Class XII Session 2025-26
Subject - Biology
Sample Question Paper - 10

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. Which of the following is the correct food chain? **[1]**

   a) Frog ⟶ Snake ⟶ Eagle ⟶ Grasshopper ⟶ Grass

   b) Grass ⟶ Grasshopper ⟶ Frog ⟶ Snake ⟶ Eagle

   c) Eagle ⟶ Snake ⟶ Grasshopper ⟶ Grass ⟶ Frog

   d) Grasshopper ⟶ Grass ⟶ Snake ⟶ Frog ⟶ Eagle

2. Name the spermicidal cream developed by Central Drug Research Institute (Lucknow), India. **[1]**

   a) Consap

   b) Sapindus

   c) Spermacid

   d) Corovira

3. Which one of the following is related to ex-situ conservation of threatened animal and plants? **[1]**

   a) Himalayan region

   b) Biodiversity hotspots

   c) Wildlife Safari Parks

   d) Amazon rainforest

4. A mother of one-year-old daughter wanted to space between her children. The best contraceptive method she should use is: **[1]**

   a) Tubectomy

   b) Oral contraceptives

   c) Copper-T

   d) Diaphragm

5. The source of Taq polymerase used in PCR is a: **[1]**

   a) Thermophilic fungus

   b) Thermophilic bacterium

   c) Mesophilic fungus

   d) Halophilic bacterium

6. The technology of biogas production was developed in India mainly due to the efforts of: **[1]**

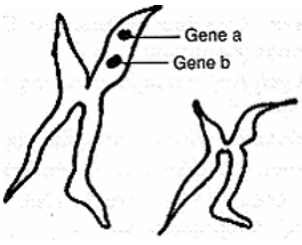
a) ISRO

b) Pusa Agriculture

c) IARI and KVIC

d) ICRI and KVIC

7. Given below is a highly simplified representation of human sex chromosomes from a karyotype. The genes a and b could be of: **[1]**



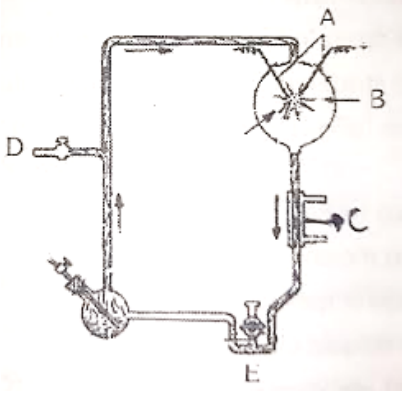
a) Attached ear lobe and Rh blood group

b) Haemophilia and red green colour blindness

c) Colour blindness and body height

d) Phenylketonuria and haemophilia.

8. 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

9. Stability of ecosystem depends upon: **[1]**

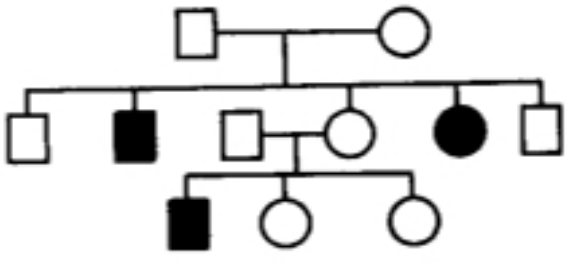
a) Interchange between producers and consumers

b) Number of producers

c) Primary productivity

d) Number of consumers

10. Study the pedigree chart given below: **[1]**



What does it show?

a) Inheritance of a recessive sex-linked disease like haemophilia

b) The pedigree chart is wrong as this is not possible

c) Inheritance of a sex-linked inborn error of metabolism like phenylketonuria

d) Inheritance of a condition like phenylketonuria as an autosomal recessive trait

11. Bacterium Propionibacterium shermanii is used in the preparation of edible product: **[1]**

a) Idli

b) Swiss cheese

c) Curd

d) Roquefort cheese

12. Which native plasmid did Stanley Cohen and Herbert Boyer use for the construction of the first recombinant DNA? **[1]**

a) Streptococcus pneumoniae

b) Haemophilus influenzae

c) Escherichia coli

d) Salmonella typhimurium

13. **Assertion (A):** A medical termination of pregnancy is legally allowed upto the 28th week of pregnancy. **[1]**
Reason (R): MTP is done if family physician or gynaecologist consider the need for abortion.

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.

14. **Assertion:** BOD is a measure of the organic matter present in the water. **[1]**
Reason: BOD refers to the amount of oxygen that would be consumed if all the organic matter in one litre of water were oxidised by bacteria.

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.

15. **Assertion (A):** A pyramid of numbers can neither be inverted. **[1]**
Reason (R): The number of insects feeding on a big tree is more than the number of trees on which insects are feeding.

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:** Life originated by chance coming together of necessary chemicals through a series of chemical reactions (abiogenesis). **[1]**
Reason: Abiogenesis has not been experimentally proved.

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.

Section B

17. a. Differentiate between humoral immune response and cell-mediated immune response. **[2]**

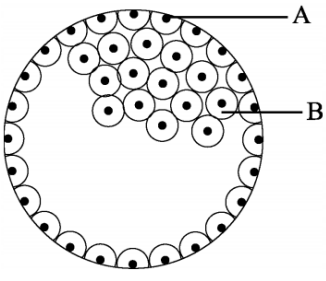
b. Draw a schematic diagram of an antibody molecule and label any four parts.

18. i. Construct a complete transcription unit with promotor and terminator on the basis of the hypothetical template strand given below. **[2]**

ii. Write the RNA strand transcribed from the above transcription unit along with its polarity.

19. Mention any two characteristics of pollen in plants such as maize and coconut palm to suit the kind of pollination in them. **[2]**

20. In the given figure, give the name and functions of parts labelled A and B. **[2]**



21. Explain the role of the following during the sewage treatment: **[2]**

a. flocs

b. anaerobic sludge digester

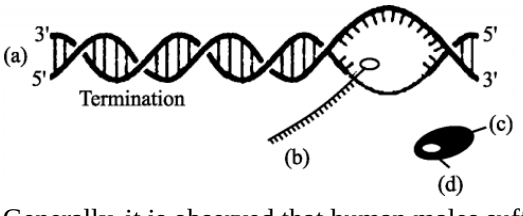
OR

a. Give an example of viral biocontrol agent.

b. Why are they considered to be desirable when an ecologically sensitive area is being treated?

Section C

22. The process of termination during transcription in a prokaryotic cell is being represented here. Name the label a, b, c and d. **[3]**

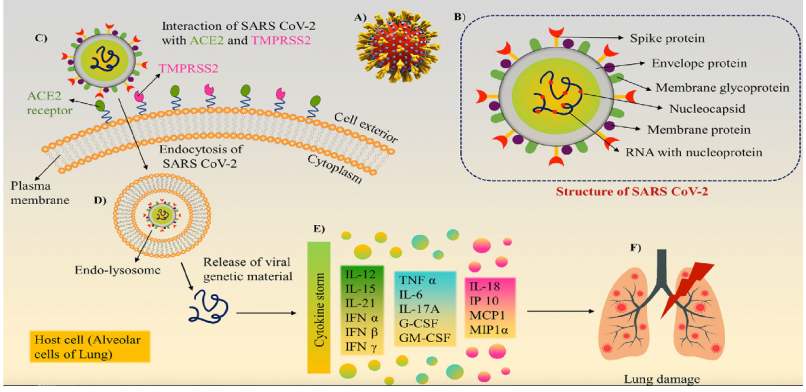


23. Generally, it is observed that human males suffer from hemophilia more than human females, who rarely suffer from it. Explain giving reasons. **[3]**

24. Study the table showing the population interaction between species **Z** and **Y** respectively. Assign the appropriate +/– signs for **A**, **B**, **D**, **E** and respective interactions for **C** and **F**. **[3]**

Species 'Z'	**Species 'Y'**	**Name of Interaction**
A	B	Mutualism
–	–	C
D	E	Parasitism
+	O	F

25. This image shows how lungs are damaged by SARS CoV-2 and how molecular diagnostic techniques help to diagnose it. **[3]**



i. List the three molecular diagnostic techniques that help to detect pathogens from suspected patients.

ii. Mention one advantage of these techniques over conventional methods.

26. a. **For ethical reasons, biodiversity must be conserved.** Do you agree? Write your views in support of your answer. **[3]**

b. Write the characteristic features of a specific area on the basis of which it is designated as a **hot spot**. Write any one major threat to these areas.

OR

How have the following factors affected the biodiversity of an area? Explain.

a. Habitat loss and fragmentation

b. Over-exploitation

27. Comment on the statement that evolution and natural selection are end result or consequence of some other processes but themselves do not process. **[3]**

28. How does a vaccine for a particular disease immunise the human body against that disease? **[3]**

Section D

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

Cleavage is the series of rapid mitotic divisions in zygote and forms blastula. The 2, 4, 8, 16 daughter cells are called blastomeres. Embryo with 64 blastomeres is known as blastocyst and has blastocoel cavity. Blastocyst gets implanted in uterine wall and leads to pregnancy.

i. Why the cells of the inner cell mass of blastocyst are called stem cells? (1)

ii. At which stage of embryonic development trophoectoderm develops? (1)

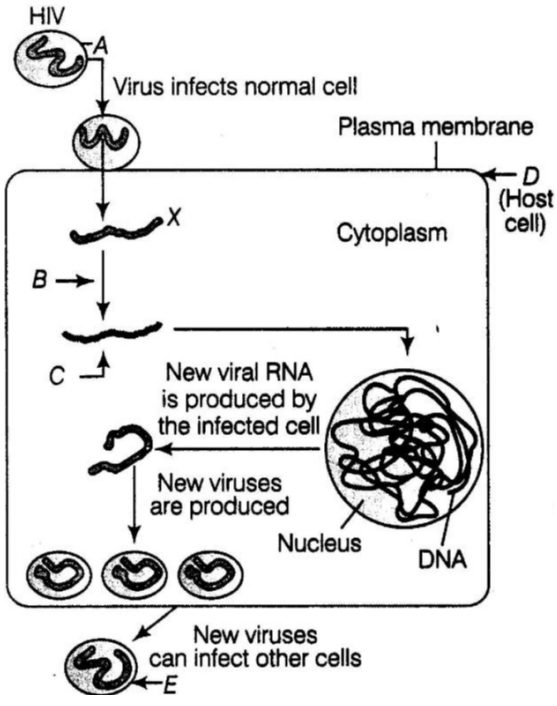
iii. What is the site of implantation? (2)

OR

What is the correct sequence of various structures formed during embryonic development? (2)

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

Study the diagram showing replication of HIV in humans:



i. Write the chemical nature of the coat A. (1)

ii. Name the enzyme B acting on X to produce molecule C. Name C. (1)

iii. Mention the name of the host cell D the HIV attacks first when it enters into the human body. (2)

OR

Name the two different cells the new viruses E subsequently attack. (2)

Section E

31. Trace the development of microspore mother cell in the anther to a mature pollen grain. **[5]**

OR

i. Show the development of megaspore mother cell upto the formation of mature embryo sac in flowering plants with the help of labelled diagrams only.

ii. How does geitonogamy differ from xenogamy?

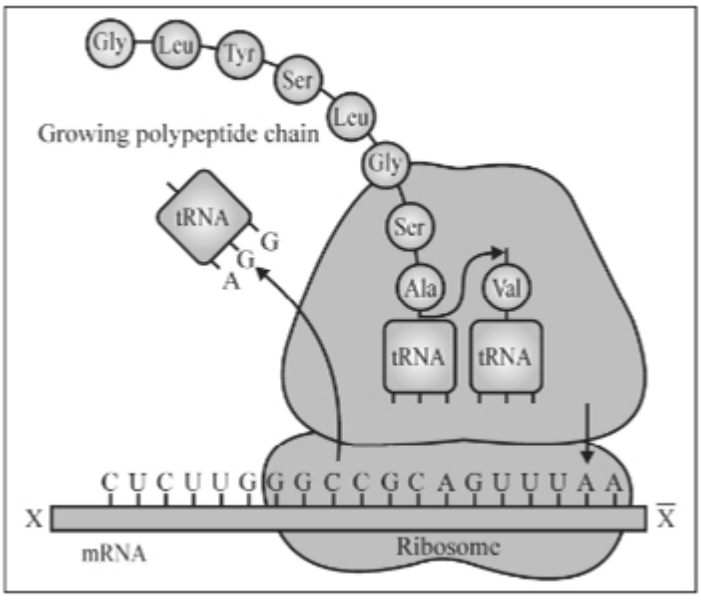
iii. Name the type of flowers that are invariably autogamous.

32. i. Name and describe the technique which is an important tool of forensic science. **[5]**

ii. Mention any two applications of this technique other than its use in forensic studies.

OR

Study the schematic diagram given below and answer the questions that follow:



i. Identify the polarity from **X** to $\overline{X}$ in the mRNA segment shown. Mention how many more amino acids can be added to the polypeptide that is being translated and why.

ii. Write the initiating codon for translation, its anticodon and the amino acid it codes for.

iii. Explain the charging of an adaptor molecule. Why this molecule needs to be charged?

33. Describe the roles of heat, primers and the bacterium *Thermus aquaticus* in the process of PCR. **[5]**

OR

Explain the role(s) of the following in biotechnology

i. Restriction endonuclease

ii. Gel-electrophoresis

iii. Selectable markers in pBR322

Solution

Section A

1. **(b)** Grass ⟶ Grasshopper ⟶ Frog ⟶ Snake ⟶ Eagle

   Explanation:

   Grass ⟶ Grasshopper ⟶ Frog ⟶ Snake ⟶ Eagle

2. **(a)** Consap

   Explanation:

   Central drug research institute, Lucknow, India has developed a spermicidal cream called Consap. It has the capability of killing the sperm released during insemination.

3. **(c)** Wildlife Safari Parks

   Explanation:

   Wildlife Safari Parks

4. **(c)** Copper-T

   Explanation:

   Copper-T is a contraceptive method under intrauterine contraceptive device which prevents implantation and reduces the motility of sperm. It is implanted inside the uterus and works up to five years. So, it is the best method for spacing between two children.

5. **(b)** Thermophilic bacterium

   Explanation:

   Thermophilic bacterium

6. **(c)** IARI and KVIC

   Explanation:

   Cattle dung is used for the production of biogas, commonly called gobar gas. The technology of biogas production from cow dung was developed in India mainly due to the efforts of the Indian Agricultural Research Institute (IARI) and Khadi and Village Industries Commission (KVIC).

7. **(b)** Haemophilia and red green colour blindness

   Explanation:

   Haemophilia and red-green colour blindness both are a sex-linked recessive gene on X chromosome. Body height is an example of polygenic inheritance. Rhesus blood group is base on the presence or absence of Rh-protein on the surface of RBC, phenylketonuria (PKU) is a recessive autosomal variation.

8. **(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 +CH4, C-cold water, D-vacuum, E-U trap

9. **(a)** Interchange between producers and consumers
Explanation:
Interchange between producers and consumers

10. **(d)** Inheritance of a condition like phenylketonuria as an autosomal recessive trait
Explanation: Inheritance of a condition like phenylketonuria as an autosomal recessive trait

11. **(b)** Swiss cheese
Explanation:
Swiss cheese

12. **(c)** Escherichia coli
Explanation:
The construction of the first recombinant DNA was done by using the native plasmid of. **Escherichia coli**.

13. **(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.

14. **(a)** Assertion and reason both are correct statements and reason is correct explanation for assertion.
Explanation:
Assertion and reason both are correct statements and reason is correct explanation for assertion.

15. **(d)** A is false but R is true.
Explanation:
A pyramid of numbers can be inverted because the number of insects feeding on a big tree is more than the number of trees on which insects are feeding.

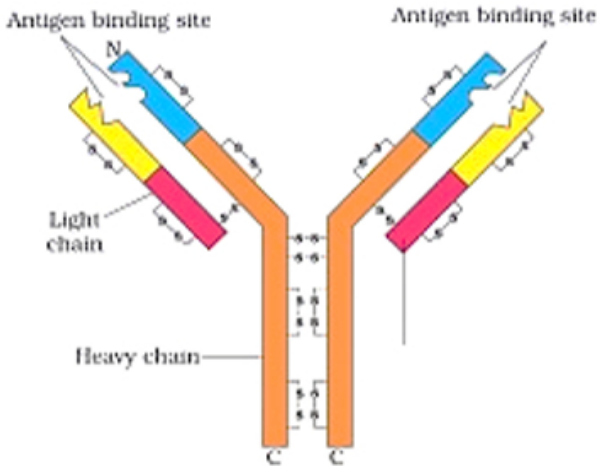
16. **(c)** Assertion is correct statement but reason is wrong statement.
Explanation:
Assertion is correct statement but reason is wrong statement.

Section B

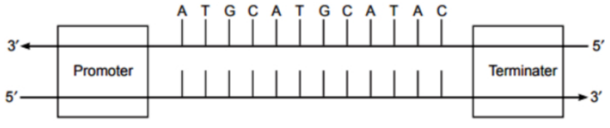
17. a.

Humoral immune response	**Cell-Mediated immune response**
Mediated by B-lymphocytes	Mediated by T- lymphocytes
Antibodies are produced by B-lymphocytes in the blood.	T- cells do not secrete antibodies but help B-cells to produce them.
This is not responsible for graft rejection.	This is responsible for the graft rejection.

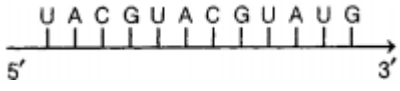
b.



18. i. Transcription unit



ii. RNA strand transcribed from the above transcriptional unit



19. (i) Pollen grains are produced in large quantities.
(ii) They are small, smooth and non-sticky.

20. A. = Trophoblast - Gets attached to the endometrium and draws nutritive material secreted by uterine endometrium gland.
B. = Inner cell mass - Differentiates as Embryo.

21. a. These consume the major part of organic matter in the effluent, and significantly reduce the BOD.
b. Anaerobic sludge digestors where anaerobic digestion of sludge takes place, producing 'Biogas' in the process.

OR

a. Baculoviruses / Nucleopolyhedrovirus
b. They are considered to be good bio-control agents because these viruses are excellent candidates for species-specific, narrow-spectrum insecticidal applications and show no negative impacts on plants, mammals, birds or even non-target insects and are desirable for integrated pest management.

Section C

22. a. DNA molecule
b. mRNA transcript
c. RNA polymers
d. Rho factor

23. Haemophilia is a recessive X-linked genetic type disorder. Haemophilia is more common among males than females because males only inherit one X-chromosome. There are 46 chromosomes in humans Females have XX chromosome while males have X and Y chromosome. So, male offspring inherit X-chromosome from their mother and Y-chromosome from them father Males only have one X-chromosome and if the X-chromosome and this is the reason that males are suffering from haemophilia is the x-chromosome carries the mutation. While in females as they have so X chromosomes, and this is a recessive disorder.

24. A = +
B = +
C = Competition
D = +
E = -
F = Commensalism

25. Molecular diagnostic techniques to detect pathogens from suspected patients are as follows
i. Polymerase Chain Reaction (PCR)
ii. Recombinant DNA technology
iii. Enzyme Linked Immuno Sorbent Assay (ELISA)

The advantage of these techniques is that they help in the early detection and treatment of diseases, which is not possible by the conventional diagnosis.

26. a. Yes, We share the planet with many other organisms like plants / animals / microbes ,every species has an intrinsic value, moral duty to take care of other organism wellbeing, pass on our biological legacy in good order to future generations.

    b.
    - Regions showing very high level of species richness, high degree of endemism.
    - Accelerated habitat loss.

    OR

    a.
    - **Habitat loss-** loss of habitat leads to loss of biodiversity and threatens the survival of plants and animals to extinction.
    - **Fragmentation-** ammals and birds requiring large territories and certain animals with migratory habits are badly affected due to fragmentation, leading to population decline.

    b. Many commercially important species are overharvested, endangering their existence which may lead to their extinction.

27. This is a debatable point that evolution and natural selections are the end result or consequence of some other processes but themselves do not process. When we discuss the success of life on the earth then we treat evolution and natural selection as a process. But when discussions how life has evolved from simple forms then evolution and natural selection appear to results in some other processes. Among the scientific community; this issue is still a moot point.

28. During vaccination for a particular disease, an antigen or antigenic protein or pathogen which is in inactive form is introduced into the body to induce a mild immune response.
    The vaccine generates antibodies that neutralise the toxin/pathogen and produces memory B or T-cells, which recognise the pathogen in the subsequent encounters and produce antibodies.

Section D

29. i. The embryo at 64 celled stage is known as blastocyst. It comprises of an inner cell mass which is attached to embryonic pole and an outer covering of cells which is known as trophoblast. The trophoblast later forms the chorion which is part of placenta. The inner cell mass has the property to undergo unlimited symmetrical divisions without getting differentiated.

    ii. Embryo with 64 cells is called blastula (blastocyst) and has blastocyst cavity. Blastocyst is composed of an outer envelope of cells called trophoblast and inner cell mass.

    iii. Implantation is the attachment of blastocyst to the uterine wall. The portion of blastocyst where the inner cell mass is located lies against the endometrium of uterus.

    OR

    Zygote $\rightarrow$Morula $\rightarrow$Blastula $\rightarrow$Gastrula.

30. i. A - Protein coat

    ii. B - Reverse transcriptase, X-viral RNA
    C - Viral DNA

    iii. D - Macrophages (animal or human cell)

    OR

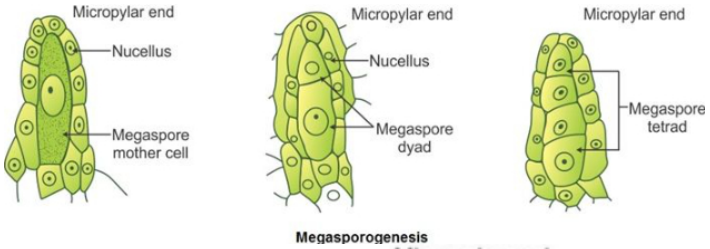
    E - Macrophages and helper T-cells

Section E

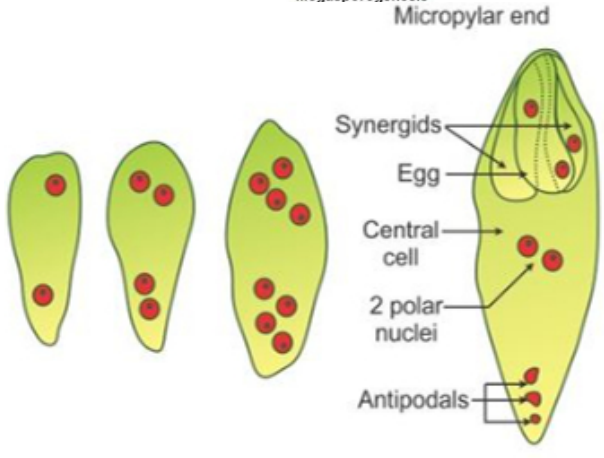
31. **Microsporogenesis** comprises the events which lead to the formation of the haploid unicellular microspores. During microsporogenesis, the diploid sporogenous cells differentiate as microsporocytes (pollen mother cells or meiocytes) which divide by meiosis to form four haploid microspores. Each diploid meiocyte gives rise to a tetrad of four haploid microspores and microsporogenesis is complete with the formation of distinct single-celled haploid microspores.
    Microgametogenesis comprises events which lead to the progressive development of the unicellular microspores into mature microgametophytes containing the gametes. This phase begins with the expansion of the microspore which is commonly associated with the formation of a single large vacuole. Vacuolation is accompanied by the displacement of the microspore nucleus to an eccentric position against the microspore wall. In this position, the nucleus undergoes first pollen mitosis (pollen mitosis I) which results in the formation of two unequal cells, a large vegetative cell and a small generative cell each containing a haploid nucleus. The generative cell subsequently detaches from the pollen grain wall and is engulfed by the vegetative cell forming a unique 'cell within a cell' structure. The engulfed generative cell divides once more by mitosis (pollen mitosis II) to form the two sperm cells completely enclosed within the vegetative cell cytoplasm either before pollen is shed (tricellular pollen) or within the pollen tube (bicellular pollen).

OR

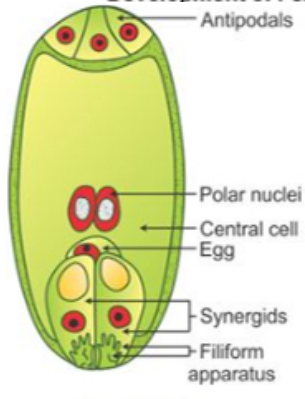
i. The development of megaspore mother cell upto the formation of mature embryo sac in flowering plant is



Megasporogenesis



Development of Female Gametophyte



Mature Embryo Sac

ii. Geitonogamy is the transfer of pollen grains from the anther to the stigma of another flower of the same plant - xenogamy is the transfer of pollen from anther to the stigma of another plant.

iii. Cleistogamous flowers or the flowers which never open.

32. i. One important technique in forensic science is DNA profiling, also known as DNA fingerprinting. DNA profiling analyzes specific regions of an individual's DNA to create a unique genetic profile. It is commonly used in criminal investigations to identify suspects, link evidence to a crime scene, or establish paternity.

ii. Two additional applications of DNA fingerprinting other than its use in forensic science include the following:

Genealogy and Ancestry: DNA profiling can be used in genealogical research to trace family lineages and determine genetic relationships between individuals. It has become a popular tool for individuals interested in learning about their ancestry and building family trees.

Wildlife Conservation: DNA profiling helps in identifying and tracking endangered species, monitoring illegal wildlife trade, and investigating poaching cases. By analyzing DNA samples from animals and matching them to a database, researchers can gather valuable information about population sizes, migration patterns conservation purposes.

OR

i.
- X to $\overline{X}$ is 5' $\longrightarrow$ 3'
- No more amino acids will be added
- as the last codon UAA is a stop codon

ii.
- AUG
- Anticodon - UAC
- methionine

iii.
- Charging of adopted molecule - The amino acids are activated in the presence of ATP, and linked to their cognate tRNA or the adapter molecule,

- Amino acids needs to be charged so peptide bonds can be formed using this energy.

33. **Role of Heat** - In PCR (in vitro), the DNA strands are separated by heating them at 95°C for 2 minutes. Heating causes the breakdown of H-bonds between the bases of two strands leading to their unwinding.
Role of Primers - Primers are short lengths of DNA about 20bp long that are required to start DNA polymerisation in PCR. The primers hybridise to their complementary sequence on the DNA strands at 40-50^{o}C temperature and help in DNA polymerisation.
Role of *Thermus aquaticus* - An enzyme called Taq polymerase is isolated from *Thermus aquaticus*. Since this bacterium thrives in temperature as high as 95°C, this enzyme can also tolerate high temperature without undergoing denaturation. Therefore, this enzyme is used in PCR instead of normal DNA polymerase.

OR

i. **Restriction endonucleases** -These are the bacterial enzymes that cut dsDNA into fragments after recognising and binding to the specific nucleotide sequences, known as recognition site. These enzymes are used to form recombinant molecules of DNA, composed of DNA from different sources.
ii. **Gel-electrophoresis** is the technique which allows the separation and visualisation of fragments of DNA on an agarose gel matrix.
Since the DNA fragments are negatively-charged molecules, they separate and move towards the anode (+ve) under the influence of an electric field. DNA fragments are separated on the basis of their size through the sieving effect provided by the gel.
iii. **Selectable markers in pBR322** help in identification and selection of transformants. pBR322, an E coll cloning vector has two antibiotic resistance genes, i.e. for ampicillin and tetracycline, which act as a selectable marker. When a foreign DNA is ligated at the site of tetracycline resistance (tet^{R}) gene in pBR322, the recombinant plasmid will lose tetracycline resistance due to insertional inactivation of foreign DNA, but can still be selected out from non-recombinants by placing the transformants on ampicillin containing a medium. The transformants growing on ampicillin containing medium are then transferred on tetracycline containing a medium. The recombinants will grow on ampicillin containing medium but not on tetracycline one whereas non-recombinants grow on both.