Class XII Session 2026-27
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. How many of the following features are related to Nirodh - a popular brand of condoms? **[1]**

   i. Prevention of sexually transmitted infections.
   ii. Phagocytosis of sperm.
   iii. Male contraceptive device.
   iv. Acts as chemical barrier.
   v. Physiological changes in cervical mucus.

   a) (i) and (iii) b) (i), (ii), (iv)
   c) (ii) and (iv) d) (i), (ii), (v)

2. Exploration of molecular, genetic and species level diversity for gaining products of economic importance is called **[1]**

   a) Bio-prospecting b) Bio-piracy
   c) Bio-patenting d) Exploitation

3. After invitro fertilization: **[1]**

   a) Embryo with more than 8 cells are implanted in uterus
   b) Only embryo with cells more than 16 is implanted in uterus.
   c) Embryo with 8-16 cells can not be implanted in uterus.
   d) Embryo with more than 16 cells are not implanted in uterus.

4. Which of the following is not a feature of the plasmids ? **[1]**

a) Circular structure
b) Single stranded
c) Independent replication
d) Transferable

5. Which one among the following biofertilizers does **not** fix atmospheric nitrogen? **[1]**

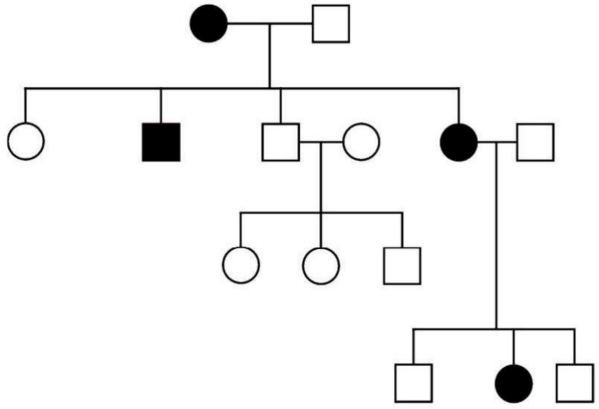
a) Oscillatoria
b) Glomus
c) Azospirillum
d) Rhizobium

6. Which of the following statements regarding food chain is false? **[1]**

a. In aquatic ecosystems grazing food chain is major conduit for energy flow.
b. In terrestrial ecosystems, a large fraction of energy flows through detritus food chain.
c. Detritus food chain begins with dead organic matter.
d. Primary consumers belong to the first trophic level.

a) Statement a is false
b) Statement d is false
c) Statement b is false
d) Statement c is false

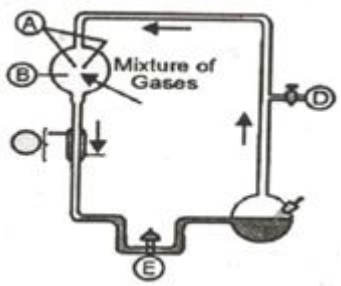
7. Study the pedigree chart of a family showing the inheritance of myotonic dystrophy: **[1]**



The trait under study is:

a) recessive X-linked trait
b) autosomal recessive trait
c) dominant X-linked trait
d) autosomal dominant trait

8. What was the resultant found in the place marked E? **[1]**



a) Organic esters only
b) Some fatty acids and organic acids
c) Some amino acids as glycine and alanine
d) Glucose, fatty acids and lipids

9. Healthy ecosystems are the base for a wide range of **[1]**

a) Economic, environmental and aesthetic goods and services.
b) Only aesthetic goods and services.

c) Only economic services. d) Only economic goods.

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



a) Normal individuals b) Sex unspecified

c) Affected individuals d) Matting between relatives

11. A complex polysaccharide produced from sucrose by the bacterium Leuconostoc mesenteroides is: [1]

a) Cellulose b) Chitin

c) Dextran d) Starch

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 where couples abstain from coitus. [1]
Reason (R): Coitus from day 5-10 should be avoided because this is the time of ovulation.

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):** Nitrogen fixing enzyme in legume root nodules functions at low oxygen concentration. [1]
Reason (R): Low oxygen concentration is provided by leghaemoglobin.

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):** Herbivores are called first order consumers. [1]
Reason (R): Lion is a top carnivore.

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:** The earliest organisms that appeared on the earth were non-green and presumably anaerobes. [1]
Reason: The first autotrophic organisms were the chemoautotrophs that never released oxygen.

a) If both Assertion & Reason are true but the reason is not the correct explanation of the assertion

b) If both Assertion & Reason are true and the reason is the correct explanation of the assertion

c) If Assertion is true statement but Reason is false,

d) If both Assertion and Reason are false statements,

Section B

17. Observe the diagram of Genetic code and answer the following questions: **[2]**

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

OR

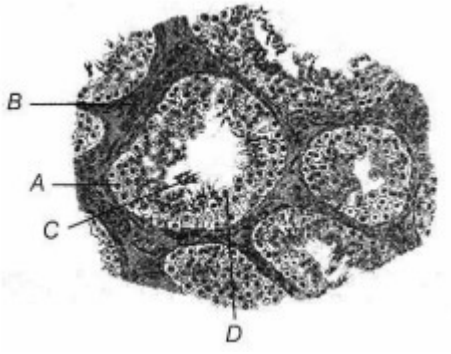
i. How many types of RNA polymerases are there in a eukaryote cell? Mention which one of them transcribes hnRNA.

ii. Write the changes that hnRNA undergoes before it leaves the nucleus as mRNA.

18. Name the antibiotic that was used to treat wounded soldiers in World War II. Explain its chance discovery. **[2]**

Name the scientists who were awarded the Nobel Prize for this discovery.

19. 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.

20. What is pollination? Name the different agencies of pollination. **[2]**

OR

Is pollination and fertilisation necessary in apomixis? Give reasons.

21. a. Give an example of viral biocontrol agent. **[2]**

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

OR

Explain the role of the following during the sewage treatment:

a. flocs

b. anaerobic sludge digester

Section C

22. Use of heavy isotope of nitrogen by Meselson and Stahl demonstrated semi-conservative mode of replication of a DNA molecule. Explain how did they arrive at this conclusion. **[3]**

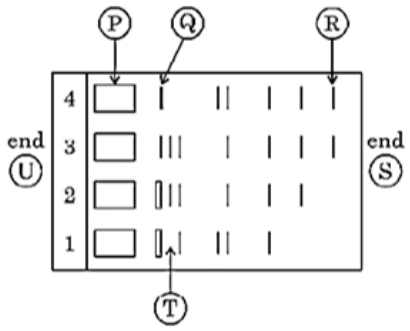
23. Using a Punnett square work out the distribution of phenotypic features in the first filial generation after a cross between a homozygous female and a heterozygous male for a single locus. **[3]**

24. a. Draw a graph for a population whose population density has reached the carrying capacity. **[3]**

b. Out of the two population growth curves, which one is considered a more realistic for most populations? Why?

c. Draw a growth curve where resources are not limiting for the growth of a population and give its equation.

25. a. Given below is the stepwise schematic representation of the process of electrophoresis. Identify the **alphabets** representing (i) Anode end (ii) smallest/lightest DNA strand in the matrix (iii) Agarose gel **[3]**



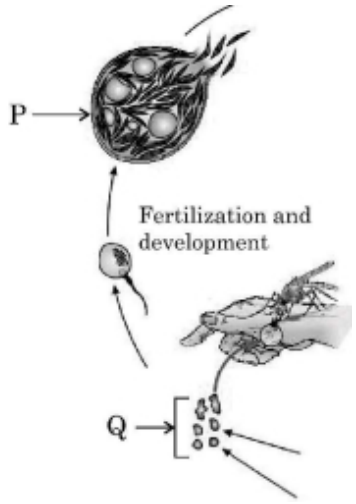
b. What is elution? State the importance of elution in this process.

26. a. Alien species are highly invasive and are a threat to indigenous species. Substantiate this statement with the help of any two examples. **[3]**

b. State any two criteria for determining biodiversity hotspots.

27. What is divergent evolution? Explain by taking examples of plants. **[3]**

28. Study a part of life cycle of Plasmodium given below: **[3]**



Answer the following questions:

a. Name the infective stage of Plasmodium that is stored in the female Anopheles mosquito.
b. Where does fertilization and development of parasite take place?
c. Identify labels P and Q in the given diagram.
d. Asexual and sexual phase of the life cycle of the Plasmodium takes place in two different hosts. Write their names.

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.

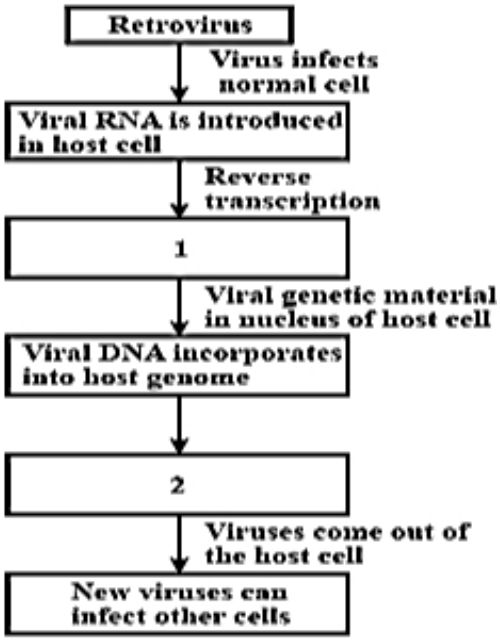
i. Why the cells of the inner cell mass of blastocyst are called stem cells? (1)
ii. At which stage of embryonic development trophoectoderm develops? (1)
iii. What is the site of implantation? (2)

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]**

The diagram shows the replication of the retrovirus in the host.



i. Fill in the missing data in boxes labelled 1 & 2. (1)

ii. Why is it named as retrovirus? (1)

iii. While the virus is being replicated and released, does the infected cell survive and why the virus infected cells prevent spreading of virus to healthy cells? (2)

OR

What is the effect of HIV infection on immune system? (2)

Section E

31. Draw a labelled sketch of L.S. of pistil showing the progamous type of fertilization. **[5]**

OR

a. Draw the embryo sac of a flowering plant and label the following:

i. 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. Name and describe the steps involved in the technique widely used in forensics that serves as the basis of paternity testing in case of disputes. **[5]**

OR

Compare the processes of DNA replication and transcription in prokaryotes.

33. 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. **[5]**

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?

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. **(a)** (i) and (iii)
   Explanation:
   Nirodh is a brand of male condom, so it is a male contraceptive device that prevents pregnancy by providing a physical barrier which stops sperm from entering the female reproductive tract. Because it prevents exchange of body fluids and contact of mucous membranes, it also reduces transmission of sexually transmitted infections. It does not cause phagocytosis of sperm (phagocytosis is a biological immune process, not the action of a condom), nor does it act as a chemical barrier (that term applies to spermicides; condoms are a physical/mechanical barrier), nor does it produce physiological changes in cervical mucus (that effect is produced by hormonal methods). Therefore only statements (i) and (iii) apply.

2. **(a)** Bio-prospecting
   Explanation:
   "Bio-prospecting" is the correct term because it specifically means the systematic exploration of biological diversity at the molecular, genetic and species levels in order to discover organisms, genes, enzymes or biochemical compounds that can be developed into products of economic value (for example medicines, industrial enzymes, agricultural traits). The phrase in the question - exploration of molecular, genetic and species level diversity for gaining products of economic importance - is essentially the definition of bio-prospecting.
   This differs from general "exploitation," which simply means using resources (without implying the search for new useful biological materials); from "bio-piracy," which denotes unauthorized or unethical appropriation of biological resources and traditional knowledge; and from "bio-patenting," which refers to seeking intellectual property rights over biological inventions once they are identified. Thus, the activity described is best named bio-prospecting.

3. **(a)** Embryo with more than 8 cells are implanted in uterus
   Explanation:
   After in vitro fertilization, embryos that are typically implanted in the uterus are those that have developed to a certain stage, usually around 8 cells or more. This stage indicates that the embryo has a higher chance of successful implantation and development. Other options incorrectly state the conditions for implantation, as embryos with 8 to 16 cells can also be viable for implantation.

4. **(b)** Single stranded
   Explanation:
   Single stranded

5. **(b)** Glomus
   Explanation:
   The genus Glomus exhibits symbiotic association with higher plants.

6.

(b) Statement d is false

Explanation:

Primary consumers (i.e, Herbivores) belong to T_2 level, while T_1 level is formed of producers.

7.

(d) autosomal dominant trait

Explanation:

autosomal dominant trait

8.

(c) Some amino acids as glycine and alanine

Explanation:

In Urey and Miller's experiment, the product formed after the continuous sparking in the mixture of gases at high temperature were some amino acids like glycine and alanine. Sugar and nitrogenous base were also obtained from the same set up by some other scientist.

9. **(a)** Economic, environmental and aesthetic goods and services.

Explanation:

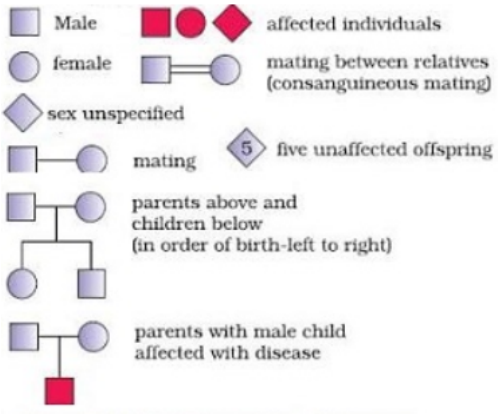
Healthy ecosystems are the base for a wide range of economic,environmental and aesthetic goods and services. The products ofecosystem processes are named as ecosystem services, for example,healthy forest ecosystems purify air and water, mitigate droughts andfloods, cycle nutrients, generate fertile soils, provide wildlife habitat,maintain biodiversity, pollinate crops, provide storage site for carbonand also provide aesthetic, cultural and spiritual values.

10.

(c) Affected individuals

Explanation:

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



11.

(c) Dextran

Explanation:

Dextran

12.

(c) DNA fingerprinting

Explanation:

DNA fingerprinting

13.

(c) A is true but R is false.

Explanation:

Periodic abstinence is a natural method of birth control in which the couples avoid or abstain from coitus (copulation or intercourse) from day 10 to 17 of the menstrual cycle because ovulation can occur during this period. The chances of fertilization are very high during this period, therefore, it is called the fertile period.

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.

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

Explanation:

Herbivores obtain their food directly from plants. They are called first order consumers. The carnivores, which cannot be preyed upon further, lie at the top of food chain and are termed as top carnivores, e.g. lion, tiger.

16. **(a)** If both Assertion & Reason are true but the reason is not the correct explanation of the assertion

Explanation:

The earliest organisms that appeared on the earth were non-green and presumably anaerobes as the primordial atmosphere was virtually oxygen-free.

Section B

17. 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.

OR

i. 3 types are present in eukaryote cell.
RNA Polymerase –II trancribes hnRNA.

ii. Splicing/Introns are removed and exons are joined in a definite order, undergoes capping/at 5' end where unusual nucleotide (methyl guanosine triphosphate) is added, tailing/ at 3' end where (200-300) adenylate residues are added.

18.
- Penicillin is used to treat Wounded soldiers in world War II.
- Alexander Fleming while working on Staphylococci bacteria, once observed a mould growing in one of his unwashed culture plates around which Staphylococci could not grow, He found out that it was due to a chemical produced by the mould and he named it Penicillin after the mould Penicillium notatum.
- Alexander Fleming, Ernest Chain, Howard Florey.

19. 1. A-Spermatogonia,
B-Interstitial cells
C-Spermatozoa.

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.

20. Pollination is the transfer of pollen grains from the mature anther to the stigma of a flower.
Pollinating agents are-
    i. Biotic
        a. insects
        b. Bats
        c. Snails
        d. Birds
    ii. Abiotic
        a. Water
        b. Wind

OR

No, they are not necessary. Apomixis is formation of seed without fertilisation. Embryos can develop directly from the nucellus or synergid or egg.Therefore, there is no need for either pollination or fertilisation.

21. 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.

OR

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.

Section C

22. *E.coli* was grown in 15NH4Cl containing medium for many generations to get ^{15}N incorporated into DNA and then the cells were transferred into 14NH4 Cl, containing a medium. The extracted DNA was centrifuged in a CsCl density gradient to measure the densities of DNA as heavy DNA molecule could be distinguished from normal by this method. DNA extracted from the culture after one generation (20 minutes), showed intermediate/ hybrid density, DNA extracted after two generations (40 minutes) showed equal amounts of 'light' DNA and hybrid DNA. This proved that DNA replicated semi conservatively.

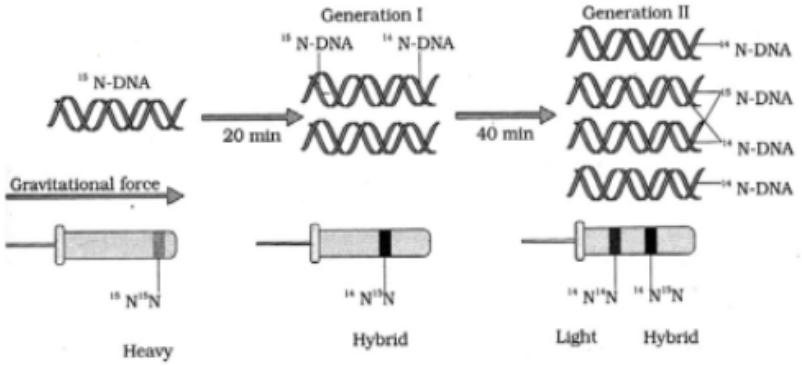
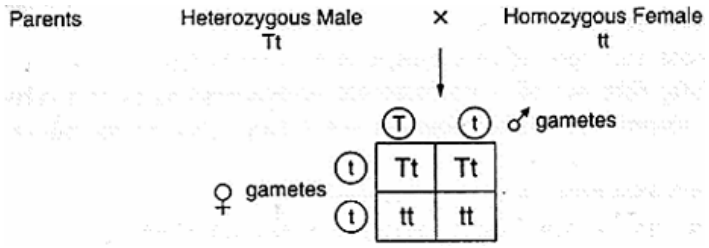


Fig: Separation of DNA by centrifugation

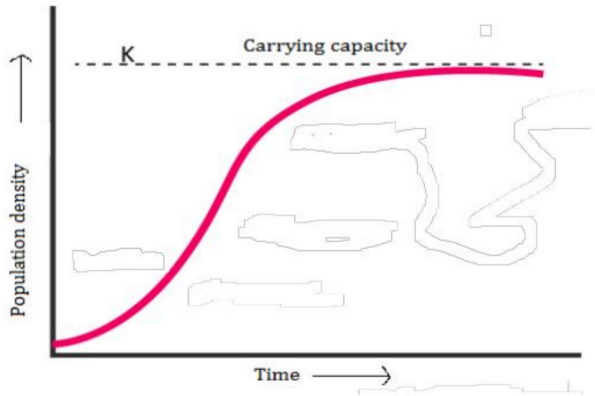
23.



The phenotypic ratio in F_1 gen.

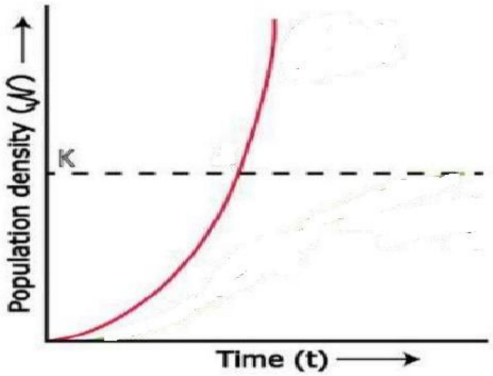
Tall	**Dwarf**
2	2
1	1

24. a.



b. Verhulst-Pearl logistic growth/ Logistic growth curve/ Sigmoid growth curve
Since resource for growth for most animal populations are finite and become limiting sooner or later.

c.



25. a. i. Anode = S
ii. Smallest/lightest DNA Strand = R
iii. Agarose gel = T

b. The DNA fragments purified in this way are used in constructing recombinant DNA by joining them with cloning vectors.

26. a. The Nile perch introduced into Lake Victoria in East Africa led eventually to the extinction of an ecologically unique assemblage of more than 200 species of Cichlid fish in the lake, the environmental damage caused and threat posed to our native species by invasive weed species like carrot grass (Parthenium) or Lantana or water hyacinth (Eicchornia), Introduction of the African catfish Clarias gariepinus for aquaculture purposes is posing a threat to the indigenous catfishes in our rivers. (Any two)

b. High degree of endemism and high levels of species richness

27. The same structure developed along different directions due to adaptations to different needs. This is divergent evolution and these structures are homologous. For e.g. thorn of Bougainvillea and tendrils of Cucurbita represents homology.

28. a. Sporozoites

b. In the gut of the female Anopheles mosquito

c. P: Salivary gland of female Anopheles mosquito
Q: Gametocytes

d. Asexual phase = In human
Sexual phase = In mosquito

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 →Morula →Blastula →Gastrula.

30. i. 1. Viral DNA is produced by reverse transcription.
2. New viral RNA is produced by the infected cell.

ii. HIV has RNA genome; it produces DNA by reverse transcription.

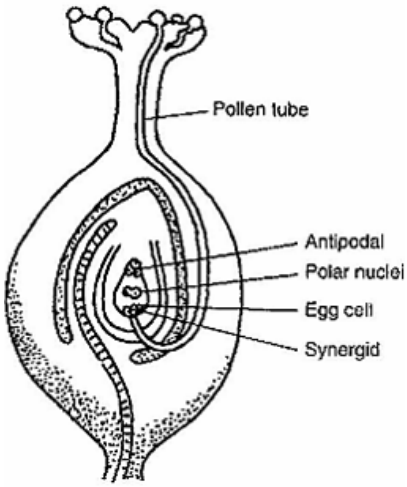
iii. Infected cell can survive and by releasing alpha-interferon.

OR

Due to HIV infection immune system gets suppressed as decrease in T-lymphocytes occurs.

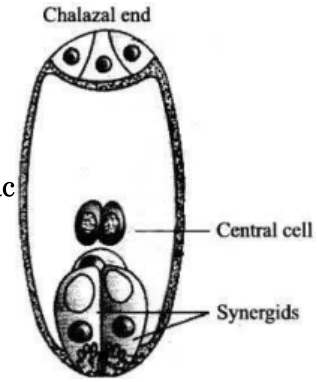
Section E

31.



OR

a. Structure of embryo sac



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 nucleii fuses with one male gamete, to produce triploid primary endosperm nucleus (PEN), which divides repeatedly forming free nuclei, subsequently cell wall formation occurs.

32. DNA fingerprinting is used in forensic.

Steps which are involved in DNA fingerprinting are as follows:

i. Isolation of DNA
ii. Digestion of DNA by restriction endonuclease enzyme
iii. Separation of DNA fragments, by electrophoresis
iv. Transferring of separated DNA fragments to synthetic membrane such as nitrocellulose or nylon.
v. Hybridization, using labelled VNTR probe.
vi. Detection of hybridized DNA fragments by autoradiography

OR

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 complimentary base pair rule
iv. Polymerization occurs in 5' $\rightarrow$ 3' direction

Disimilarities-

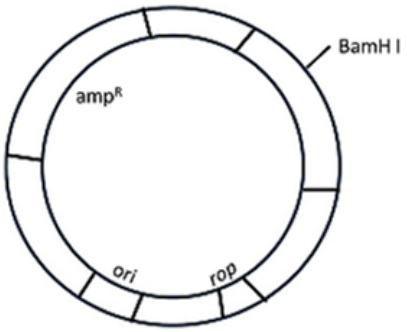
DNA replication

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.

33. i.



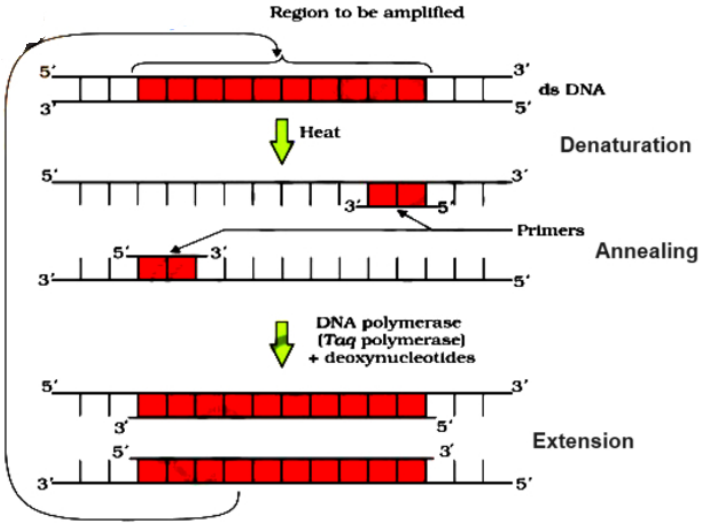
ii. The **rop gene** (repressor of primer) regulates the copy number of the plasmid. It helps maintain a balance in the number of plasmid copies in the host cell by encoding a protein that interacts with the origin of replication, thereby controlling the replication rate of the plasmid.
iii. Without 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.

OR

a.
- (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

b. 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)

