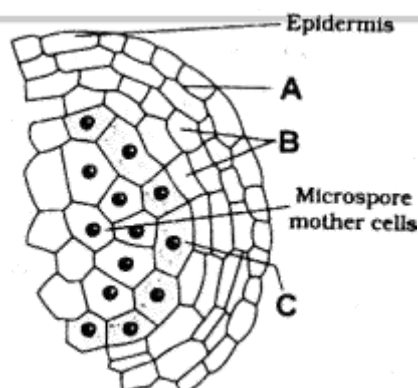
- (1) Micro S.M.C (2N)  $\xrightarrow{\text{Mitosis}}$  Microspore  
tetrad (2N)  $\xrightarrow{\text{Mitosis}}$  Microspore (N)

- (2\*) Micro S.M.C (2N)  $\xrightarrow{\text{Mitosis}}$  Microspore  
tetrad (N)  $\rightarrow$  Microspores (N)

- (3) Microspore tetrad (2N)  $\xrightarrow{\text{Mitosis}}$   
Microspores

- (4) Micro S.M.C (2N)  $\xrightarrow{\text{Mitosis}}$  Microspore  
tetrad (2N)  $\xrightarrow{\text{Mitosis}}$  Microspores (2N)

25. The above given diagram is an enlarged view of one microsporangium of a matured anther identify A, B and C-



- (1) A – Middle layer, B – Endothecium, C – Tapetum  
(2) A – Endothecium, B – Middle layer, C – Middle layer  
(3\*) A – Endothecium, B – Middle layer, C – Tapetum  
(4) A – Tapetum, B – Middle layer, C – Endothecium

26. After triple fusion central cell changes into-

- (1) Embryo  
(2) Embryo sac  
(3\*) Primary endosperm cell (PEC)  
(4) Primary endosperm nucleus

27. True about clitoris  
 (i) Tiny finger like structure  
 (ii) Lies at upper junction of two labia minora  
 (iii) Lies at upper junction of two labia majora  
 (iv) Lies above urethral opening  
 (v) Lies below urethral opening  
 (1) ii, iv (2) i, ii, v (3\*) i, ii, iv (4) iii, v
28. Which hormones produced in women only during pregnancy  
 (1) hCG (2) Hpl (3) Relaxin (4\*) All of above
29. The fluid that provides energy for the sperm cells comes from the \_\_\_\_\_.  
 (1) Urethra (2) Bulbourethral glands  
 (3) Prostate gland (4\*) Seminal vesicles
30. Which of the sets of diseases are completely curable if detected early?  
 (1) Hepatitis – B, Gonorrhoea, Syphilis  
 (2) Genital herpes, Chlamydiasis, Syphilis  
 (3) HIV Infections, Chlamydiasis, Gonorrhoea  
 (4\*) Chlamydiasis, Gonorrhoea, Syphilis
31. Misuse of amniocentesis has led to misuse of \_\_\_\_\_.  
 (1\*) MTP (2) STD (3) RTI (4) HIV
32. In order to combat infertility, special techniques are used like \_\_\_\_\_.  
 (1) Stimulated Reproductive Technologies (2\*) Assisted Reproductive Technologies  
 (3) Fertile Reproductive Technologies (4) In-vitro fertilization
33. An ideal contraceptive should be:  
 (A) User-friendly (B) Easily available  
 (C) Effective and reversible (D) With nor or least side-effects  
 (1) A, B and C only (2) A, D only  
 (3) B and C only (4\*) All of the above
34. Amniocentesis test is based on \_\_\_\_\_ to determine sex of developing foetus:  
 (1) External genitalia (2) Secondary sexual characters  
 (3\*) Chromosomal pattern (4) Embryonic enzymes
35. The presence of large amount of nutrients in water causes excessive growth of planktonic (free-floating) algae, called. This is called  
 (1) Red tide (2) Bio-magnification  
 (3\*) Algal bloom (4) Biofortification
36. A cross between a homozygous recessive and a heterozygous plant is called  
 (1) Monohybrid cross (2) Dihybrid cross  
 (3\*) Test cross (4) Back cross
37. From a cross Aa BB × aa BB, following genotypic ratio will be obtained in F<sub>1</sub> generation  
 (1\*) 1 Aa BB : 1 aa BB (2) 1 Aa BB : 3 aa BB  
 (3) 3 Aa BB : 1 aa BB (4) All Aa BB : No aa BB
38. Inheritance of ABO blood group system is an example of  
 (1\*) Multiple allelism (2) Partial dominance  
 (3) Epistasis (4) Dominance

39. High species diversity is essential for:  
 A. High productivity  
 B. Stability  
 C. Resilience  
 D. Ecosystem health  
 (1) Only (A) and (B)            (2) Only (B) and (D)            (3) Only (A), (B) and (D)            (4\*) (A), (B), (C), (D)
40. In context of genetic material: Base + Sugar →  
 (1) Nucleotide            (2\*) Nucleoside            (3) Nucleic acid            (4) Nuclein
41. Male is homogametic in:  
 (1) Drosophila            (2) Human            (3\*) Fowl            (4) All of above
42. In eukaryotes which of the following is removed from transcribed RNA before it is transported to cytoplasm for translation?  
 (1) 3'polyA. tail            (2\*) Intron            (3) 5'cap            (4) Ribosome binding site
43. VNTR are useful in DNA profiling because they:  
 (i) Are hypervariable            (ii) are inherited            (iii) Synthesized constitutive enzymes  
 (1) (i), (ii) and (iii) are correct            (2\*) (i) and (ii) are correct  
 (3) all are incorrect            (4) all are correct
44. Which genotype characterizes an organism that is heterozygous for two genes?  
 (1) RRyy            (2) RrYY            (3) RRYy            (4\*) RrYy
45. Mendel's law of heredity can be explained with the help of  
 (1) Mitosis            (2\*) Meiosis  
 (3) Both mitosis and meiosis            (4) None of the above
46. Which part of the lungs is infected in pneumonia?  
 (1\*) Alveoli            (2) Trachea            (3) Bronchus            (4) Terminal bronchioles
47. Grafted kidney may be rejected in patient due to  
 (1) Humoral immune response            (2\*) Cell mediated immune response  
 (3) Passive immune response            (4) Innate immune response
48. Speciation is generally a function of:  
 (1) Area            (2) Time            (3) Volume            (4\*) Both (1) and (2)
49. Brewer's Yeast is –  
 (1) *Saccharomyces cariocanus*            (2) *Saccharomyces florentinus*  
 (3\*) *Saccharomyces cerevisiae*            (4) *Saccharomyces spencerorum*
50. Rhizopus nigricans is  
 (1) Bacteria            (2\*) Fungi            (3) Protozoa            (4) Virus

### PART- B

#### Instructions:

- (1) Write in a clear legible handwriting.
- (2) There are three sections in part- B of the question paper and total 1 to 27 questions are there.
- (3) All the questions are compulsory. Internal options are given.
- (4) The numbers at right side represent the marks of the question.
- (5) Start new section on new page.
- (6) Maintain sequence.

**SECTION – A [2 M]**

**Answer question No. 1 to 12 as directed. Each question carry 2 marks. (Attempt any 8 out of 12)**

**[16]**

**1. Mention two functions of the codon AUG.**

**Sol.** Two functions of the codon AUG are:

- (i) It acts as a start codon during protein synthesis.
- (ii) It codes for the amino acid methionine.

**2. (a) State the role of DNA ligase in biotechnology.**

(b) What happens when *Meloidegyme incognitia* consumes cells with RNAi gene?

**Sol.** (a) DNA ligase joins the DNA fragments with same sticky ends./Link Okazaki fragments or discontinuously synthesised fragments./Link desired gene with plasmid to form recombinant DNA (Any one)  
(b) The specific mRNA of the nematode is silenced and the parasite dies.

**3. Discuss transmission and cause of haemophilia.**

**Sol.** Haemophilia is a sex linked recessive disease, which shows its transmission from unaffected carrier female to some of the male progeny. In this disease, a single protein that is a part of the cascade of proteins involved in the clotting of blood is affected. Due to this, in an affected individual a simple cut will result in non-stop bleeding. The heterozygous female (carrier) for haemophilia may transmit the disease to sons. The possibility of a female becoming a haemophilic is extremely rare because mother of such a female has to be at least carrier and the father should be haemophilic.

**4. Define standing crop and also mention how it is different from standing state?**

**Sol.** Each trophic level has a certain mass of living material at a particular time called as the standing crop. The standing crop is measured as the mass of living organisms (biomass) or the number in a unit area. The amount of nutrients, such as carbon, nitrogen, phosphorous, calcium, etc., present in the soil at any given time, is referred to as the standing state. It varies in different kinds of ecosystems and also on a seasonal basis.

**5. Give scientific reason: Mango trees cannot grow country like Germany and Canada.**

**Sol.** All the biochemical reactions require enzymes. These enzymes have an optimal range for their functioning. Significant increase and decrease in the temperature reduces the efficiency of enzymes their by slowing down the metabolism. Mango trees grow in tropical climate. Germany and Canada are located in temperate region. Where the temperature is comparatively very low.

**6. Define Polyploidy and aneuploidy.**

**Sol.** The phenomenon of failure of Cytokinesis after cell division resulting in increase of whole set of chromosome in an organism is called polyploidy.

The phenomenon of failure of segregation of chromatids during cell division as a result of gain or loss of chromosome (s) is called aneuploidy.

**7. Mention the function of each of the following:**

- (a) Tassels of corn-cob.
- (b) Tapetum in the microsporangium.

**Sol.** (a) These are the stigma and style which wave in the wind to trap pollen grains.  
(b) Provides nourishment to the developing pollen grains.

**8. (a) Why are transgenic animals so called?**

**(b) Explain the role of transgenic animals in**

**(i) Vaccine safety**

**(ii) Biological products with the help of an example each.**

**Sol.** (a) Transgenic animals are so called because these animals have had their DNA manipulated.

(b) (i) Vaccine safety: Transgenic mice are developed to test safety of polio vaccine before being used on humans.

(ii) Human protein ( $\alpha$ -1 antitrypsin) is used to treat emphysema.

9. **Offspring formed due to sexual reproduction have better chances of survival. Why? Is this statement always true?**

**Sol.** Offspring formed by sexual reproduction have better chances of survival because they have the genetic material of two parents and that shows variation. This is important for the survival of species. This statement is always true.

10. **Where is sporopollenin in plants? State its significance with reference to its chemical nature.**

**Sol.** Sporopollenin is present in the exine of pollen grains. It is the most resistant organic material in nature. It provides protection to the pollen/gamete/gametophyte from unfavourable conditions or chemicals (acids, enzymes and high temperature).

11. **Name the natural source of agarose. Mention one role of agarose in biotechnology.**

**Sol.** The natural source of agarose is sea weed. Agarose is natural polymer. It is used to develop the matrix for gel electrophoresis. It helps in the separation of DNA fragments based on their size

12. **Why do predators avoid eating Monarch butterfly? How does the butterfly develop this protective feature?**

**Sol.** The Monarch butterfly is highly distasteful to its predator (birds) because of a special chemical present in its body. It acquires this chemical during its caterpillar stage by feeding on a poisonous weed.

#### SECTION – B [3 M]

**Answer question No.13 to 21 as directed. Each question carry 3 marks. (Attempt any 6 out of 9) [18]**

13. **Give the method for isolation of genetic material DNA.**

**Sol.** In order to cut the DNA with restriction enzymes, it needs to be in pure form, free from other macro-molecules. Since the DNA is enclosed within the membranes, we have to break the cell open to release DNA along with other macromolecules such as RNA, proteins, polysaccharides and also lipids. This can be achieved by treating the bacterial cells/plant or animal tissue with enzymes such as lysozyme (bacteria), cellulase (plant cells), chitinase (fungus). You know that genes are located on long molecules of DNA intertwined with proteins such as histones. The RNA can be removed by treatment with ribonuclease whereas proteins can be removed by treatment with protease. Other molecules can be removed by appropriate treatments and purified DNA ultimately precipitates out after the addition of chilled ethanol. This can be seen as collection of fine threads in the suspension

14. **“Transgenic animals have been proved very useful for human welfare” comment on the statement.**

**Sol.** Animals that have had their DNA manipulated to possess and express and extra (foreign) gene are known as transgenic animals.

(i) **Normal physiology and development:** Transgenic animals can be specifically designed to allow the study of how genes are regulated, and how they affect the normal functions of the body and its development, e.g., study of complex factors involved in growth such as insulin-like growth factor.

(ii) **Study of disease:** Many transgenic animals are designed to increase our understanding of how genes contribute to the development of disease. These are specially made to serve as models for human diseases so that investigation of new treatments for diseases is made possible. Today transgenic models exist for many human diseases such as cancer, cystic fibrosis, rheumatoid arthritis and Alzheimer's.

(iii) **Biological products:** Medicines required to treat certain human diseases can contain biological products, but such products are often expensive to make. Transgenic animals that produce useful biological products can be created by the introduction of the portion of DNA (or genes) which codes for a particular product such as human protein ( $\alpha$ -1-antitrypsin) used to treat emphysema. Similar attempts are being made for treatment of

phenylketonuria (PKU) and cystic fibrosis. In 1997, the first transgenic cow, Rosie, produced human protein-enriched milk (2.4 grams per litre). The milk nutritionally a more balanced product for human babies than natural cow-milk.

- (iv) **Vaccine safety:** Transgenic mice are being developed for use in testing the safety of vaccines before they are used on humans. Transgenic mice are being used to test the safety of the polio vaccine.
- (v) **Chemical safety testing:** This is known as toxicity/safety testing. The procedure is the same as that used for testing toxicity of drugs. Transgenic animals are made that carry genes which make them more sensitive to toxic substances than non-transgenic animals. They are then exposed to the toxic substances and the effects studied.

15. **Mention the product produced and its use by each of the microbes listed below:**

- (i) Streptococcus      (ii) Lactobacillus      (iii) Saccharomyces cerevisiae

Sol.

S.No.	Microbes	Products	Use
(i)	Streptococcus	Streptokinase	Bioactive molecule used to remove blood clot.
(ii)	Lactobacillus	Lactic acid	Coagulates and partially digests milk proteins and form curd.
(iii)	Saccharomyces cerevisiae	Ethanol	For bread-making fermenting malted cereals and fruit juices.

16. How do ecologists estimate the total number of species present in the world?

Sol. Temperate areas are taxonomically the most thoroughly investigated regions of the world. The number of species of any exhaustively studied group is compared between temperate and other regions say tropics.

- ❖ The ratio is applied to calculate the possible number of species of another group in the area which has not been thoroughly explored.
- ❖ Rough estimate from the rate of finding of new species also gives an idea of total diversity in the area.
- ❖ Based on these two criteria Robert May has estimated the number of species to be 7 million.

17. **What is Ti plasmid? Name the organism where it is found. How does it help in genetic engineering?**

Sol. An extra-chromosomal DNA which delivers gene of interest into variety of plants and act as cloning vector is called Ti plasmid. They are present in *Agrobacterium tumefaciens*. Ti plasmid vectors are used for genetic transformation in many dicot plants. The tumour inducing (Ti) plasmid of *Agrobacterium tumefaciens* has been modified into a cloning vector which is no more pathogenic to the plants but is still able to use the mechanisms to deliver genes of interest into a variety of plants.

18. (a) **How does cleistogamy ensure autogamy?**

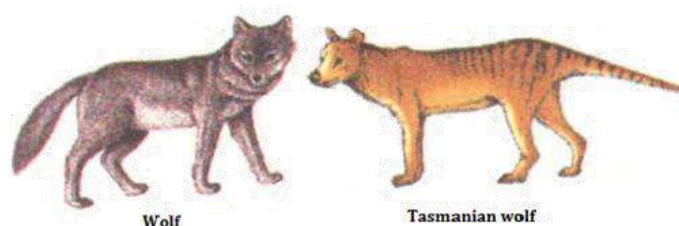
(b) **State one advantage and one disadvantage of cleistogamy to the plant.**

Sol. (a) Cleistogamy flowers do not open. Therefore, the pollens have to land on the stigma of the same flower. This ensures autogamy.

(b) Advantage: Self-pollination is assured/thus ensuring seed formation.

Disadvantage: Least variations observed and it leads to inbreeding depression.

19. **Refer to the figure given below and answer the questions that follow:**



a) Recognize and explain the process by which Tasmanian wolf evolved.



- b) Give one example of an animal that has evolved along with Tasmanian wolf.  
 c) Compare and contrast the two animals shown?

**Sol.**

- 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).  
 b) Tiger cat/banded ant eater/Marsupial rat/Kangaroo/Wombat/Bandicoot/Koala/Marsupial mole/Sugar glider  
 c) Wolf is a placental mammal, whereas Tasmanian wolf is a marsupial mammal

**20. What are sacred groves? What is their role in conservation?**

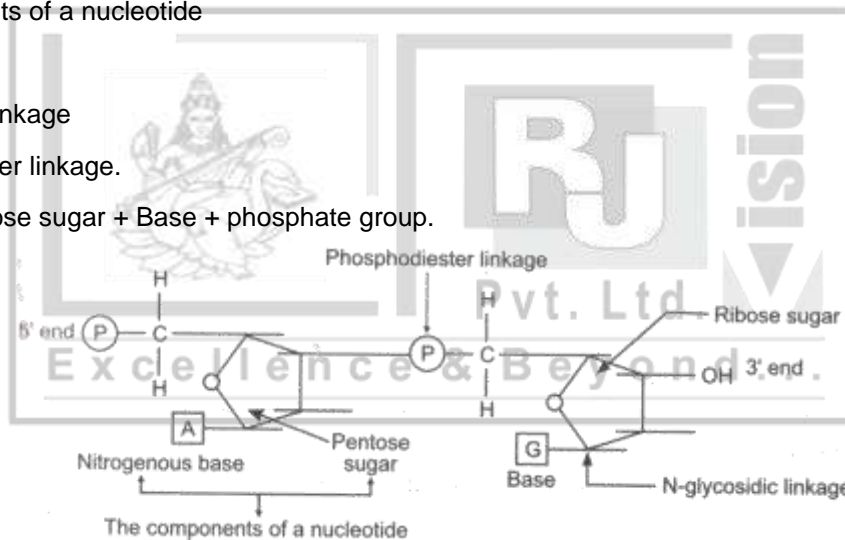
**Sol.** Sacred groves are forest patches around places of worship which are held in high esteem by tribal communities due to their religious sanctity. These groves protect many endemic species which are rare or have become extinct elsewhere, can be seen to flourish here.

**Example:** Such sacred grooves in India are found in Western Ghats of Karnataka and Maharashtra, Khasi and Jaintia hills in Meghalaya, Aravalli hills of Rajasthan and Sarguja, Chanda and Bastar areas of Madhya Pradesh.

**21. Draw a schematic representation of dinucleotide. Label the following:**

- (i) The components of a nucleotide  
 (ii) 5' end  
 (iii) N-glycosidic linkage  
 (iv) Phosphodiester linkage.

**Sol.** Nucleotide = Ribose sugar + Base + phosphate group.



### SECTION – C [4 M]

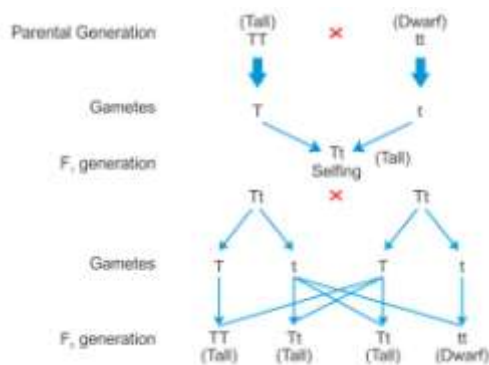
Answer question No. 22 to 27 as directed. Each question carry 4 marks. (Attempt any 4 out of 6) [16]

**22. Explain the Law of Dominance using a monohybrid cross.**

**Sol.**

- ❖ When two contrasting factors/genes are present in an organism, one of them may mask the presence of the other. For example, in a monohybrid cross between homozygous tall ( $TT$ ) and homozygous dwarf ( $tt$ ) varieties of pea plants, the  $F_1$  offspring (hybrids) resemble the tall parent, but in  $F_2$  generation both tall and dwarf plants appeared.
- ❖ The  $F_1$  hybrids carried the factor for dwarfness ( $t$ ), but it could not express itself in the presence of the factor for Tallness ( $T$ ). In the Mendelian language a factor which expresses itself in the hybrids is called **dominant** and its alternative form that fails to express itself in the presence of dominant factor is termed as **recessive**.

- ❖ Thus, the principle of dominance states that 'when two alternative factors / genes come together in an organism, only one of them called **dominant**, is expressed, while the other factor / gene of the pair called recessive, remains unexpressed or latent.
- ❖ A dominant character is expressed in both homozygous ( $TT$ ) and heterozygous ( $Tt$ ) individuals. However, a recessive character is expressed only in homozygous ( $tt$ ) individual. Mendel studied inheritance of seven contrasting characters.
- ❖ In each case, he noticed that one form of the character from each of the contrasting pair dominates over the other and is expressed in the  $F_1$  generation, whereas the other is not expressed and remains recessive. The results of  $F_2$  generation, however showed that the recessive character reappears and in a definite ratio.
- ❖ The  $F_2$  ratio in each experiment was invariably 3 : 1 i.e., approximately three fourth of them were dominant type



- ❖ Phenotypic ratio:3:1 ; Genotypic ratio:1:2:1

23. **How did Hershey and Chase differentiate between DNA and protein in their experiment while proving that DNA is the genetic material.**

Sol.

- ❖ Hershey and Chase (1952) grew cultures of *E.coli* in medium rich in radioactive sulphur ( $S^{35}$ ) and phosphorous ( $P^{32}$ ).
- ❖  $S^{35}$  gets incorporated into sulphur containing amino acids of protein while  $P^{32}$  into nucleic acid (DNA).
- ❖ They then introduced separately  $T_2$  bacteriophage in both the above labeled cultures of *E.coli* for their (viral phage) multiplication.
- ❖ The  $S^{35}$  was incorporated into the protein coat of virus in that culture of *E. coli* which was labeled with  $S^{32}$ .
- ❖  $P^{32}$  was found in case of nucleic acid (DNA) of that virus which was introduced in *E.coli* culture labeled with  $P^{32}$
- ❖ Actually Sulphur is a component of few sulphur containing amino acids (methionine and cysteine) in protein.
- ❖ Phosphorus is a component of nucleotides in DNA/RNA.
- ❖ On this basis, Hershey and Chase differentiated between DNA and protein while providing that DNA is the genetic material.

24. (a) **Explain the mechanism of Sex-determination in humans.**

(b) **Difference between male heterogamety and female heterogamety with the help of an example of each.**

- Sol. (a) In humans, females have two sex chromosomes, XX, and males also have two sex chromosomes, XY. The females produce only one kind of gamete or ovum, i.e., X but the males produce two kinds of gametes, i.e., X and Y. The ovum has equal chances (50% each) of getting fertilised by either an X sperm or a Y sperm, resulting in XX female and XY male respectively.

(b)

Male heterogamety	Female heterogamety
1. Males produce two types of gametes.	1. Females produce two types of gametes.
2. Example, male grasshopper produce	2. Example, female birds produce gametes

gametes of two types- X and O.

of two types- Z and W.

**25. Describe the discontinuous synthesis of DNA.**

**Sol.** The discontinuous synthesis of DNA is as follows:

- (i) At the replication site, unwinding of double stranded DNA takes place by DNA gyrase and helicase.
- (ii) ssBPs (single-stranded binding proteins) bind to the separated strands to avoid recoiling or to provide stability.
- (iii) Since DNA polymerase can synthesis DNA only in 5'→3' direction, DNA synthesis occurs discontinuously on the lagging strand.
- (iv) These small fragments of DNA are called Okazaki fragments.
- (v) The enzyme primase adds primers after every fragment is formed.
- (vi) These Okazaki fragments are then joined by DNA ligase.

**26. Describe the function of two pituitary and two ovarian hormones in the menstrual cycle of human female.**

**Sol.** The menstrual cycle is controlled by rhythmic synthesis and release of ovarian hormones under feedback control from the hormones of anterior pituitary. These are discussed below.

- (i) Pituitary hormones: The gonadotroph cells of anterior pituitary secrete FSH and LH in females. Their role in menstrual cycle are
  - a) Follicle Stimulating Hormone (FSH): it is secreted during the follicular phase of the cycle and is responsible for follicular development on induction of LH receptors on granulosa cells of the ovary.
  - b) Luteinising Hormone (LH): Its primary function is to stimulate the formation of corpus luteum and secretion of oestradiol and progesterone from ovary.
- (ii) Ovarian hormones: Ovary secretes the following hormones under the effect of FSH and LH.
  - a) Oestrogen: It influences proliferation of the uterine Endometrium to prepare for implantation of the fertilised oocyte. Ovulation occurs and the ruptured follicles develop into corpus luteum. Secretion of LH is inhibited.
  - b) Progesterone secreted from corpus luteum under LH influence, maintains Endometrium for implantation. Its rising level inhibits LH.

**27. Excessive doses and abusive usage of drugs like LSD, barbiturates, amphetamines, etc., are harmful to humans. These drugs are used as medicines to help patients with mental illness. State the major adverse effects of such drugs on humans.**

**Sol.** The major adverse effects of such drugs on humans can be classified into two categories, i.e. immediate and far-reaching.

Immediate effects are as follows

- i. Reckless behaviour, vandalism and violence, respiratory and heart failure, cerebral haemorrhage due to the excessive doses of drugs may lead to coma and death.'
- ii. Aggressive and rebellious behaviour, depression, fatigue, withdrawal and isolation.
- iii. Deteriorating relationships with family and friends.
- iv. Changes in sleeping pattern, fluctuation in weight, appetite and lack of personal hygiene.
- v. Drop in academic performance of students, absence from school/college and loss of interest in hobbies.

Far-reaching implications are as follows

- i. Habit of stealing on not getting money to buy drugs, alcohol, etc.
- ii. Mental and financial distress to not just the addict but to his/her entire family and friends.
- iii. Alcohol use in adolescence may lead to heavy drinking in adulthood.
- iv. Chronic use of alcohol damages nervous system and also causes liver cirrhosis.
- v. Higher risk of infections like AIDS and hepatitis-B, transferred through sharing of infected needle and syringes or sexual contact.