Class XII Session 2025-26
Subject - Biology
Sample Question Paper - 1

Time Allowed: 3 hours **Maximum Marks: 70**

General Instructions:

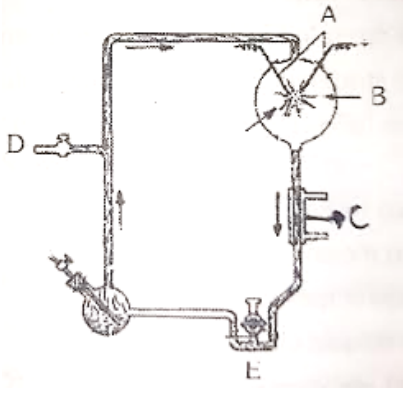
1. All questions are compulsory.
2. The question paper has five sections and 33 questions. All questions are compulsory.
3. Section–A has 16 questions of 1 mark each; Section–B has 5 questions of 2 marks each; Section– C has 7 questions of 3 marks each; Section– D has 2 case-based questions of 4 marks each; and Section–E has 3 questions of 5 marks each.
4. 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.
5. Wherever necessary, neat and properly labeled diagrams should be drawn.

Section A

1. Mycorrhiza is an example of: **[1]**

   a) Saprophytism
   b) Parasitism
   c) Thyroxine
   d) Symbiosis

2. The diagram represents miller's experiment. Choose the correct combination of labelling. **[1]**

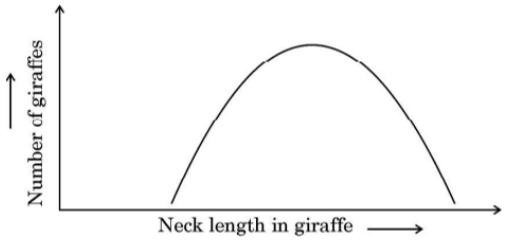


   a) A-electrodes, B-NH_3 + H_2O, C-hot water, D-tap, E-U trap
   b) A-electrodes, B-NH_4 + H_2 + CO_2 +CH_3, C-hot water, D-vacuum, E-U trap
   c) A-electrodes, B-NH_3 + H_2 + H_2O +CH_4, C-steam, D-vacuum, E-U trap
   d) A-electrodes, B-NH_3 + H_2 + H_2O +CH_4, C-cold water, D-vacuum, E-U trap

3. Energy transfer from one trophic level to another is: **[1]**

   a) 50%
   b) 100%
   c) 5%
   d) 10%

4. Select the option that gives the correct description of the process of Natural Selection with respect to the length of the neck of giraffe. **[1]**



a) Stabilising selection as giraffes with medium neck lengths are selected.

b) Directional selection as giraffes with longer neck lengths are selected.

c) Disruptive selection as giraffes with smaller and longer neck lengths are selected.

d) Stabilising selection as giraffes with longer neck lengths are selected further.

5. **Assertion (A):** Large holes in **Swiss cheese** are due to the production of a large amount of carbon dioxide by specific microbe. **[1]**

Reason (R): The specificity of characteristic texture, flavour and taste of **Swiss cheese** is due to the use of bacterium Propionibacterium shermanii.

a) Both Assertion and Reason are true, and Reason is the correct explanation of the Assertion.

b) Both Assertion and Reason are true, but Reason is **not** the correct explanation of the Assertion.

c) Assertion is true but Reason is false.

d) Both Assertion and Reason are false.

6. **Assertion:** Gene flow increases genetic variations. **[1]**

Reason: The random introduction of new alleles into the recipient population and their removal from the donor population affects allele frequency.

a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

c) Assertion is correct statement but reason is wrong statement.

d) Assertion is wrong statement but reason is correct statement.

7. Hot spots are places where: **[1]**

a) High degree of endemism

b) All of these

c) High degree of species richness

d) High degree of habital loss

8. Which of the following is a hormone releasing Intra-Uterine Device (IUD)? **[1]**

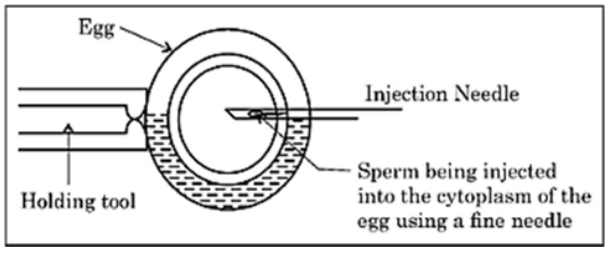
a) Multiload- 375

b) Cervical cap

c) Vault

d) LNG-20

9. Observe the schematic representation of assisted reproductive technology given below: **[1]**



Identify the most appropriate technique depicted in the above diagram.

a) ZIFT
b) ICSI
c) IUT
d) IUI

10. Among the following stem cells, which are found in umbilical cord: **[1]**

a) Cord blood stem cells
b) All of these
c) Embryonic stem cells
d) Adult stem cells

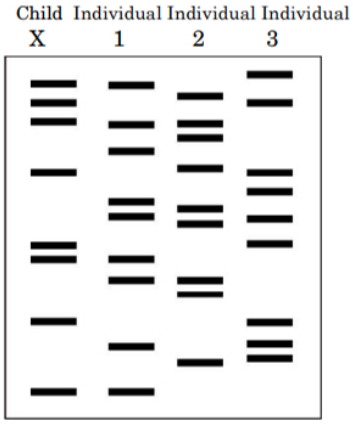
11. α - interferon acts as **[1]**

a) Biological response modifier
b) Sedative
c) Allergen
d) Carcinogen

12. In a test-cross involving F_1 dihybrid flies, more parental-type offspring were produced than the recombinant-type offspring. This indicates: **[1]**

a) The two genes are linked and present on the same chromosome
b) Both of the characters are controlled by more than one gene.
c) Chromosomes failed to separate during meiosis
d) The two genes are located on two different chromosomes

13. Study the DNA profiles obtained as a result of DNA fingerprinting of a child **X** and three individuals 1, 2 and 3. Which one of the following options shows the possible parents of the child **X**? **[1]**



a) 1 and 3
b) Only individual 3
c) 2 and 3
d) 1 and 2

14. In a particular climatic condition, decomposition rate is slower if: **[1]**

a) Detritus is rich in humus.
b) Detritus is rich in sugars.
c) Detritus is rich in nitrogen.
d) Detritus is rich in lignin and chitin.

15. **Assertion (A):** Some aquatic ecosystems have inverted biomass pyramids. **[1]**
Reason (R): More energy is required by the organisms occupying higher trophic levels.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

16. **Assertion (A):** Generally, a woman does not conceive during the lactation period. **[1]**
Reason (R): The hormone 'prolactin initiates and maintains lactation in a postpartum woman

a) Both A and R are true and R is the correct explanation of A.

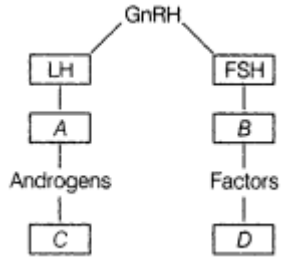
b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

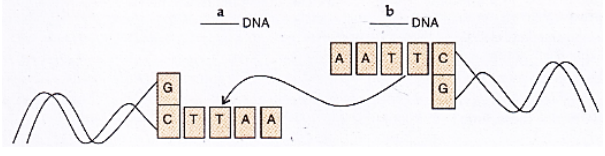
d) A is false but R is true.

Section B

17. Identify A, B, C and D with reference to gametogenesis in humans, in the flow chart given below. **[2]**



18. **[2]**



Study the linking of DNA fragments shown above.

i. Name 'a' DNA and 'b' DNA

ii. Name the enzyme that can link these two DNA fragments.

19. How has the bacterium *Bacillus thuringiensis* helped us in controlling caterpillars of insect pests? **[2]**

OR

What is LAB? What is its role in human stomach?

20. In the diagram given below, show the path of a pollen tube from the pollen on the stigma into the embryo sac. **[2]**

Name the components of egg apparatus.

21. Sangeeta has developed a transgenic crop. She wants to grow this crop directly into the field. Will you allow her to do so? What will you suggest her? **[2]**

Section C

22. Observe the diagram of Genetic code and answer the following questions: **[3]**

Second letter

First letter	U	C	A	G	Third letter
U	UUU Phe, UUC Phe, UUA Leu, UUG Leu	UCU Ser, UCC Ser, UCA Ser, UCG Ser	UAU Tyr, UAC Tyr, **UAA Stop**, **UAG Stop**	UGU Cys, UGC Cys, **UGA Stop**, UGG Trp	U C A G
C	CUU Leu, CUC Leu, CUA Leu, CUG Leu	CCU Pro, CCC Pro, CCA Pro, CCG Pro	CAU His, CAC His, CAA Gln, CAG Gln	CGU Arg, CGC Arg, CGA Arg, CGG Arg	U C A G
A	AUU Ile, AUC Ile, AUA Ile, **AUG Met**	ACU Thr, ACC Thr, ACA Thr, ACG Thr	AAU Asn, AAC Asn, AAA Lys, AAG Lys	AGU Ser, AGC Ser, AGA Arg, AGG Arg	U C A G
G	GUU Val, GUC Val, GUA Val, GUG Val	GCU Ala, GCC Ala, GCA Ala, GCG Ala	GAU Asp, GAC Asp, GAA Glu, GAG Glu	GGU Gly, GGC Gly, GGA Gly, GGG Gly	U C A G

i. How many codons codes for amino acids and how many do not?

ii. Explain the following giving one example of each.

a. Unambiguous and specific codon

b. Degeneration codon

c. Universal codon

d. Initiator codon

23. i. Why is the collection of white-winged moths and dark-winged moths made in England between 1850 - 1920 considered a good example of natural selection? **[3]**

ii. **Evolution is based on chance events in nature and chance mutations in organisms**. Justify the statement.

24. A species-area curve is drawn by plotting the number of species against the area. How is it that when a very large area is considered the slope is steeper than that for smaller areas? **[3]**

OR

What does the term genetic diversity refer to? What is the significance of large genetic diversity in a population?

25. a. Write the complete name of the diagnostic test for AIDS. Explain the principle it works on. **[3]**

b. Name the type of genetic material present in AIDS-causing pathogen.

26. Define the following terms and give one example for each: **[3]**

a. Commensalism

b. Parasitism

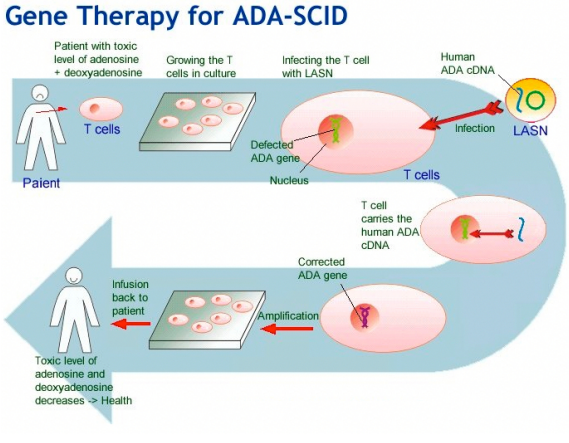
c. Camouflage

d. Mutualism

e. Interspecific competition

27. Define and design a test cross. **[3]**

28. This image highlights the process of Gene Therapy of ADA-SCID. **[3]**



i. Mention the cause of ADA deficiency in humans.

ii. How has genetic engineering helped patients suffering from it?

Section D

29. **Read the following passage and answer the questions that follow:** **[4]**

"Mosquitoes are drastically affecting the human health in almost all the developing tropical countries. Different species of mosquitoes cause very fatal diseases so much so that many humans loose their life and if they survive, are unable to put in productive hours to sustain their life. With the result the health index of the country goes down."

a. Name the form in which Plasmodium gains entry into (i) human body (ii) the female Anopheles body. **(1)**

b. Why do the symptoms of malaria not appear in a person immediately after being bitten by an infected female Anopheles? Give one reason. Explain when and how do the symptoms of the disease would appear. **(2)**

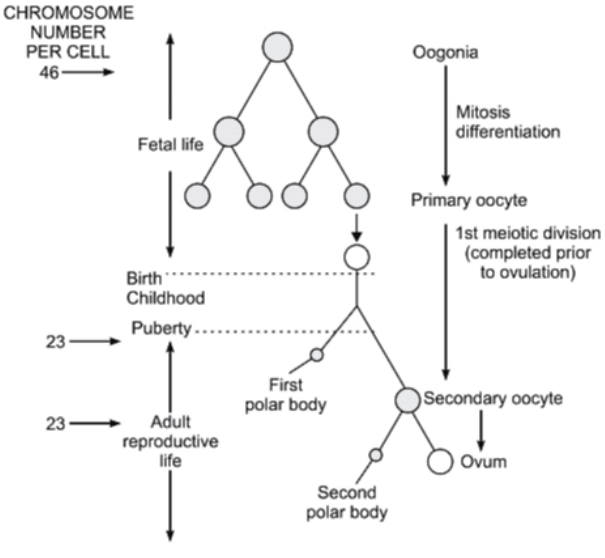
OR

Explain the events which occur within a female Anopheles mosquito after it has sucked blood from a malaria patient. **(2)**

c. Name a species of mosquito other than female Anopheles and the disease, for which it carries the pathogen. **(1)**

30. **Read the following text carefully and answer the questions that follow:** **[4]**

The process of formation of a mature female gamete is called oogenesis which is markedly different from spermatogenesis. A schematic representation of Oogenesis is shown below study the flow chart carefully.



i. How is a primary oocyte different from a secondary oocyte? (1)

ii. Mention the changes taking place during the transition of a secondary follicle to Graafian follicle in the oogonia. (1)

iii. How many primary follicles are left in each ovary in a human female at puberty? (2)

OR

What happen to graafuan follicle after ovulation? (2)

Section E

31. Define an operon. Giving an example, explain an Inducible operon. **[5]**

OR

Explain the process of transcription in prokaryotes.

32. i. Why must a cell be made 'competent' in biotechnology experiments? How does calcium ion help in doing so? **[5]**

ii. State the role of 'biolistic gun' in biotechnology experiments.

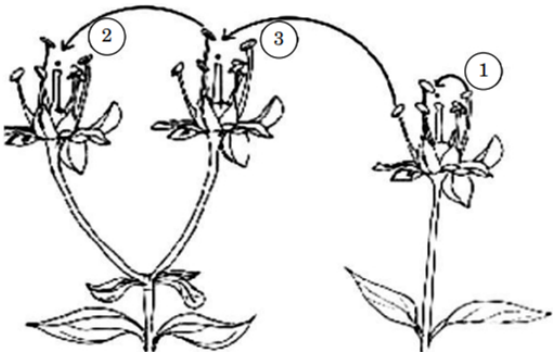
OR

For the selection of recombinants, insertional inactivation of the antibiotic marker has been superseded by insertional inactivation of a marker gene coding for a chromogenic substrate. Give reasons.

33. Draw a labelled diagram of the sectional view of a mature pollen grain of angiosperms. Explain the function of any two of its parts. **[5]**

OR

Study the diagram given below showing the modes of pollination. Answer the questions that follow.



i. The given diagram shows three methods of pollen transfer in plants. What are the technical terms used for pollen transfer methods 1, 2 and 3?

ii. How do the following plants achieve pollination successfully?

1. Water lily
2. Vallisneria

iii. Flowering plants have developed many devices to avoid inbreeding depression. Explain one hereditary and one physiological device which helps plants to achieve this target.

Solution

Section A

1.

(d) Symbiosis

Explanation:

Symbiosis

2.

(d) A-electrodes, B-NH_3 + H_2 + H_2O +CH_4, C-cold water, D-vacuum, E-U trap

Explanation:

A-electrodes, B-NH_3 + H_2 + H_2O +CH_4, C-cold water, D-vacuum, E-U trap

3.

(d) 10%

Explanation:

10%

4.

(b) Directional selection as giraffes with longer neck lengths are selected.

Explanation:

Directional selection as giraffes with longer neck lengths are selected.

5. **(a)** Both Assertion and Reason are true, and Reason is the correct explanation of the Assertion.

Explanation:

Both Assertion and Reason are true, and Reason is the correct explanation of the Assertion.

6.

(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

Explanation:

Assertion and reason both are correct statements but reason is not correct explanation for assertion.

7.

(b) All of these

Explanation:

Hot-spot is areas with a high density of biodiversity or megadiversity which are also the most threatened ones.

Hot spots are determined by four factors,

i. Number of species/species diversity.
ii. Degree of endemism.
iii. Degree of a threat to habitat due to its degradation and fragmentation.
iv. Degree of exploitation.

India has two hotspots-North-East Himalayas and the Western Ghats.

8.

(d) LNG-20

Explanation:

LNG-20

9.

(b) ICSI

Explanation:

Intracytoplasmic sperm injection (ICSI) is an infertility treatment. It involves injecting live sperm into a person's eggs in a laboratory.

10.

(c) Embryonic stem cells

Explanation:

Embryonic stem cells

11. **(a)** Biological response modifier

Explanation:

There are currently three major types of IFNs: alpha, beta, and gamma. Each type has similar but distinctive capabilities for altering biological responses.

Alpha-IFN was the first Biological response modifier(BRM) approved by the Food and Drug Administration (FDA) in 1986. Two different manufacturers have brands of this product available.

12. **(a)** The two genes are linked and present on the same chromosome

Explanation:

The two genes are linked and present on the same chromosome

13. **(a)** 1 and 3

Explanation:

1 and 3 shows the possible parent of the child X.

14.

(d) Detritus is rich in lignin and chitin.

Explanation:

Detritus is rich in lignin and chitin.

15.

(b) Both A and R are true but R is not the correct explanation of A.

Explanation:

Both A and R are true but R is not the correct explanation of A.

16.

(b) Both A and R are true but R is not the correct explanation of A.

Explanation:

Milk secretion is maintained as long as breast feeding, and hence hormone production continues. A woman does not conceive during the lactation period because lactation stimulates prolactin secretion and there is evidence that prolactin inhibits GnRH secretion, and antagonises the action of gonadotrophins on the ovaries. Ovulation is inhibited, and the ovaries are inactive, so estrogen and progesterone output falls to low levels. Thus during lactation a woman does not conceive. Only 5-10% chances are there during lactation period. This can also be interpreted as mechanism devised by nature so that mother can look after the new born child by providing it with milk.

Section B

17. A- Leydig's cell
    B- Sertoli cell
    C- Spermatogenesis (Formation of sperms)
    D- Spermiogenesis (Transformation of spermatid into sperm)
18. i. 'a' - Vector DNA and 'b' - Foreign DNA.
    ii. DNA ligase.

19. *Bacillus thuringiensis* produces an endotoxin which when ingested and released in the gut of the larvae of insect pest disrupts its gut lining and thus caterpillars are killed. By killing the caterpillars, it helps in pest control.

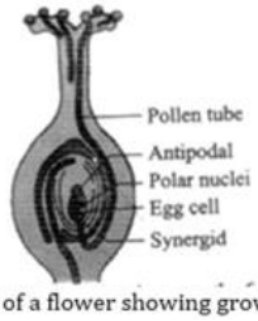
OR

Lactic Acid Bacteria (LAB) or Lactics constitute a diverse group of microorganisms associated with plants, meat, and dairy. They are used in the manufacture of dairy products such as acidophilus milk, yogurt, buttermilk, and cheeses.

Role of LAB in human stomach:

lactic acid bacteria have a number of well-established benefits. They can improve lactose digestion, play a role in preventing and treating diarrhea and act on the immune system, helping the body to resist and fight infection. It play a very beneficial role in checking disease-causing microbes

20.



Longitudinal section of a flower showing growth of pollen tube

Synergids and egg cell are the components of egg apparatus.

21. No, as GMO may pose some threat to environment or living organism. I will ask her to approach GEAC as GEAC is responsible for approval of proposals relating to release of genetically engineered organisms and products into the environment including experimental field trials.

Values

- Sense of responsibility.
- Understanding.

Section C

22. i. Out of 64 codons 61 code for amino acids and rest 3 codons do not code for any amino acids. These function as stop codons.

ii. a. **Unambiguous and specific codon** These code for only one amino acid, thus, making the genetic code unambiguous and specific e.g. UUU.

b. Some amino acids are coded by more than one codon, so the code is **degenerate**, e.g. serine is coded by 6 codons.

c. The codon is nearly **universal**. Some exceptions to the rule are mitochondrial codon and in some protozoans, e.g. UUU.

d. **Initiator codon** AUG has a dual function. It codes for methionine and also acts as an initiator.

23. i. During the pre-industrialisation all the white-winged moths survived due to white coloured lichens on trees, but during post-industrialisation, white-winged moths were unable to survive as predators could spot the moth against contrasting background, and the dark-winged moths survived, this showed that in a mixed population of white and dark-winged moths those who can adapt better will survive.

ii. The excess use of herbicides and pesticides has resulted in the selection of resistant varieties that developed due to the chance or random mutation.

24. When we consider a large area to assess the species-area curve, we need to understand the advantages offered by the large areas. A larger area means more resources and a higher number of plants. This will provide more food to sustain more individuals. Thus, species richness increases with an increase in the explored area. This explains the occurrence of the steeper slope when we draw the species-area curve for a large area.

OR

The term genetic diversity refers to the diversity of genes within a species.

It is important for the following reasons:

(i) Greater the genetic diversity among organisms of a species, the more chances it has in surviving environmental perturbations.

(ii) Species with higher genetic variations tend to be more resistant to diseases. They also show greater adaptibility to changing environmental conditions. On the other hand, genetically uniform populations are highly prone to diseases and harsh environment.

25. a. **ELISA Test** - ELISA, which stands for Enzyme-Linked Immunosorbent Assay, is used to detect HIV infection.

Principle of working of ELISA:

ELISA works on the principle that specific antibodies bind the target antigen and detect the presence and quantity of antigens

binding. In order to increase the sensitivity and precision of the assay, the plate must be coated with antibodies with high affinity. ELISA can provide a useful measurement of antigen-antibody concentration.

b. The core of HIV (Human immunodeficiency virus) contains two molecules of **single stranded RNA** (as genetic material) and reverse transcriptase.

26. a. **Commensalism:** In ecology, commensalisms is a class of relationship between two organisms where one organism benefits but the other is unaffected.

b. **Parasitism:** It is a relationship between two organisms where the larger animal is at harm and the smaller animal is benefited.

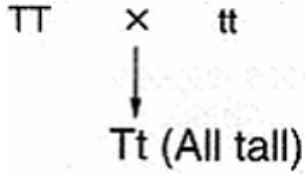
c. **Camouflage:** Camouflage is a method of crypsis - avoidance of observation - that allows an otherwise visible organism or object to remain indiscernible from the surrounding environment through deception. The best example of camouflage is shown by the garden lizard which changes its colour as per its surroundings.

d. **Mutualism:** It is relationship between two organisms where both organisms are benefited. For example, some birds pick worms and insects from big animals skin to get food. This helps the bigger animal to get rid of insects and worms.

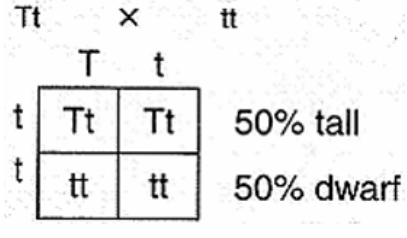
e. **Interspecific competition**: Interspecific competion, in ecology, is a form of competition in which individuals of different species compete for the same resource in an ecosystem (e.g. food or living space).

27. **Test cross:** A cross in which an individual with an unknown dominant phenotype is crossed with a recessive individual for that trait. So it is helpful in knowing the genotype (whether it is homozygous or heterozygous for the dominant trait) of an unknown individual.

Condition I: If the unknown is homozygous tall (TT) then crossing with dwarf recessive (tt) gives all tall offsprings (Tt).



Condition II: If the unknown is heterozygous tall (Tt), then crossing with dwarf results in 50% tall (Tt) and 50% dwarf (tt) progeny.



28. i. Deletion of the gene for ADA in an individual leads to ADA deficiency disorder Adenosine Deaminase (ADA) enzyme is crucial for immune system to function.

ii. Gene therapy is helpful in the treatment of ADA deficiency.

The treatment involves the following steps:

a. Lymphocytes from the blood of patient are grown on a culture outside the body.

b. A functional ADA, cDNA (using a retroviral vector) is then introduced into these lymphocytes.

c. Such genetically engineered lymphocytes are returned to the blood of patient.

d. Periodic infusion of such genetically engineered lymphocytes is required by the patient.

Section D

29. a. i. Sporozoites form in Human body.

ii. gametocytes in female Anopheles mosquito.

b.
- The sporozoites after entering the body need to undergo asexual reproduction in liver and RBC
- RBC burst, released haemozoin which is responsible for chill and high fever recurring every 3-4 days.

OR

Gametocytes (male and female) enter female mosquito body via blood meal, fertilization in gut / stomach, sporozoites escape from the gut, and migrate into salivary glands (of mosquito)

c. Aedes, - dengue/chikungunya or Culex, - filariasis or elephantiasis

30. i. The primary oocyte is a diploid cell whereas secondary oocyte is a haploid cell. The primary oocyte is formed when oogonia are at the prophase-I of the meiotic division in the foetal ovary whereas secondary oocyte is formed from primary oocyte after meiosis – I division to produce ova in females during the stage of puberty.

ii. The secondary follicle is then transformed into a tertiary follicle characterized by antrum, which is a fluid-filled cavity. At this phase, the primary oocyte grows in size inside the tertiary follicle to complete the first meiotic division. The tertiary follicle

finally transitions to form the Graafian follicle.

iii. large number of primary follicles degenerate in females during the period from birth to puberty by the process called follicular atresia. As a result, about 60000-80000 primary follicles are left in each ovary at puberty.

OR

After ovulation, the remaining cells of Graafian follicle are stimulated by LH to develop corpus luteum (an endocrine gland which secrete progesterone hormone).

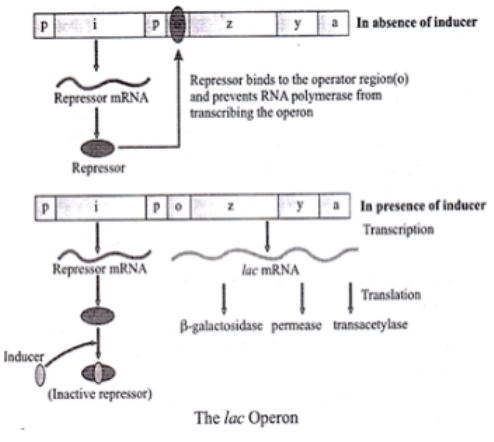
Section E

31. A functioning unit of genomic DNA containing a cluster of genes under the control of a single promoter is called an operon. An operon is generally transcribed into polycistronic mRNA. A single mRNA which codes for more than one protein is called polycistronic mRNA. An operon is made up of 3 basic DNA components:

i. **Promoter:** A nucleotide sequence that enables a gene to be transcribed is called a promoter. It is recognized by RNA polymerase, which then initiates transcription.

ii. **Operator:** A segment of DNA to which a repressor binds is called the operator.

iii. **Structural genes:** The genes that are co-regulated by the operon are called structural genes. **Inducible Operon:** When the operon is regulated by an inducer, it is called an inducible operon. An inducer can switch on or off the operon. Lac operon is an example of an inducible operon. Lactose is a substrate of enzyme beta-galactosidase and is the inducer of the lac operon.



The *lac* Operon

The given diagram shows the working of the lac operon. In the absence of an inducer, the repressor binds to the operator region and prevents transcription.

In the presence of an inducer, repressor becomes inactive. This allows transcription in the operator region which results in the release of mRNA. Subsequently, mRNA promotes translation and protein synthesis is accomplished.

OR

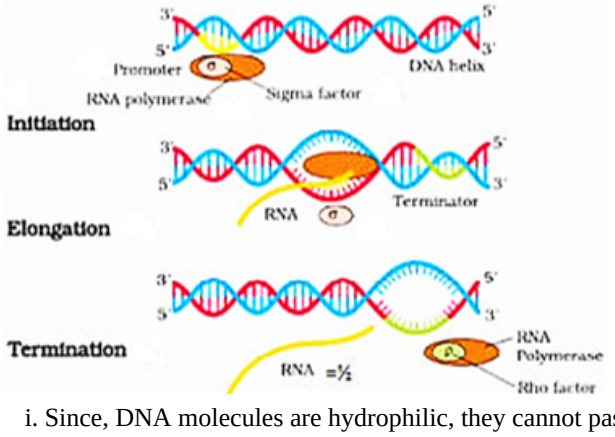
Process of transcription in Prokaryotes are as follows

DNA - dependent RNA polymerase that catalyses the process of transcription, three steps: initiation, elongation, and termination,

Initiation: RNA polymerase binds to promoter, associated with initiation - factor (σ) at 5' end of DNA,

Elongation: nucleoside phosphates serve as substrate following the rule of complementarity, RNA polymerase help in opening the helix and continuous elongation,

Termination: Terminator factor (ρ), nascent RNA falls off along with RNA polymerase



32. i. Since, DNA molecules are hydrophilic, they cannot pass through cell membranes. For recombinant DNA to be integrated into the vector or host genome, it is necessary for the DNA to be inserted in the cell. Therefore, making the host cells competent is necessary for biotechnology experiments.

The two ways by which cells can be made competent to take up DNA are:

a. **Chemical action** -The host cell is treated with a specific concentration of divalent cation, i.e. calcium which increases the pore size in the cell membrane. DNA is then incubated with the treated bacterial cell at 42°C, thereby increasing the efficiency of DNA entering through pores in the cell wall.

b. **Heat shock treatment-** Incubating the cells with recombinant DNA on ice, followed by a brief treatment of heat at 42°C and again putting them back on ice.

ii. Biolistic guns or gene guns are used to bombarded rDNA loaded on gold or tungsten particles with high velocity. In this way, the rDNA is delivered to the desired host cells.

OR

Selection of recombinants due to inactivation of antibiotics is a laborious process as it requires:

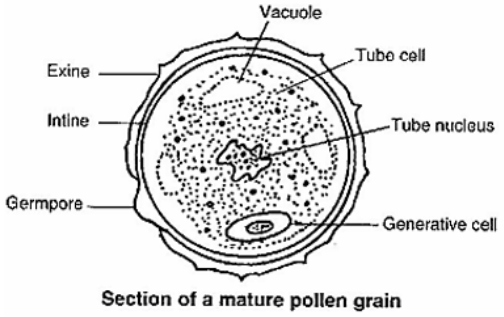
i. a vector with two antibiotic resistance marker.

ii. preparation of two kinds of media plate with one antibiotic each.

Transformed cells are first plated on that antibiotic plate which has not been insertional inactivated (ampicillin) and incubated overnight for growth of transformants. For the selection of recombinants, these transformants are Replica plated on second antibiotic (tetracycline) plate (which got inactivated due to insertion of a gene). Non-recombinants grow on both the plates (one carrying ampicillin and the other carrying tetracycline) while recombinants will grow only on ampicillin plate.

This entire exercise is laborious and takes more time (two overnight incubation) as well. However. if we choose the second option (insertional inactivation of a marker that produces colour in the presence of a chromogenic compound), we can distinguish between the recombinants and nonsubstrate recombinants on a single medium plate (containing one antibiotic and the chromogenic compound) after overnight growth.

33.



Section of a mature pollen grain

OR

i. The three method of pollen transfer in plant are

1. Autogamy
2. Geitonogamy
3. Xenogamy

ii. 1. Water lily: achieve successfully pollination by insects/wind.

2. Vallisneria: Female flowers on long stalks reach water surface male flowers or pollen released on water and carried by water current to female flowers to achieve pollination.

iii. Genetic: Self-incompatibility/prevents self-pollen (same flower or other flowers of same plant) from fertilizing the ovules by inhibiting pollen germination, pollen tube growth in pistil.

Physiological: Pollen release and stigma receptivity are not synchronized, either pollen matures earlier and stigma later or pollen matures later than stigma.