Class XII Session 2025-26
Subject - Biology
Sample Question Paper - 7

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. The product of ecosystem processes are called as: **[1]**

   a) Economic services
   b) Ecosystem services
   c) Ecological benefits
   d) Biological services

2. If the mean and median pertaining to a certain population are of the same value, the following is most likely to occur: **[1]**

   a) A normal distribution
   b) A skewed curve
   c) A T-shaped curve
   d) A bi-modal distribution

3. Threatened species list includes: **[1]**

   a) Critically endangered, endangered, vulnerable.
   b) Only critically endangered and endangered species.
   c) Only critically endangered species.
   d) Only vulnerable and lower risk species.

4. Human population follows: **[1]**

   a) M-shaped growth curve
   b) J-shaped growth curve
   c) Z-shaped growth curve
   d) S-shaped growth curve

5. Which of the following techniques made it possible to genetically engineered living organism? **[1]**

   a) Heavier isotope labelling
   b) Recombinant DNA technique
   c) X-ray diffraction
   d) Hybridization

6. The first antibiotic was discovered accidentally by A while working on B. **A** and **B** are **[1]**

a) A - Waksman; B - Streptococcus

b) A - Fleming; B - Staphylococci

c) A - Fleming; B - Penicillium notatum

d) A - Waksman; B - Bacillus brevis

7. In the pedigree analysis, the symbol shown below represent **[1]**

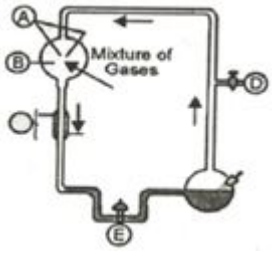
a) Normal individuals

b) Sex unspecified

c) Affected individuals

d) Matting between relatives

8. The diagram represents the Miller experiment. Choose the correct combination of labelling. **[1]**



a) A – electrodes, B – (NH_3 + H_2 + H_2O + CH_4), C – cold water, D – Vacuum, 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_2O, C – hot water, D – tap, E – U trap

d) A – electrodes, B – NH_3 + H_2 + H_2O + CH_4, C – steam, D – Vacuum, E – U trap

9. The organism that occupies more than one trophic level in a pond ecosystem is: **[1]**

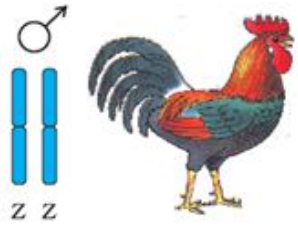
a) Phytoplankton

b) Frog

c) Fish

d) Zooplankton

10. On the basis of the sex chromosome shown below, the bird shown is **[1]**



a) Female

b) Cannot be decided

c) Male

d) Transgender

11. Which one of the following fixes the atmospheric nitrogen but is not an autotroph? **[1]**

a) Oscillatoria

b) Rhizobium

c) Anabaena

d) Nostoc

12. Variable number of tandem repeats (VTNRs) in the DNA molecule are highly useful in: **[1]**

a) Recombinant DNA technology

b) Stem cell culture

c) DNA fingerprinting

d) Monoclonal antibody production

13. **Assertion (A):** Periodic abstinence is a natural method of birth control. **[1]**

Reason (R): In this male partner withdraws his penis from the vagina just before ejaculation so as to avoid insemination.

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 (A):** Rotenone is a bjoinsecticide. **[1]**

Reason (R): Rotenone is obtained from living organism and is employed to kill bacteria.

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.

15. **Assertion (A):** The pyramid of biomass can be inverted. **[1]**

Reason (R): The biomass of fishes far exceeds that of phytoplankton on which fishes feed.

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):** Homo sapiens have evolved from chimpanzee-like ancestors. **[1]**

Reason (R): There is no difference between the two in the amino acid sequence of the protein Cytochrome-C.

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

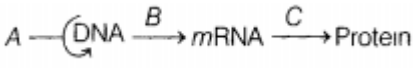
b) Both Assertion (A) and Reason (R) are true, but Reason (R) is **not** the correct explanation of the Assertion (A).

c) Assertion (A) is true, but Reason (R) is false.

d) Assertion (A) is false, but Reason (R) is true.

Section B

17. Some of the microbes used as biofertilizers are prokaryotes. Name the taxonomic group they come under. With the help of an example, mention how they act as biofertilizers. **[2]**

18. 

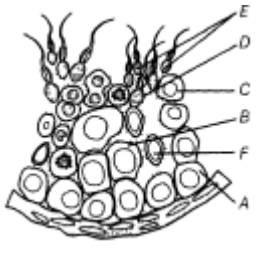
[2]

i. Look at the above sequence and mention the event A, B and C.

ii. What does central dogma state in molecular biology? How does it differ in some viruses?

19. State one advantage and one disadvantage of cleistogamy. **[2]**

20. Name the labels A, B, C, D, E and F in the diagram of seminiferous tubule. **[2]**



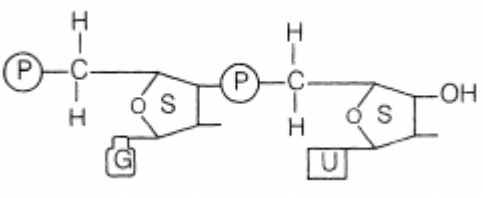
21. Effluent from the primary treatment of sewage is passed for secondary treatment. Explain the process till the water is ready to be released into natural water bodies. **[2]**

OR

Name the enzyme produced by Streptococcus bacterium. Explain its importance in medical sciences.

Section C

22. Answer the questions based on the dinucleotide show below. **[3]**



i. Name the type of sugar to which guanine base is attached to.

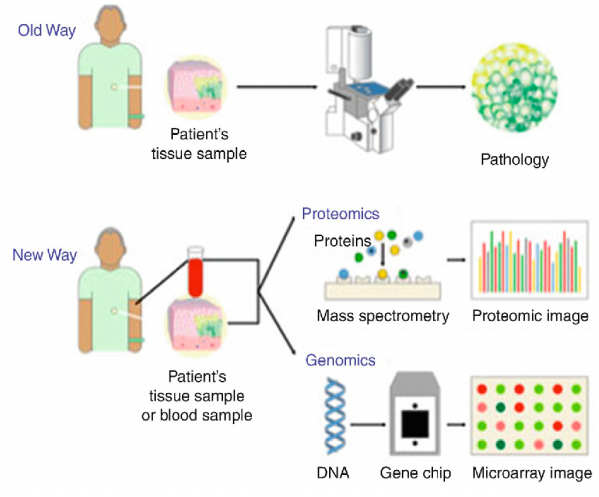
ii. Name the linkage connecting the two nucleotides.

iii. Identify the 3' end of the dinucleotide. Give a reason for your answer.

23. Why is the frequency of red-green color blindness is many times higher in males than that in females? **[3]**

24. Differentiate between an **Expanding age pyramid** and a **Stable age pyramid**. Substantiate your answer with diagrams. **[3]**

25. The image below describes the molecular diagnostic procedures. **[3]**



i. Write any two biochemical/molecular diagnostic procedures for early detection of viral infection.

ii. Explain the principle of any one of them.

26. With the help of three examples, explain the **broadly utilitarian** argument for conservation of biodiversity. **[3]**

OR

i. Explain the concept of endemism.

ii. Name four regions in and around our country that are considered hot-spots.

27. Who proposed the term evolution? What is evolution? List the different evidences in support of evolution. **[3]**

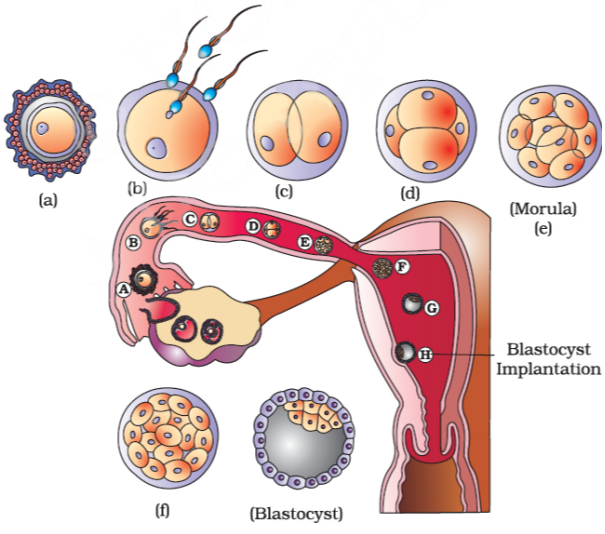
28. Different types of antibodies are produced in our body by the B-lymphocytes in response to a pathogen that enters in our blood. Name any two antibodies produced and draw a schematic representation of an antibody molecule and label its four parts. **[3]**

Section D

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

Nikita and Anita studying about fertilization and implantation. They have to represent a poster in the class on this topic so they both have made the following poster which includes all the stages starting from fertilization to

implantation.



i. Discribe the zygote division till the stage of blastocysts. (1)

ii. Specify endocrine function of corpus luteum. How does it influence the uterus? Why is it essential? (1)

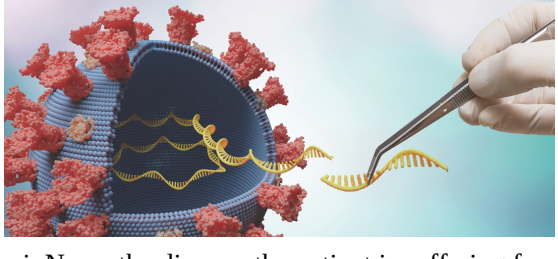
iii. What will happen if the fallopian tubes are partially blocked and the ovulated eggs are prevented from reaching the uterus? (2)

OR

State the fate of the trophoblast of a human blastocyst at the time of implantation. (2)

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

A pathogen is defined as **an organism causing disease to its host**, with the severity of the disease symptoms referred to as virulence. Pathogens are taxonomically widely diverse and comprise viruses and bacteria as well as unicellular and multicellular eukaryotes. The immune system of a person is suppressed. He was found positive for a pathogen in the diagnostic test ELISA.



i. Name the disease, the patient is suffering from. (1)

ii. Which pathogen is identified by ELISA test? (1)

iii. Which cells of the body are attacked by the pathogen? (2)

OR

Suggest preventive measures of the infection. (2)

Section E

31. Differentiate between: **[5]**

a. hypocotyol and epicotyl

b. coleoptile and coleorrhiza

c. integument and testa

d. perisperm and pericarp

OR

i. Explain the monosporic development of embryo sac in the ovule of an angiosperm.

ii. Draw a diagram of the mature embryo sac of an angiospermic ovule and label any four parts in it.

32. a. Describe the structure of a **transcription Unit**. **[5]**

b. Explain the basis of defining the two DNA strands of a structural gene in a transcription unit.

OR

How did Matthew Meselson and Franklin Stahl experimentally prove that DNA replication is semiconservative? Explain.

33. How and why is the bacterium *Thermus aquaticus* employed in recombinant DNA technology? Explain. **[5]**

OR

i. Draw a schematic diagram of the cloning vector pBR 322 and label (1) Bam HI site (2) gene for ampicillin resistance (3) **ori** (4) **rop** gene.

ii. State the role of **rop** gene.

iii. A cloning vector does not have a selectable marker. How will it affect the process of cloning?

iv. Why is insertional inactivation preferred over the use of selectable markers in cloning vectors?

Solution

Section A

1. **(b)** Ecosystem services
   Explanation:
   The products of ecosystem processes are called as ecosystem services. Ecosystem services includes purification of air and water by forests and soil formation as well as nutrient cycles.

2. **(a)** A normal distribution
   Explanation:
   A normal distribution

3. **(a)** Critically endangered, endangered, vulnerable.
   Explanation:
   The International Union for Conservation of Nature (IUCN) is the foremost authority on threatened species, and treats threatened species not as a single category, but as a group of three categories, depending on the degree to which they are threatened:
   - Vulnerable species
   - Endangered species
   - Critically endangered species

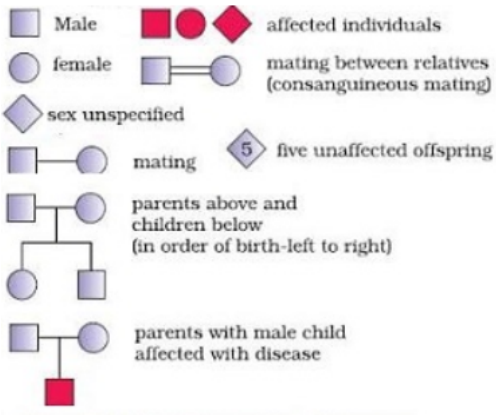
4. **(d)** S-shaped growth curve
   Explanation:
   S-shaped growth curve

5. **(b)** Recombinant DNA technique
   Explanation:
   Recombinant DNA technique

6. **(b)** A - Fleming; B - Staphylococci
   Explanation:
   A - Fleming; B - Staphylococci

7. **(c)** Affected individuals
   Explanation:

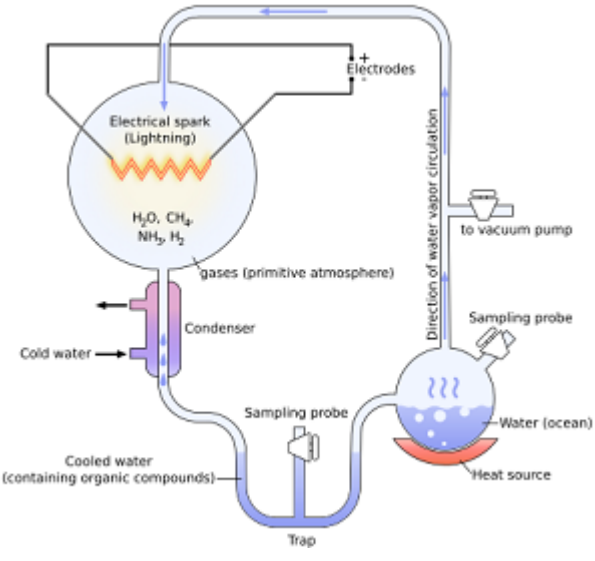
In pedigree analysis, the symbol shown above represents affected individuals.



8. **(a)** A – electrodes, B – (NH_3 + H_2 + H_2O + CH_4), C – cold water, D – Vacuum, E – U Trap.

Explanation:

In Urey and Miller experiment the set up labelled as A – electrodes, B – (NH_3 + H_2 + H_2O + CH_4), C – cold water, D – Vacuum, E – U Trap.



9. **(c)** Fish

Explanation:

Fish

10. **(c)** Male

Explanation:

Male birds bear ZZ sex chromosome as sex determination is ZO type, in which ZZ is male and ZO is female.

11. **(b)** Rhizobium

Explanation:

Rhizobium is heterotrophic soil bacteria with diverse lifestyles.

12. **(c)** DNA fingerprinting

Explanation:

DNA fingerprinting

13. **(c)** A is true but R is false.
Explanation:
A is true but R is false.

14. **(a)** Both A and R are true and R is the correct explanation of A.
Explanation:
Both A and R are true and R is the correct explanation of A.

15. **(a)** Both A and R are true and R is the correct explanation of A.
Explanation:
The pyramid of biomass can be inverted because the biomass of fishes far exceeds that of phytoplankton on which fishes feed.

16. **(a)** Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).
Explanation:
Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

Section B

17. The following microorganisms are used as biofertilizers:
    i. **Rhizobium:** They form root nodules in leguminous plants and fix the atmospheric nitrogen into an organic form. Rhizobium also has no negative effect on soil quality and improves the quality, nutrient content, and growth of the plant.
    ii. **Azotobacter:** These are free-living nitrogen fixers found in all types of upland crops. These not only fix nitrogen but also provide certain antibiotics and growth substances to the plant.

18. i. A - Replication of DNA
    B - Transcription
    C - Translation
    ii. Central dogma states that the genetic information flows from DNA to RNA and then to proteins. In some viruses the flow of information is reversed in direction, i.e. from RNA to DNA.
    It is called reverse transcription.

19. Advantage. These flowers produce assured seed set even in the absence of pollinators.
Disadvantage: Not advantageous to the plant since it does not result in genetic variation.

20. A-Spermatogonium
B-Primary spermatocyte
C-Secondary spermatocyte
D-Spermatid
E-Spermatozoa
F-Sertoli cell

21. During treatment (after adding small amount of inoculum) primary effluent is constantly agitated mechanically in (large) aeration tanks and air is pumped into it, this allows the vigorous growth of useful microbes into flocs, the microbes consume the major part of the organic matter in the effluent, it reduces the BOD of the effluent, the effluent is then passed into settling tank where the bacterial flocs are allowed to sediment, major part of the activated sludge is pumped into aerobic sludge digester.

OR

Enzyme produced by Streptococcus bacterium is streptokinase.
It is used as a 'clot buster' for removing clots from the blood vessels of patients who have undregone myocardial infraction leading to heart attack.

Section C

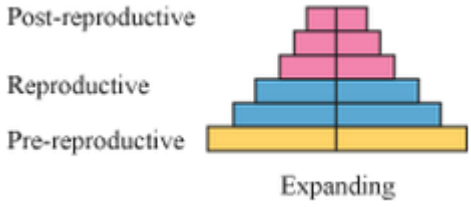
22. i. Pentose sugar or deoxyribose sugar.
    ii. Two nucleotides are linked through 3'-5' phosphodiester linkage to form a dinucleotide.
    iii. The ribose sugar has a free 3'-OH group which is referred to as 3' end of the polynucleotide chain.

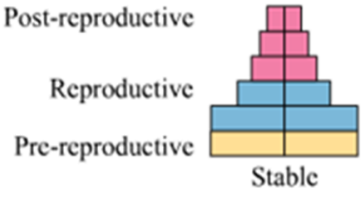
23. The genes that produce photopigments are present on X-chromosomes. If some of the genes are missing or damaged, it can result in colour blindness. Since males have only one X-chromosome, the chances of colour blindness are very high in males. In the case of females, to be colourblind must have the allele for it in both her X-chromosomes. In case, if female possesses the allele for colourblind in only one X-chromosome, then she will act as a carrier and won't be affected by it.

24.

Expanding age pyramid	Stable age pyramid

The population of pre-reproductive age is greater than population of reproductive age	The population of pre-reproductive age equals to population of reproductive age





25.
- **Name of biochemical/molecular diagnostic tests for viruses:**
  - **ELISA** - Enzyme-Linked Immunosorbent Assay
  - **PCR** – Polymerase Chain Reaction
- **Principle of ELISA -** It is based on antigen-antibody interaction. Infection by a pathogen can be detected by the presence of antigens or by detecting the antibodies synthesized against the pathogen.

26. The broadly utilitarian argument described as biodiversity plays a major role in many ecosystem services that nature provides.

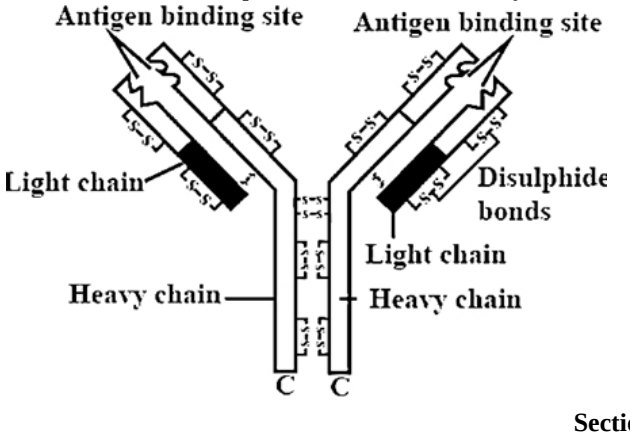
i. Broadly utilitarian mainly explains the broad and general use of biodiversities like **oxygen,**
ii. **pollination, and**
iii. **aesthetic value** which is not limited to particular species.

OR

i. Endemism: These are the species which are confined to a particular geographical region and they are not found anywhere else. Such species are called endemic species.
ii. Four regions in and around our country that are considered hot-spots are
   a. Western Ghats
   b. Himalaya
   c. Indo-Burma
   d. Sri Lank

27.
- The term evolution is considered to be used by Charles Lyell initially. But the theory of evolution was proposed by Charles Darwin.
- Evolution signifies “Descent with modification” which means the process of inheritable changes in any species over several generations.
- There are many pieces of evidence which support the evolution. Few are:
  - Homologous and analogous structures
  - Molecular biology related evidence where shared ancestry of life has been reflected by DNA and genetic code in different species.
  - Biogeography related evidence showing speciation due to geographical isolation.
  - Fossils records from different geological timelines.

28. a. lg A, lg I are the two produced antibodies.
b. There are schematic representation of an antibody molecule as follows:



Section D

29. i. When the zygote moves through the isthmus of the oviduct, the mitotic division is initiated and is called the cleavage towards the uterus to form 2,4,8,16 daughter cells called blastomeres. It is an embryo containing 8 to 16 blastomeres from the morula. It continues to transform and divide into blastocysts as it further approaches the uterus.

ii. The endocrine function of corpus luteum is to secrete progesterone which is essential for the maintenance of endometrium layer of uterus. Thickened endometrium is necessary for the implantation of fertilised ovum and other events of pregnancy.

iii. Fertilization may take place but the zygote may develop in the tube instead of the uterus.

OR

The trophoblast layer of the human blastocyst gets attached to the endometrium and the inner cell mass gets differentiated into an embryo. After attachment, the uterine cells divide rapidly and cover the blastocyst.

30. i. The patient is suffering from AIDS (Acquired Immuno Deficiency Syndrome).

ii. HIV (Human Immunodeficiency Virus) identified by the ELISA.

iii. Helper T-cells, macrophages, B-lymphocytes are attacked by the pathogen.

OR

Preventive measures:

a. People should be educated about AIDS transmission.

b. Disposable needles and syringes should be used.

c. Sexual habits should be changed immediately.

d. High-risk groups should be discouraged from donating blood.

e. Routine screening may be done.

Section E

31. a. Hypocotyl - The portion of embryonic axis between the radical and cotyledon
Epicotyl - The portion of embryonic axis between the plumule and cotyledon

b. Coleoptile - It is a conical protective sheath over the plumule in monocot seeds.
Coleorrhiza - It is a protective sheath over the radical and root tip.

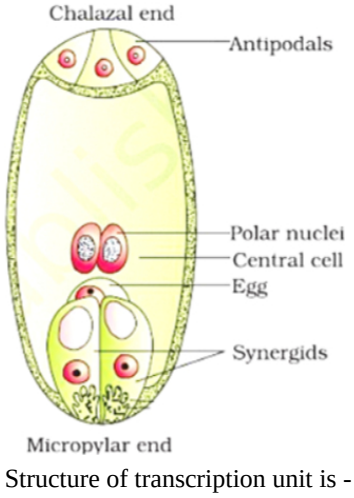
c. Integument is the covering of ovule, while testa is the outer seed coat developed from the outer integuments.

d. Perisperm is the residual persistent nucellus, while the pericarp is the fruit wall derived from the ovary wall.

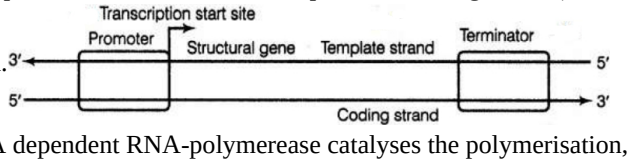
OR

i. The first cell of the female gametophyte is represented by the functional megaspore that grows along the micropylar known as the chalazal axis. The functioning megaspore's nucleus divides during phase to produce two cells that migrate to the opposing poles to form the 2-nucleate embryo sac. The 4-nucleate and eventually the 8-nucleate stages of the embryo sac are created by two more consecutive mitotic nuclear divisions. One nucleus from each group at a pole migrates to the cell's core, becoming known as a polar nucleus. The three remaining cells form antipodals and are encircled by a wall towards the end of the chalazal. The egg apparatus is made up of three cells at the micropylar end, one of which is an egg or female gamete and the other two are synergids. The mature embryo sac contains two polar cells, three antipodals cell at chalazal end, one egg, and two synergids at micropylar end.

ii.



32. a. Structure of transcription unit is - The promoter , and terminator flank/present on either side of structural gene, promoter located towards 5'end / upstream, (it is the presence of a promoter that defines the template and coding strands) terminator is located towards 3'end / downstream of the coding strand.



b. Since two DNA strands have opposite polarity, and DNA dependent RNA-polymerase catalyses the polymerisation, in only one direction 5'→3', the strand with polarity 3'→5' act as a template strand, the other strand with polarity 5'→3' is (does not

code for anything) during transcription, and is referred to as coding strand.

OR

Matthew Meselson and Franklin Stahl conducted an experiment in 1958 to prove that DNA replication is semiconservative. They labeled the DNA of Escherichia coli bacteria with heavy nitrogen isotope N-15. Then, they transferred the bacteria to a medium with a lighter nitrogen isotope N-14. After allowing the bacteria to replicate their DNA, they extracted DNA samples at different time points and subjected them to density gradient centrifugation. The results showed a hybrid band in the first generation, indicating semiconservative replication. In subsequent generations, two distinct bands appeared, representing fully heavy and fully light DNA.The heavier strand represents the parents stand and the lighter is the new one synthesized from the culture indicating the semiconservative mode of DNA replication. This confirmed the semiconservative nature of DNA replication.

33. The bacterium *Thermus aquaticus* is employed and used for amplification of the gene of interest using PCR technique.
Usually Taq (*Thermus aquaticus*) DNA polymerase, a thermostable enzyme is isolated from a thermophilic bacterium. The enzyme extends the two primers towards each other in order to copy the DNA segment (act as a template) lying between the two primers.

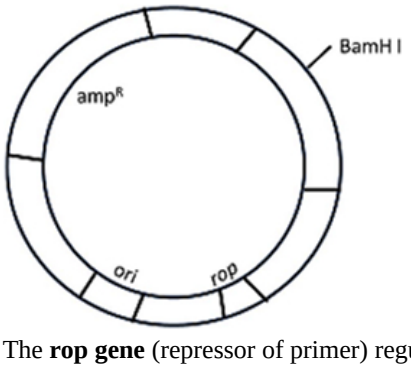
The step requires the presence of deoxynucleoside triphosphates and Mg^{2+} and occurs at 72°C.
If these cycles are repeated many times, the DNA segment can be amplified to approximately a billion times the DNA segment are made.

i. These are restriction endonucleases enzymes which cut the DNA molecule at the specific base sequences into fragments with sticky ends.
e.g., Eco RI, Hind II

ii. The enzyme restriction endonuclease cleaves DNA at a specific site resulting in the formation of fragments with single strand portions at the ends called sticky-ends. In practice, the digestion by the restriction enzyme keeping all other conditions at the optimum level and checked by using agarose gel electrophoresis technique.

OR

i.



ii. The **rop gene** (repressor of primer) regulates the copy number of the plasmid. It helps maintain a balance in the number of plasmid copies in the host cell by encoding a protein that interacts with the origin of replication, thereby controlling the replication rate of the plasmid.

iii. Without a selectable marker, such as antibiotic resistance, it becomes challenging to identify and isolate cells that have successfully taken up the cloning vector. In the absence of a selectable marker, distinguishing between transformed and non-transformed cells is difficult, which significantly hampers the efficiency of cloning and selection processes.

iv. **Insertional inactivation** is preferred over solely using selectable markers because it provides a more specific method for identifying successful cloning. Insertional inactivation involves inserting a gene or sequence into the vector that disrupts the function of a reporter gene. This allows for easy identification of successful clones by checking for loss of function of the reporter gene.