

Class XII Session 2024-25
Subject - Biology
Sample Question Paper - 8

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. Large unit of land having different types of plants and animals is called: **[1]**
a) Ecosystem b) Uniform vegetation
c) Niche d) Biome
2. Which of the following sexually transmitted disease is **not** caused by a virus? **[1]**
a) Genital warts b) Genital herpes
c) Gonorrhoea d) Hepatitis-B
3. The IUCN Red Data List (2004) in the last 500 years documents the extinction of nearly 784 species including: **[1]**
a) 359 invertebrates b) 330 invertebrates
c) 338 invertebrates d) 362 invertebrates
4. Intense lactation in mothers acts as a natural contraceptive due to the **[1]**
a) Hypersecretion of gonadotropins b) Suppression of fertilization
c) Suppression of gonadotropins d) Suppression of gametic transport
5. DNA profiles of the child and three individuals 1, 2 and 3 who claim to be the parents of the child are given below. Select the option that shows the correct actual parent/parents of the child. **[1]**

CH₄), C – cold water, D – Vacuum, E – U

Trap.

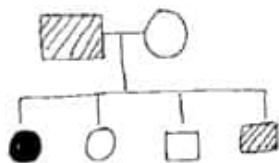
CH₃, C – hot water, D – Vacuum, E – U

Trap.

9. The important steps in the process of decomposition are: [1]

- a) All of these
b) Humification and mineralization
c) Fragmentation and mineralization
d) Leaching and catabolism

10. Study the pedigree chart of a certain family given below and select the correct conclusion which can be drawn for the character [1]



- a) The trait under study could not be colour blindness
b) The female parent is heterozygous
c) The male parent is homozygous dominant
d) The parent could not have had a normal daughter for this character

11. A chemical substance derived from a living source and has the capacity to inhibit the growth or destroy the microbes is called: [1]

- a) Antibiotic
b) Toxoid
c) Toxin
d) Vaccine

12. The source organism of Taq polymerase is: [1]

- a) Bacillus thuringiensis
b) Escherichia coli
c) Agrobacterium tumefaciens
d) Thermus aquaticus

13. **Assertion (A):** Generally, a woman does not conceive during the lactation period. [1]

Reason (R): The hormone prolactin initiates and maintains lactation in a 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.

14. **Assertion (A):** Griseofulvin extracted from *P. griseofulvum* is used for ringworm treatment. [1]

Reason (R): Trichophyton, Epidermophyton, etc. cannot grow well in presence of *Penicillium griseofulvum*.

- 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):** Autotrophs are also called as transducers. [1]

Reason (R): They change one form of energy into another.

- 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):** Most **evolutionary trees** place information about pattern of relationship on horizontal axis and [1]

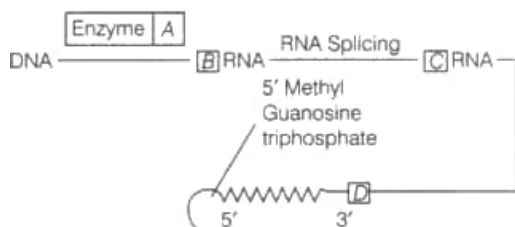
time on vertical axis.

Reason (R): An **evolutionary tree** depicts pattern of relationship among parents and offsprings.

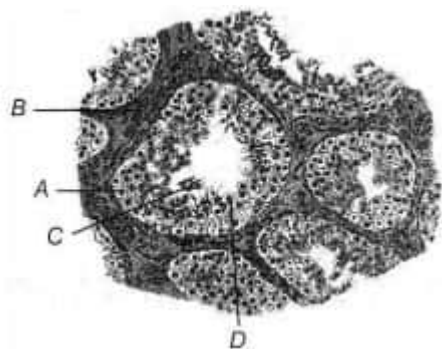
- a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.
- c) A is true but R is false. d) A is false but R is true.

Section B

17. 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. Given below is a sequence of steps of transcription in a eukaryotic cell. Answer the following questions: [2]



- i. Fill up the blanks (A, B, C and D) left in the sequence.
- ii. Why hnRNA is required to undergo splicing?
19. Majority of angiosperms have hermaphrodite flowers, but self-pollination is discouraged by them. Explain any three outbreeding devices that they have developed to achieve this. [2]
20. Study the sectional view of human testis showing seminiferous tubules given below. [2]



- i. Identify A, B and C.
- ii. Write the function of A and D.
21. a. A patient had suffered myocardial infarction and clots were found in his blood vessels. Name a **clot buster** that can be used to dissolve the clots and the micro-organism from which it is obtained. [2]
- b. A woman had just undergone a kidney transplant. A bioactive molecular drug is administered to oppose kidney rejection by the body. What is the bioactive molecule? Name the microbe from which this is extracted.
- c. What do doctors prescribe to lower the blood cholesterol level in patients with high blood cholesterol? Name the source organism from which this drug can be obtained.

OR

Treatment of wastewater is done in a sewage treatment plant to make it less polluting. Explain the following with reference to this treatment process:

- a. Primary sludge
- b. Activated sludge
- c. Anaerobic sludge digesters

Section C

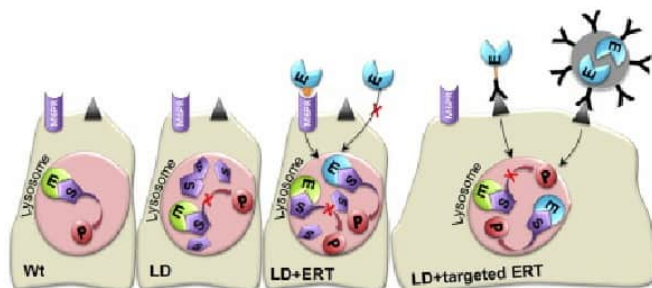
22. i. Construct a complete transcription unit with promotor and terminator on the basis of the hypothetical template strand given below. [3]



- ii. Write the RNA strand transcribed from the above transcription unit along with its polarity.
23. Mention the advantages of selecting pea plant for experiment by Mendel. [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. The image below elaborates enzyme-replacement therapy. [3]



- i. Explain enzyme-replacement therapy to treat adenosine deaminase deficiency.
- ii. Mention two disadvantages of this procedure.
26. i. Explain the concept of endemism. [3]
- ii. Name four regions in and around our country that are considered hot-spots.

OR

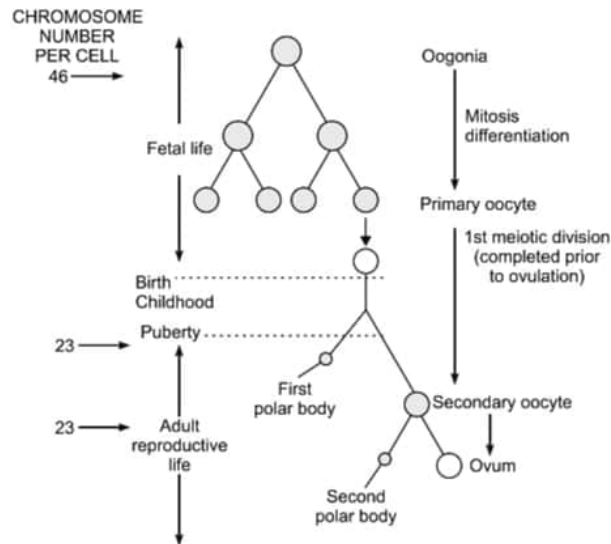
How are **in-situ** and **ex-situ** approaches of biodiversity conservations different from each other?

27. Who put forward the theory of natural selection? Explain the concept of differential reproduction as a major component of the theory of natural selection. [3]
28. A child is born with ADA-deficiency. [3]
- a. Suggest and explain a procedure for possible life-long (permanent) cure.
- b. Name any other possible treatment for this disease.

Section D

29. 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.



- How is a primary oocyte different from a secondary oocyte? (1)
- Mention the changes taking place during the transition of a secondary follicle to Graafian follicle in the oogonia. (1)
- How many primary follicles are left in each ovary in a human female at puberty? (2)

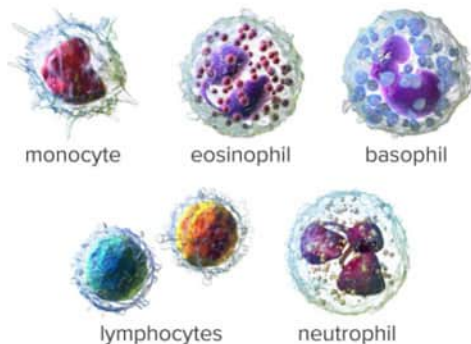
OR

What happens to a Graafian follicle after ovulation? (2)

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

[4]

A lymphocyte is a **type of white blood cell**. Enlarge. Blood cells. Blood contains many types of cells: white blood cells (monocytes, lymphocytes, neutrophils, eosinophils, basophils, and macrophages), red blood cells (erythrocytes), and platelets. Blood circulates through the body in the arteries and veins.



- Why are the antigens called antibody-generating chemicals? (1)
- Which two types of lymphocytes are involved in immunity? (1)
- Give the common site of formation of two types of lymphocytes. (2)

OR

What is the site of differentiation of two types of lymphocytes? (2)

Section E

- Describe the process of double fertilisation in angiosperms.
- Trace the development of a polyploid cell that is formed after double fertilisation in a non-albuminous seed and albuminous seed.

[5]

OR

- Draw the embryo sac of a flowering plant and label the following:
 - Central cell

ii. Chalazal end

iii. Synergids

b. Name the cell and explain the process it undergoes to develop into an embryo sac.

c. Explain the development of endosperm in coconut.

32. Compare the processes of DNA replication and transcription in prokaryotes. [5]

OR

Explain the relationship of ribosomes, t-RNA and m-RNA during the process of translation in Prokaryotes.

33. If a desired gene is identified in an organism for some experiments, explain the process of the following: [5]

i. Cutting this desired gene at specific location.

ii. Synthesis of multiple copies of this desired gene.

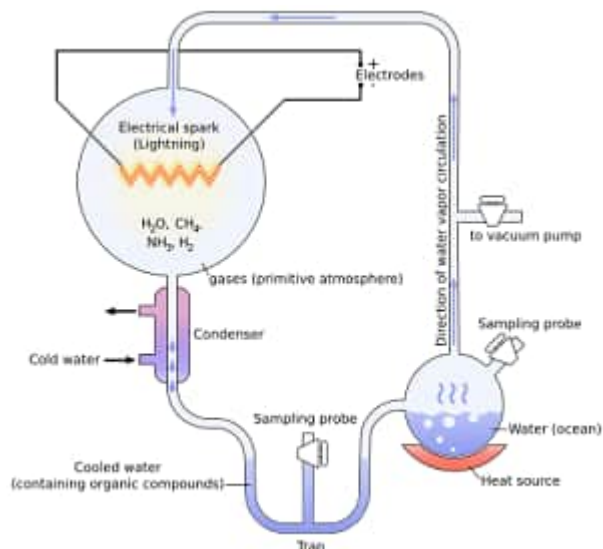
OR

A gene was identified in a fungus by a research worker in a lab which was considered to be of a great importance in the field of agriculture. As a student of biotechnology, write the steps you would suggest to (i) Isolate this gene of interest from the fungus and (ii) amplify this gene for further experimentation and research.

Solution

Section A

1. **(d) Biome**
Explanation: Biome
2. **(c) Gonorrhoea**
Explanation: Gonorrhoea is caused by bacteria.
3. **(a) 359 invertebrates**
Explanation: 359 invertebrates
4. **(c) Suppression of gonadotropins**
Explanation: Suppression of gonadotropins
5. **(c) Individual 1 and 3**
Explanation: Individual 1 and 3 show actual parents/parents of child.
6. **(d) Methane**
Explanation: Methane
7. **(b) Directional selection as giraffes with longer neck lengths are selected.**
Explanation: Directional selection as giraffes with longer neck lengths are selected.
8. **(c) A – electrodes, B – ($\text{NH}_3 + \text{H}_2 + \text{H}_2\text{O} + \text{CH}_4$), C – cold water, D – Vacuum, E – U Trap.**
Explanation: In Urey and Miller experiment the set up labelled as A – electrodes, B – ($\text{NH}_3 + \text{H}_2 + \text{H}_2\text{O} + \text{CH}_4$), C – cold water, D – Vacuum, E – U Trap.



9. **(a) All of these**
Explanation: All of these
10. **(b) The female parent is heterozygous**
Explanation: Pedigree chart is used to detect the flow of particular trait in the family over several generations. The given charts indicate that the female parent is heterozygous in nature.

11. **(a)** Antibiotic
Explanation: Antibiotic
12. **(d)** *Thermus aquaticus*
Explanation: The source organism of Taq polymerase is *Thermus aquaticus*
13. **(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.
14. **(a)** Both A and R are true and R is the correct explanation of A.
Explanation: Antibiotics are chemical substances produced by some microbes which in small concentration can kill or retard the growth of harmful microbes without adversely affecting the host. Griseofulvin is an antibiotic produced by *Penicillium griseofulvum* and is antifungal in nature, especially effective against ringworm. Ringworm is caused by dermatophytic fungi like *Epidermophyton*, *Trichophyton*, *Microsporum*, etc. which cannot grow in presence of *P. griseofulvum* because of the antagonistic effect of antibiotic griseofulvin secreted by it.
15. **(a)** Both A and R are true and R is the correct explanation of A.
Explanation: Autotrophs are those plants which are able to synthesise organic food from inorganic raw materials with the help of solar radiations. They are also called as transducers because they are capable to change light energy into chemical energy (organic food).
16. **(c)** A is true but R is false.
Explanation: A is true but R is false.

Section B

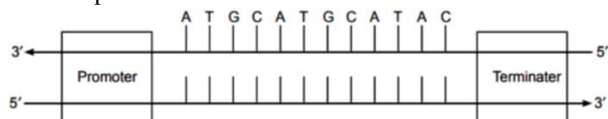
17. The following microorganisms are used as biofertilizers:
- Rhizobium:** They form root nodules in leguminous plants and fix the atmospheric nitrogen into an organic form. *Rhizobium* also has no negative effect on soil quality and improves the quality, nutrient content, and growth of the plant.
 - 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 - DNA polymerase, B - hnRNA, C - Spliced RNA, D - mRNA
ii. hnRNA is required to undergo splicing because of the presence of introns in it. These need to be removed and the exons have to be joined in a specific sequence for translation to take place.
19. i. Pollen release and stigma receptivity not synchronised, either pollen released before the stigma is receptive or otherwise.
ii. Anther and stigma are placed at different position, stigma cannot come in contact with the pollen of the same flower.
iii. In some plant flowers are unisexual, male flower and female flower born on different plant.
iv. Self incompatibility, it is a genetic mechanism and prevents self pollen from fertilising the ovule by inhibiting pollen germination or pollen tube growth in the pistil.
v. Many angiosperms possess genetic mechanisms that prevent self-pollination through self-incompatibility systems. These systems recognize and reject pollen from the same plant, promoting cross-pollination.
20. 1. A-Spermatogonia,
B-Interstitial cells
C-Spermatzoa.
2. A-Spermatogonia produces a spermatogonium (plural: spermatogonia) is an undifferentiated male germ cell. Spermatogonia undergo spermatogenesis to form mature spermatozoa in the seminiferous tubules of the testes.
D-Sertoli cells provide nutrition to sperms.
21. a. Clot buster - Streptokinase, microorganism - *Streptococcus*
b. Cyclosporin A, *Trichoderma polysporum*
c. Statins, *Monascus purpureus*

OR

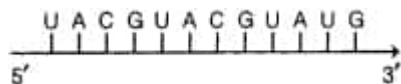
- Treatment process in primary Sludge: All the solids that settle down, during the primary treatment of sewage water.
- Treatment process in Activated Sludge: Produced during the secondary treatment or biological treatment of sewage, primary effluent + aerobic microbes flocs (bacteria and fungus) - get converted to a sediment whose BOD has reduced significantly.
- Treatment process in Anaerobic sludge digesters: Large tanks where activated sludge is treated with anaerobic bacteria which digest the bacteria and fungi, and produce a mixture of CH_4 , H_2S and CO_2 / Biogas

Section C

22. i. Transcription unit



- ii. RNA strand transcribed from the above transcriptional unit



23. Pea is an annual plant which gives result within a year. Large number of seeds are produced by pea plant in one generation. Pea plant has short life cycle. A large number of true breeding varieties with observable alternative forms for a trait were available.

24. A = +

B = +

C = Competition

D = +

E = -

F = Commensalism

25. In enzyme replacement therapy, the patient is given functional ADA (Adenosine Deaminase) by injection.

Hereditary disease can be corrected by gene therapy. It is a collection of methods that allows correction or replacement of defective genes. The first gene therapy was given in 1990 to a 4 years old girl with Adenosine Deaminase (ADA) deficiency. It is caused due to the deletion of gene for adenosine deaminase.

Disadvantages

- The patient does not completely recover from the disease.
 - It needs periodic injections of the enzyme to the patients.
26. 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
- Western Ghats
 - Himalaya
 - Indo-Burma
 - Sri Lanka

OR

In situ conservation - conservation and protection of whole ecosystem and its biodiversity at all levels in their natural habitat.

Whereas **Ex situ conservation** involves taking out the threatened animals and plants from their natural habitat and placed in special settings where they can be protected and given special care.

27. Charles Darwin formulated the theory of natural selection.

Differential reproduction means that some members of a population have traits that enable them to grow up and reproduce at a higher rate and leave more surviving offspring in the next generation than others. If it continues for many generations genes of the individuals, which produce more offspring will become more predominant in the gene pool of population.

28. a. Gene therapy can be used for the treatment of the child with ADA deficiency. In this method, the lymphocytes from the blood of the patient are grown in a culture outside the body. A functional ADA cDNA is introduced into these lymphocytes using a retroviral vector. These lymphocytes are then returned to the patient. If the gene isolated from marrow cells producing ADA is introduced into cells at early embryonic stage, then it can be a permanent cure.
- b. Other possible methods for curing ADA deficiency disease - Bone marrow transplantation and enzyme replacement therapy (giving the functional enzyme to the patient by injection).

Section D

29. 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 secretes progesterone hormone).

- 30. i. The antigens called antibody-generating chemicals because a specific antigen stimulates the production of specific antibody.
- ii. B-lymphocytes and T-lymphocytes are involved in immunity.
- iii. Haemocytoblasts or stem cells of bone marrow are the common sites of formation of two types of lymphocytes.

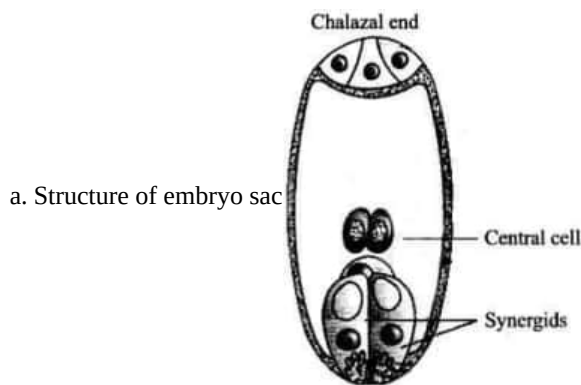
OR

B-lymphocytes differentiate in Peyer's patches, tonsils and appendix of mammals and bursa of Fabricius in the birds. T-lymphocytes differentiate in the thymus gland.

Section E

- 31. a. Double fertilization in angiosperms involves the fusion of two sperm cells with two distinct female gametes:
One of the male gametes, fuses with the nucleus of the egg cell, to form a diploid zygote (syngamy)
Second male gamete, fuses with two polar nuclei, to form (triploid) primary endosperm nucleus (triple fusion)
- b. The primary endosperm nucleus undergoes successive nuclear divisions, to give rise to free nuclei / free nuclear endosperm, subsequent cell wall formation results in cellular endosperm.

OR



- b. Cell name - Functional Megaspore

Nucleus of functional megaspore divides mitotically three times to form 8 free nucleate stage of embryo sac, after this cell walls are laid down leading to 7 celled embryo sac.

- c. Development of endosperm in coconut - The two polar nuclei fuse with one male gamete, to produce triploid primary endosperm nucleus (PEN), which divides repeatedly forming free nuclei, subsequently cell wall formation occurs.

32. Similarities-

Both the processes involve-

- i. Unwinding of the helix and separating the two DNA strands
- ii. Breaking the hydrogen bonds between the bases / pairs
- iii. Follow complementary base pair rule
- iv. Polymerization occurs in 5' → 3' direction

Disimilarities-

DNA replication

- i. DNA nucleotides added are ATP, GTP, CTP, TTP
- ii. Deoxyribose sugar is the part of nucleotide
- iii. Adenine pairs with Thymine
- iv. Both strands copied
- v. Resulting into two DNA molecules

Transcription

- i. RNA nucleotides added are ATP, GTP, CTP, UTP
- ii. Ribose sugar is the part of nucleotide
- iii. Adenine with Uracil
- iv. Only one strand copied
- v. Resulting in formation of an RNA molecule.

OR

During the process of translation in prokaryotes, amino acids are activated in the presence of ATP and they are linked to their aminoacylation of tRNA, as ribosome is the cellular factory for protein synthesis which exists as two subunits for the initiation and this small subunit of ribosome binds to mRNA at the start codon that is AUG. Then it is recognised by initiator t-RNA, large subunit has two sites for subsequent amino acids to bind to each other with a peptide bond. Then it proceeds towards the elongation process where charged tRNAs sequentially bind to the appropriate codon in mRNA, by forming complementary base pairs with the tRNA anticodon. Then ribosome moves codon by codon along with the m-RNA, and amino acids are added one by one, at the end, a release factor binds to the stop codon which can be UAA / UAG / UGA for terminating the translation.

33. i. Cutting of the desired gene at a specific location is done by incubating the DNA with specific restriction endonuclease.

Restriction enzymes recognise a particular palindromic nucleotide sequence and cut the DNA at that site.

- ii. Synthesis of multiple copies of the desired gene is carried out by Polymerase Chain Reaction (PCR)

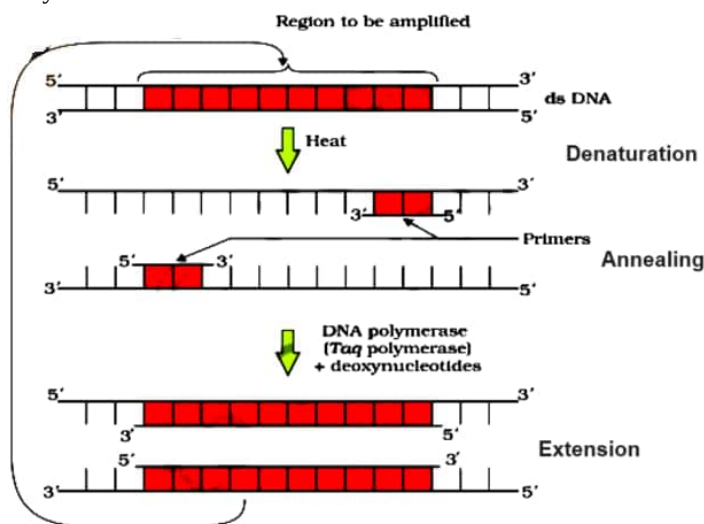
Amplification of recombinant DNA gene is done using Polymerase Chain Reaction (PCR). It is carried out in the following steps:

- Denaturation** - The double-stranded DNA is denatured by applying high temperature of 95°C for 15 seconds. Each separated strand acts as a template.
- Annealing** - Two sets of primers are added, which anneal to the 3' end of each separated strand.
- Extension** - DNA polymerase extends the primers by adding nucleotides complementary to the template provided in the reaction. Taq polymerase is used in the reaction, which can tolerate heat. All these steps are repeated many times to get several copies of the desired DNA.

OR

- (Isolation of genetic material) Fungal cells were treated with chitinase, RNA to be removed by treating with RNAase, protein was removed by treating with protease, and then addition of chilled ethanol.
 - Cutting of DNA at specific locations by restriction enzymes.
 - fragments are separated by gel electrophoresis
- Multiple copies of separated genes of interest is synthesized by following steps of the method given below: PCR (polymerase chain reaction) Denaturation, Annealing, Extension (followed by amplification)

- i. Polymerase chain reaction/PCR



- ii. Multiple copies of separated genes of interest are synthesized by following the given below method: rDNA technology, same restriction enzyme cutting both foreign DNA and vector DNA at specific point, ligases join foreign DNA to Plasmid,

transformation (cell divides and helps in multiplication of genes)

