Class XII Session 2025-26
Subject - Biology
Sample Question Paper - 3

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. In nature, inbreeding, and outbreeding of plants are regulated by: **[1]**

   a) Maturation and hybridization
   b) Intraspecific and interspecific incompatibility
   c) Parthenogenesis
   d) Duration of pollen and ovule formation

2. A common biocontrol agent for the control of plant diseases is: **[1]**

   a) Baculo virus
   b) Bacillus thuringiensis
   c) Trichoderma
   d) Glomus

3. If + sign is assigned to beneficial interaction - sign to detrimental and **0** sign to neutral interaction., then the population interaction represented by + - refers to : **[1]**

   a) Commensalism
   b) Mutualism
   c) Parasitism
   d) Amensalism

4. Which one of the following is used during **RNA i** process, to silence the desired gene? **[1]**

   a) DNA polymerase
   b) dsDNA
   c) rDNA
   d) dsRNA

5. Human settlement often leads to habitat loss which leads to fragmentation, forming smaller patches of habitats. **[1]**
   Select the statements that describe how a small patch differs from a large patch of the same habitat.

   i. Invasive species will never be seen here.
   ii. Population of large animals decreases.
   iii. Biodiversity decreases.

iv. Competition from surrounding habitats increases.

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

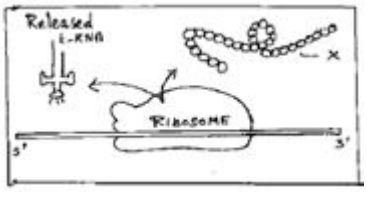
6. The change in mammalian sperm which prepares it to fertilize the ovum is termed: **[1]**

a) Preparation
b) Maturation
c) Capacitation
d) Metamorphosis

7. Which is used for preparation of bread: **[1]**

a) Aspergillus
b) S. cerevisiae
c) Lactobacillus
d) Streptobacillus

8. What does X represent in the following diagram: **[1]**

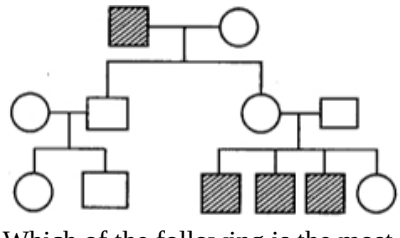


a) Released secondary protein
b) Released 3D protein molecule
c) Released tertiary protein
d) Released polypeptide chain

9. A haploid plant produces male or female gametes by: **[1]**

a) Binary fission
b) Mitosis
c) Amitosis
d) Meiosis

10. Inthe given pedigree the shaded figures denote individuals expressing a specific trait: **[1]**



Which of the following is the most probable mode of inheritance of this trait?

a) Codominant relationship of a single pair of alleles
b) Simple Mendelian Recessive
c) X-linked recessive transmission
d) X-linked dominant transmission

11. The Human Genome Project (HGP) was initiated in: **[1]**

a) 1994
b) 1988
c) 1990
d) 1992

12. Arrange the following steps that are shown in the figure: **[1]**

1. The plasmid is taken up into a bacterial cell which makes protein directed by human DNA
2. DNA segment incorporated into the bacterial plasmid
3. The segment of DNA removed from human cell
4. In Genetic engineering (Recombinant DNA technology)

a) $1 \rightarrow 4 \rightarrow 3 \rightarrow 2$

b) $1 \rightarrow 2 \rightarrow 3 \rightarrow 4$

c) $4 \rightarrow 3 \rightarrow 2 \rightarrow 1$

d) $2 \rightarrow 3 \rightarrow 4 \rightarrow 1$

13. **Assertion (A):** Pure lines are called true breed. **[1]**

Reason (R): True breeds are used for crossbreeding.

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):** Organic compounds first evolved in earth required for origin of life were protein and nucleic acid. **[1]**

Reason (R): All life forms were in water environment only.

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):** Ribosomes attached to endoplasmic reticulum release proteins into lumen of ER. **[1]**

Reason (R): Such proteins are used for formation of hydrolytic enzymes or are modified.

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):** Virus-infected cells produce interferons. **[1]**

Reason (R): Interferons can cause inflammation of virus-infected cells.

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.

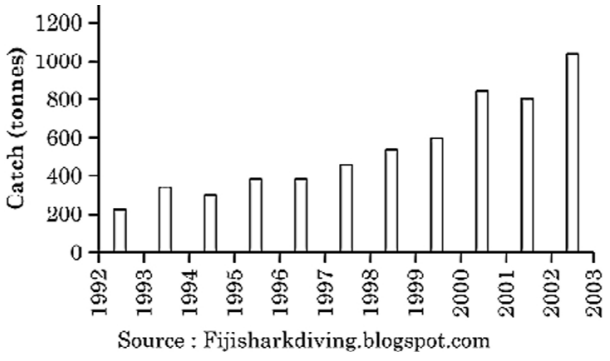
c) A is true but R is false.

d) A is false but R is true.

Section B

17. Can we use slurry of human excreta instead of cowdung slurry to produce biogas in a typical biogas plant? Support your answer giving reasons. **[2]**

18. The histogram given below representing the data for annual shark harvest in the great barrier reef/coral reef located on the east coast of Queensland, Australia. Study the histogram and answer the questions that follow. **[2]**

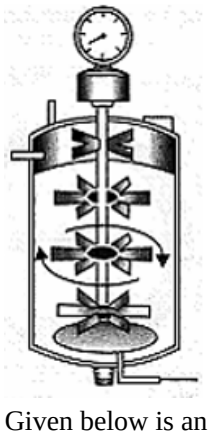


Source : Fijisharkdiving.blogspot.com

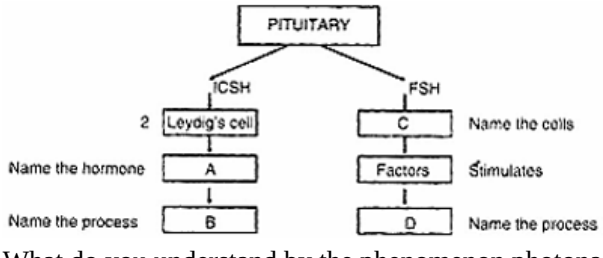
a. Write your interpretation of the data given.

b. Write the impact on the biodiversity of the area that you can interpret on the basis of given data.

19. Name the type of bioreactor shown. Write the purpose for which it is used. **[2]**



20. Given below is an incomplete chart showing the influence of hormones on gametogenesis in males. Observe the chart carefully and fill in the blanks A, B, C and D **[2]**



21. What do you understand by the phenomenon photonasty? **[2]**

OR

Define ectoparasite and endoparasite and give suitable examples.

Section C

22. After a rainy day Rahul found many dragon flies flying over stagnant water. He thinks these flies come to drink water. Is Rahul's explanation correct? Give your views. **[3]**

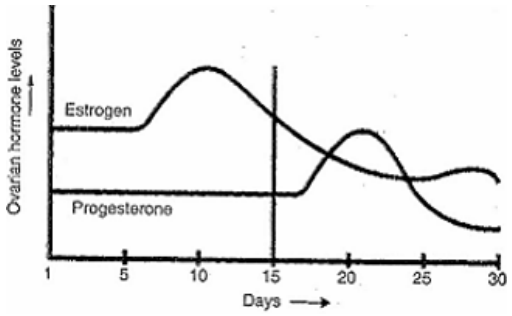
23. i. Read the graph given above and correlate the uterine events that take place according to the hormonal levels on: **[3]**

a. 6-15 days

b. 16-25 days

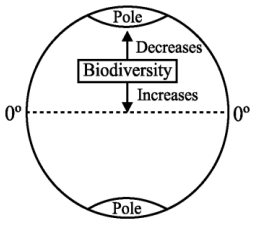
c. 26-28 days

ii. Specify the sources of the hormones mentioned in the graph.



24. In a monohybrid cross of plants with red and white flowered plants, Mendel got only red flowered plants. On self-pollinating these F_1 plants got both red and white flowered plants in 3:1 ratio. Explain the basis of using RR and rr symbols to represent the genotype of plants of parental generation. **[3]**

25. Study the diagram of the earth given below. **[3]**



i. Give the name of the pattern of biodiversity therein.

ii. Suggest any two reasons for this type of occurrence.

26. Describe the structure of pollen grain and the process of its germination. **[3]**

OR

Are parthenocarpy and apomixis different phenomena? Discuss their benefits.

27. Discuss the relationship between the detritus food chain and grazing food chain in a terrestrial ecosystem. **[3]**

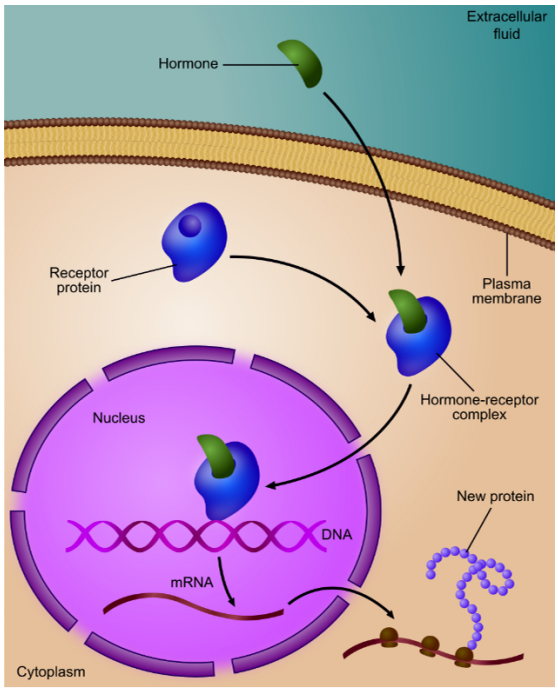
28. What are test tube babies? **[3]**

Section D

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

Gene regulation is the mechanism of switching off and switching on of the genes depending upon the requirement of cells and the state of development. Gene regulation is of two types: negative and positive. In negative gene regulation, the genes continue expressing their effect till their activity is suppressed. Positive gene regulation is the one in which the genes remain non-expressed unless and until they are induced to do it. Operon model is a co-ordinated group of genes such as structural gene, operator gene, promoter gene, regulator gene

which function together and regulate a metabolic pathway as a unit, e.g., lac operon, trp operon, ara operon, etc.



i. Regulation of gene expression occurs at which the level? (1)

ii. What is complementary to an mRNA molecule transcribed from the lac operon contains nucleotide sequences? (1)

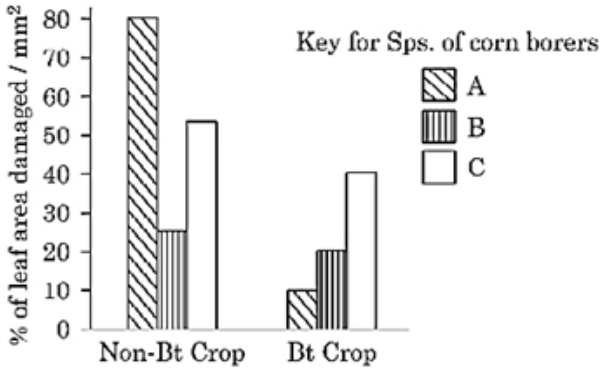
iii. Describes the control of transcription of the genes involved in the breakdown of lactose in Escherichia coli? (2)

OR

What is the function of catabolic activator protein in lac operon? (2)

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

To save the crop plant from the attack of various insect pests the biotechnologists have developed many pest resistant plants. One such example is Bt corn plant. In this plant 'cry' genes were introduced which produces cryproteins in the plant that has toxic effect on the pest (corn borer). Thus saves the corn plant from the attack of the corn borer. An experimental field study was conducted by the scientists to see the efficacy of the Bt corn plant against the attack of corn borers. Three different species of corn borers namely 'A', ' B ', 'C' were collected and were independently fed on non Bt corn plants and Bt corn plants separately for the same period. The extent of the damage caused to the leaf area of the plant was observed and noted down. With the help of the observations and data collected the following bar graph was plotted. Study the graph and answer the questions that follow.



i. Identify the species of the corn borer that was most successfully controlled by Bt corn plant. Give appropriate reason for your inference. (1)

ii. Identify the species of the corn borers which shows least impact of toxin produced by Bt genes. (1)

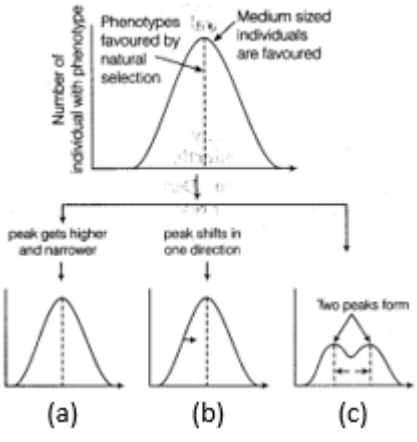
iii. What would be your advise as a Scientist, to the farmers for growing this particular Bt corn variety in the area which is infested by species **B** of corn borers? (2)

OR

Name one Bt gene that encodes protein in corn plants to control corn borers. (2)

Section E

31. Observe the diagram given below for the operation of natural selection on different traits and answer the following questions: **[5]**



i. Name A, B, and C mentioned in the above diagram.

ii. Give one example of directional selection.

iii. Write the name of factors affecting the Hardy-Weinberg Equilibrium.

OR

Explain divergent evolution in detail. What is the driving force behind it?

32. Gene therapy is an experimental technique that uses genes to treat or prevent disease. In the future, this technique may allow doctors to treat a disorder by inserting a gene into a patient's cells instead of using drugs or surgery. **[5]**

Clinical gene therapy is given to a 4 years old patient for an enzyme that is crucial for the immune system to function.

(A) Lymphocytes of the Patient.
↓
(B) _____
↓
(C) Introduction of functional ADA cDNA into Lymphocytes.
↓
(D) _____

Observe the therapeutical flow chart and give the answer to the following:

i. Complete the missing steps (B) and (D)

ii. Identify the disease to be cured.

iii. Why the above method is not a complete solution to the problem? **OR**

iv. Scientists have developed a method to cure this disease permanently. How?

OR

Explain the three different approaches used in the treatment of a person suffering from Adenosine Deaminase (ADA) Deficiency.

33. In your view what motivates youngsters to take to alcohol or drugs and how can this be avoided? **[5]**

OR

A person in your colony has recently been diagnosed with AIDS. People/residents in the colony want him to leave the colony for the fear of spread of AIDS.

i. Write your views on the situation, giving reasons.

ii. List the possible preventive measures that you would suggest to the residents of your locality in a meeting organised by you so that they understand the situation.

iii. Write the symptoms and the causative agent of AIDS.

Solution

Section A

1.

(b) Intraspecific and interspecific incompatibility

Explanation:

Inbreeding occurs in intraspecific flowers as contain the same kinds of genetic materials. Outbreeding takes place between interspecific flowers having different kinds of genetic materials.

2.

(c) Trichoderma

Explanation:

Trichoderma

3.

(c) Parasitism

Explanation:

Parasitism

4.

(d) dsRNA

Explanation:

dsRNA

5.

(c) (ii), (iii) and (iv) only

Explanation:

(ii), (iii) and (iv) only

6.

(c) Capacitation

Explanation:

Capacitation

7.

(b) S. cerevisiae

Explanation:

S. cerevisiae

8.

(d) Released polypeptide chain

Explanation:

The figure shown above represents the translation process in which protein is produced. Ribosome provides the site for protein synthesis and t-RNA brings the amino acids. The ‘x’ is the polypeptide chain produced.

9.

(b) Mitosis

Explanation:

Mitosis

10.

(c) X-linked recessive transmission

Explanation:

X-linked recessive transmission

11.

(c) 1990

Explanation:

1990

12.

(c) $4 \rightarrow 3 \rightarrow 2 \rightarrow 1$

Explanation:

$4 \rightarrow 3 \rightarrow 2 \rightarrow 1$

13.

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

Explanation:

The pure line is a strain of genetically pure true-breeding individuals. Members of the pure line are homozygous for one or more characters. In homozygous form both the factors express the same effect. These organisms are said to breed true. They are used for cross breeding in order to get the desired improvement in crops.

14.

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

Explanation:

Organic compounds that first evolved in earth which required for origin of life were protein and nucleic acid. All life forms were in aquatic environment only.

15.

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

Explanation:

Polyribosomes attached to membranes of the endoplasmic reticulum produce proteins that either pass into their lumen or become integrated into the membranes. The proteins released into the lumen generally reach Golgi apparatus for modifications like the formation of hydrolytic enzymes and glycosylation (addition of sugar residues). The modified proteins are packed in vesicles for the export or formation of lysosomes, cell wall enzymes, plasma membrane, etc.

16.

(c) A is true but R is false.

Explanation:

A is true but R is false.

Section B

17. Biogas is a mixture of gases (containing predominantly methane) produced by microbial activity and which may be used as fuel. certain bacteria, which grow anaerobically on cellulosic material, produce large amounts of methane along with CO_2 and H_2.

These bacteria are collectively called methanogens and one such common bacterium is Methanobacterium. These bacteria are commonly found in the anaerobic sludge during sewage treatment. These bacteria are also present in the rumen (a part of the stomach) of cattle. A lot of cellulosic material present in the food of cattle is also present in the rumen.

18. a. Shark harvest increases over the years from 1992 to 2003.

b. Biodiversity decreases due to over exploitation/ excessive harvesting.

19. ◦ Simple stirred tank bioreactor.
    ◦ It is used to produce large quantities of products where large volumes (100 - 1000) litres of culture can be processed.
20. A - Testosterone
    B - Spermatogenesis
    C - Sertoli cells
    D - Spermiogenesis
21. Flowers of some plants open or close in response to light and darkness, the phenomenon is called photonasty.
    The movement can be due to changes in turgor or changes in growth (therefore K+ ion concentration usually controls such movement in plants).

    OR

    Ectoparasite: Parasites that live on the body surface of hosts are called ectoparasites, e.g. leech and ticks.
    Endoparasites: Parasites that live inside the body of hosts are called endoparasites, e.g. roundworms and hookworms.

Section C

22. No, dragon flies eat mosquito larva and act as bio control agents. Dragonflies, which eat insects as adults, are a great control on the mosquito population. A single dragonfly can eat 30 to hundreds of mosquitoes per day.
    Values
    • Awareness about environment
    • Critical thinking.
23. i. a. It is the follicular phase, when the endometrium regenerates through proliferation.
    b. Progesterone increases (luteal phase) and maintains the endometrium essential for the implantation of the embryo.
    c. If the ovum is not fertilized, the endometrium disintegrates, leading to menstruation.
    ii. Estrogen is secreted by the follicle cells.
    Progesterone is secreted by the corpus luteum of the ovary.
24. On crossing red and white flower only red colour flower appeared in the F_1 generation. But the white colour flower again appears in the F_2 generation which is raised out of the F_1 individual Mendel reasoned that there is a factor of each and every character. Accordingly, there has to be one factor(R) for red flower and other one factor (r) for white flower. In case, an organism possesses only one copy of the gene then the possibility of reappearance of white flower in the F_2 generation of the given cross is not there. Also, the ratio (3:1 of red and white) indicates that each organism must possess two copies of a particular gene.
25. Latitudinal gradients pattern of biodiversity is observed in the given diagram. The reasons for this type of occurrence are as follows:
    i. More solar energy available in tropics, more productivity.
    ii. Tropical environments are less seasonal, so more predictable.
26. **Structure of Pollen grain:**
    Pollen grains are generally spherical and are about 25-50 micrometers in diameter. It has an outer layer exine and inner layer intine. Mature pollen grain contains a bigger vegetative cell and a smaller generative cell.

    Germination of Pollen Grain: The process of development of pollen tube is called germination. Hydration of stigma results in elongation of tube cells into the pollen tube. Pollen tube then grows towards the ovule for further process.

    OR

    Parthenocarpy is the condition in which fruits develop without seeds, while apomixis is a condition in which seeds develop without fertilization. Fertilization is absent in both the case but seeds are present in apomixis only. Benefits of Parthenocarpy: Seedless fruits are easier to consume; especially those fruits that naturally contain too many seeds, e.g. papaya, watermelon, and banana.
    Benefits of Apomixis: Apomixis can be used to produce apomicts hybrid seeds so that farmers will not need to buy hybrid seeds every year. This will help in drastically cutting the cost for farmers.
27. Grazing food chain (GFC) starts with producers that trap solar energy through photosynthesis and feeds the energy into the food chain while detritus food chain (DFC) begins with dead organic matter and their decomposers. Decomposers meet their energy and nutrient requirement by degrading the detritus. A much larger fraction of energy flows through DFC in a terrestrial ecosystem. DFC may be connected with GFC at some levels because some of the organisms of DFC are prey to GFC animals. This natural interconnection of the food chains makes it a complex food web.
28. The function of the ovum and sperm is done outside the woman's body to form a zygote under stimulated conditions in the laboratory. The zygote is then allowed to divide to form embryo. The embryo is then implanted in uterus where it develops into a

foetus, which in turn develops into a child. A baby produced by this technique is called test tube baby.

Section D

29. i. Regulation of gene expression can be exerted at four levels : transcriptional level during formation of primary transcript, processing like splicing, terminal additions or modifications, transport of mRNAs from nucleus to the cytoplasm and translational level.

ii. Only the structural genes of an operon are transcribed into mRNA molecule. Structural gene is a region of DNA that codes for a protein or RNA molecule that forms part of a structure or has an enzymatic function. In the case of lac operon, the structural genes are lac Z, lac Y, lac A which codes for β-galactosidase, lac permease and β-galactoside transacetylase respectively.

iii. The lac operon consists of:

Promoter: binding site of RNA polymerase

Operator: binding site of the lac repressor protein

CAP Binding Site: binding site of catabolite activator protein.

3 structural genes: lac Z, lac Y and lac A. When lac repressor protein is synthesised in its active conformation, it binds to the operator and the operon is switched off, so there is no transcription.

OR

The function of catabolic activator protein in lac operon is to activates lac gene when glucose is absent.

30. i.
- Species A
- The leaf area damaged by species - A in Bt-corn is the least.

ii. Species-B

iii. Not to grow Bt variety as seeds are expensive and of not much benefit (productivity wise)/advise to grow Bt corn with its proper justification.

OR

Cry IAb

Section E

31. i. (a) - Stabilizing, (b) - Directional and (c) - Disruptive selection.

ii. Peppered moths.

iii. Following are the factors affecting the Hardy-Weinberg Equilibrium

a. Gene migration or gene flow
b. Genetic drift
c. Mutation
d. Genetic recombination
e. Natural selection

OR

The accumulation of differences that can lead to formation of new species is called divergent evolution. When two groups of the same species face isolation from each other, group adapts to the changed circumstances in its own way. Natural selection and adaptation result in formation of adaptations in a particular group. These variations accumulate over various generations and finally a new species comes into origin. Homologous organs are results of divergent evolution. We know that organs which are similar in basic design but serve different purposes in different organisms are called homologous organs. Forelimbs of mammals and birds are very good examples of divergent evolution. In most of the mammals, the forelimbs are suited for walking, running and for doing various other chores. In birds, the forelimbs are modified into wings as part of flight adaptations in birds. In both organisms; the forelimbs are composed of humerus, radio-ulna, carpals and metacarpals. But they serve different purposes in mammals and birds. Homology indicates towards common ancestry.

32. i. Step (B): Lymphocytes are grown in the culture medium.
Step (D): Infusion of genetically engineered lymphocytes into patients.

ii. Adenosine deaminase (ADA) deficiency.

iii. As genetically engineered lymphocytes are not immortal, the patient requires the periodic infusion of cells.

iv. If the gene isolated from bone marrow cells producing ADA is introduced into cells at early embryonic stages, it could be a permanent cure.

OR

Adenosine Deaminase (ADA) Deficiency is a genetic disorder that results in the impairment of the immune system. There are three main approaches used in its treatment:

i. Enzyme Replacement Therapy (ERT): This approach involves regular infusion of ADA enzyme into the patient's bloodstream. The exogenous ADA enzyme helps to break down toxic metabolites and restore immune function. ERT requires lifelong administration and can improve immune system function in ADA-deficient individuals. Hematopoietic Stem Cell Transplantation (HSCT): HSCT involves replacing the patient's bone marrow cells with healthy donor cells that carry the correct ADA gene.

ii. Bone marrow transplant

iii. Gene Therapy: Gene therapy aims to introduce a functional ADA gene into the patient's cells using viral vectors or other delivery methods. The corrected gene helps the patient's cells produce ADA enzyme, leading to improved immune function. Gene therapy holds promise as a potentially curative treatment, but further research and clinical trials are ongoing to ensure its safety and long-term effectiveness.

33. There are many factors which motivate youngsters to take to alcohol or drugs such as

i. Pleasure or for fun sake
ii. Curiosity
iii. Desire to do more work
iv. The gesture of defiance to elders, partners and friends
v. Social pressure
vi. Feeling of independence
vii. Liking of taste
viii. Desire for excitement
ix. Desire to escape from such realities of life as disappointments, frustrations and failures
x. Unhappy married life and
xi. Desire to offset the effect of hardships and monotonous daily life.

All the victims of alcohol/drug abuse are sick persons. They need the attention of family members and friends to give up the habit. This is possible under proper medical supervision.

i. The physician should prescribe the habituating drugs only to a genuine person.
ii. Pharmacists should not sell these drugs without a physician’s prescription.
iii. Parents should keep a watch on children and should check then from using drugs as soon as they find signs of addiction in them.
iv. Social workers/policemen, if they find a drug abuser should inform the parents or de-addiction centre.
v. The addict may have psychological problems at home, at work or with society. The help of family members, social workers and employers may be taken in this work.
vi. Attempts should be made to help the alcoholics achieve and maintain a high level of motivation towards abstinence.

OR

i. The demand of the residents in the colony, to make the person suffering from AIDS to leave the colony for the fear of the spread of disease is totally wrong, unjustified, unscientific based on wrong beliefs. The AIDS does not spread by physical contact; shaking hands; coughing and sneezing; kissing and embracing; sharing utilities and telephone; swimming pools and toilets, sharing towels, etc.

ii. Preventive measures include-

a. avoid multiple sexual partners
b. use of disposable needles and syringes
c. Avoid tattoos, ear and nose pierces from unqualified people,
d. The blood test must be done during transfusion and organ transplantation,
e. The dentist should use sterilised equipment,
f. Above all people should be educated about AIDS, by NACO and NGOs.
g. Promoting regular check-up or HIV in a susceptible population.

iii. Cause: HIV-Human Immunodeficiency Virus (a type of retrovirus with RNA genome).
Symptoms: Fever, lethargy, pharyngitis nausea, headache, rashes, etc.