Class-XII Session 2022-23
Subject - Biology (044)
Sample Question Paper - 25
With Solution

BLUE PRINT

Ch. No.	Title	Marks Per Unit	Section-A (1 marks)	Section-B (2 marks)	Section-C (3 marks)	Section-D (4 marks)	Section-E (5 marks)	Total Marks
			MCQ & A/R Ques. No.	VSA Ques. No.	SA Ques. No.	Case based Ques. No.	LA Ques. No.	
1	Reproduction in organisms	16	2(Q3, 7)					2
2	Sexual Reproduction in Flowering Plants		1(Q8)			1(Q29)		5
3	Human Reproduction		1(Q13)		1(Q24)			4
4	Reproductive Health			1(Q17)	1(Q23)			5
5	Principles of Inheritance and Variation	20	1(Q10)		1(Q26)	1(Q30)	1(Q32)	13
6	Molecular Basis of Inheritance		1(Q11)		1(Q25)			4
7	Evolution		3(Q6, 9, 15)					3
8	Human Health and Disease	12			1(Q27)		1(Q31)	8
9	Strategies for enhancement in food production		2(Q1, 5)					2
10	Microbes in Human Welfare			1(Q20)				2
11	Biotechnology-Principles and Processes	12	3(Q2, 4,16)	1(Q18)				5
12	Biotechnology and its Application		2(Q14, 12)	1(Q19)	1(Q28)			7
13	Organisms and Populations	10		1(Q21)			1(Q33)	7
14	Ecosystem							0
15	Biodiversity and conservation				1(Q22)			3
16	Environmental issues							0
	Total Marks (Total Questions)		16(16)	10(5)	21(7)	8(2)	15(3)	70(33)

NOTE: The number given inside the bracket denotes question number, ask in the sample paper, while the number given outside the bracket are the number of questions from that particular chapter.

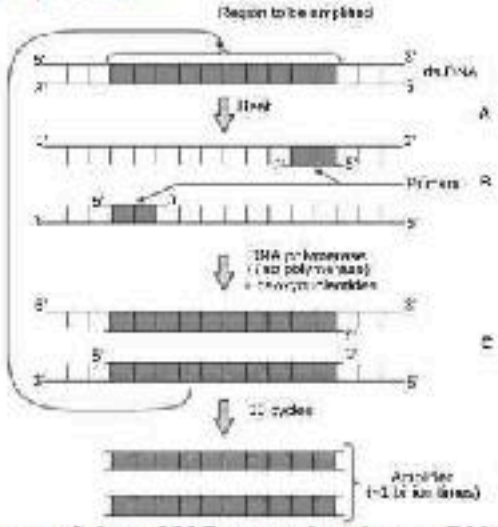
Time Allowed : 3 Hours

General Instructions

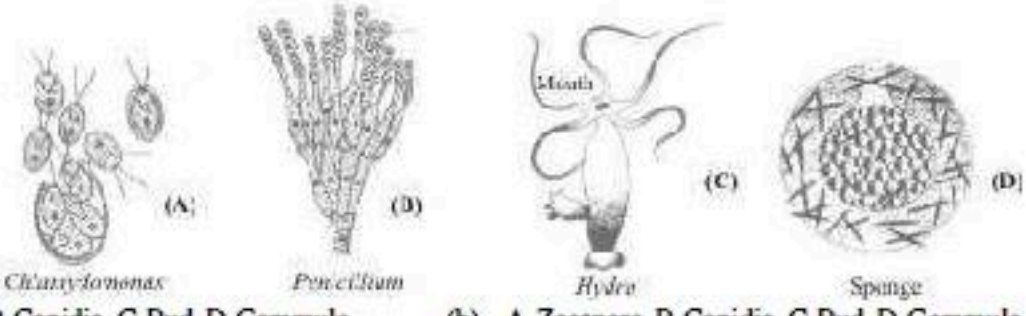
1. All questions are compulsory.
2. The question paper has five sections and 33 questions. All questions are compulsory.
3. Section–A has 16 questions of 1 mark each; Section–B has 5 questions of 2 marks each; Section–C has 7 questions of 3 marks each: Section–D has 2 case-based questions of 4 marks 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. Plants can be disease resistant by
   (a) breeding with their wild relatives.
   (b) colchicine treatment.
   (c) hormone treatment.
   (d) heat treatment.
2. The figure given below shows three steps (A, B, C) of Polymerase Chain Reaction (PCR). Select the option giving correct identification together with what it represents?

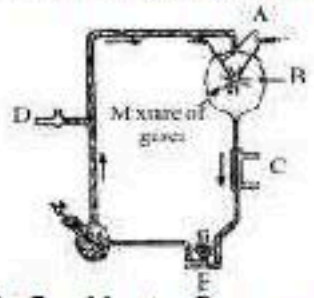


   (a) B - Denaturation at a temperature of about 98°C separating the two DNA strands.
   (b) A - Denaturation at a temperature of about 50°C.
   (c) C - Extension in the presence of heat stable DNA polymerase.
   (d) A - Annealing with two sets of primers.
3. The given figures show the members of fungi and simple plants such as algae which undergo asexual reproduction. Identify the correct asexual reproductive structures found in the members A, B, C and D.



   (a) A-Zoogamete, B-Conidia, C-Bud, D-Gemmule
   (b) A-Zoospore, B-Conidia, C-Bud, D-Gemmule
   (c) A-Zoospore, B-Conidiosporangium, C-Bud, D-Gemmule
   (d) A-Aplanospore, B-Conidia, C-Bud, D-Gemmule
4. Which one of the following represents a palindromic sequence in DNA?
   (a) 5' - GAATTC - 3' / 3' - CTTAAG - 5'
   (b) 5' - CCAATG - 3' / 3' - GAATCC - 5'
   (c) 5' - CATTAG - 3' / 3' - GATAAC - 5'
   (d) 5' - GATACC - 3' / 3' - CCTAAG - 5'
5. The new varieties of plants are produced by
   (a) selection and hybridization.
   (b) mutation and selection.
   (c) introduction and mutation.
   (d) selection and introduction.

6. The diagram represents Miller's experiment. Choose the correct combination of labelling.

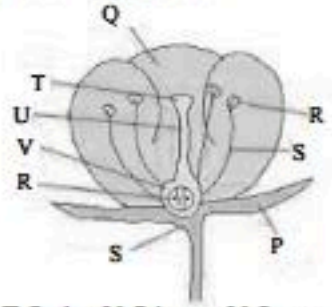


(a) A–electrodes, B– $NH_3 + H_2 + H_2O + CH_4$, C–cold water, D–vacuum, E–U trap
(b) A–electrodes, B–$NH_4 + H_2 + CO_2 + CH_3$, C–hot water, D–vacuum, E–U trap
(c) A–electrodes, B–$NH_3 + H_2O$, C–hot water, D–tap, E–U trap
(d) A–electrodes, B–$NH_3 + H_2 + H_2O + CH_4$, C–steam, D– vacuum, E–U trap

7. In the given figure of water hyacinth, a structure is marked as "X". This structure is involved in vegetative propagation as a unit of vegetative propagules. Identify the type of unit.

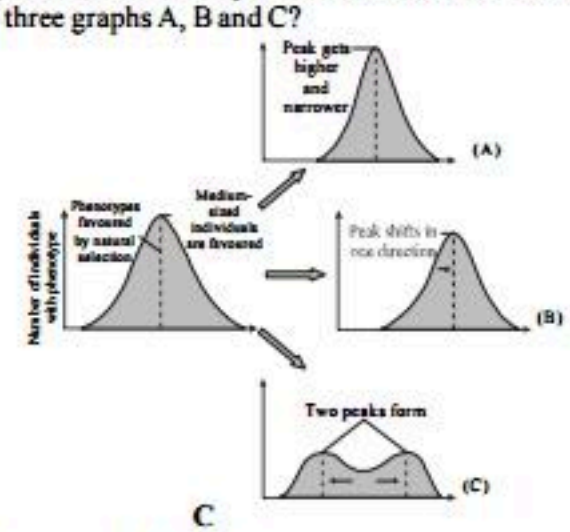
(a) Tuber (b) Offsets (c) Sucker (d) Rhizome

8. Identify P - V in the given figure and select the correct option.



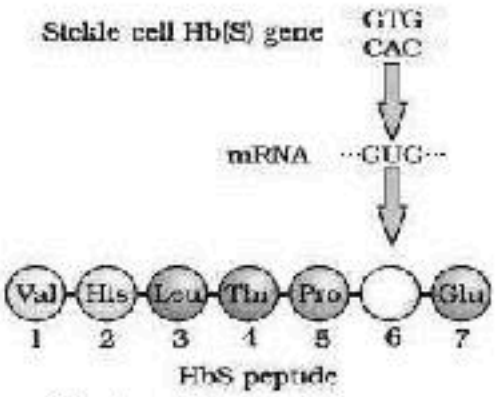
(a) P-Petal, Q-sepal, R-Filament, S-Anther, T-Style, U-Stigma, V-Ovary
(b) P-Petal, Q-Sepal, R-Anther, S-Filament, T-Stigma, U-Style, V-Ovary
(c) P-Sepal, Q-Petal, R-Anther, S-Filament, T-Stigma, U-Style, V-Ovary
(d) P-Ovary, Q-Petal, R-Anther, S-Filament, T-Stigma U-Style, V-Sepal

9. Following is the diagrammatic representation of the operation of natural selection of different traits. Which of the following options correctly identifies all the three graphs A, B and C?



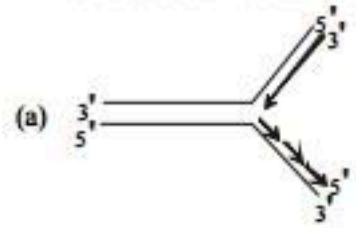
	A	B	C
(a)	Directional	Stabilizing	Disruptive
(b)	Stabilizing	Directional	Disruptive
(c)	Disruptive	Stabilizing	Directional
(d)	Directional	Disruptive	Stabilizing

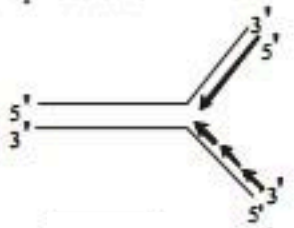
10. Which of the following is true for given diagram.

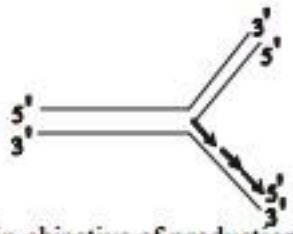


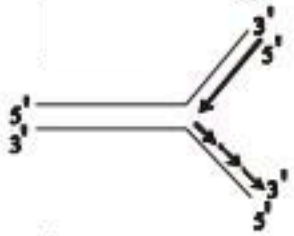
(a) A → Autosomal dominant
(b) A → Glutamic acid
(c) A → Valine
(d) It is caused due to bacteria

11. Which one of the following correctly represents the manner of replication of DNA?

(a) 

(b) 

(c) 

(d) 

12. Main objective of production/use of herbicide resistant GM crops is to
(a) eliminate weeds from the field without the use of manual labour.
(b) eliminate weeds from the field without the use of herbicides.
(c) encourage eco-friendly herbicides.
(d) reduce herbicide accumulation in food articles for health safety.

Directions: Q.No. 13–16: Consist of two statements–Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true and R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is False but R is true.

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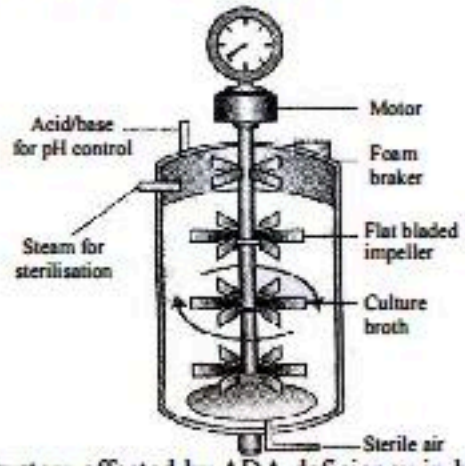
13. **Assertion :** Myometrium is important component of uterus.
Reason : Myometrium produces strong contractions during parturition.
14. **Assertion :** *Agrobacterium tumefaciens* is popular in genetic engineering because this bacterium is associated with the roots of all cereal and pulse crops.
Reason : A gene incorporated in the bacterial chromosomal genome transfer occurs without human effort.
15. **Assertion:** Darwin's finches show a variety of beaks suited for eating large seeds, flying insects and cactus seeds.
Reason: Ancestral seed-eating stock of Darwin's finches radiated out from South American mainland to different geographical areas of the Galapagos Islands, where they found competitor-free new habitats.
16. **Assertion:** Restriction endonucleases are also called 'molecular scissors'.
Reason: When fragments generated by restriction endonucleases are mixed, they join together due to their sticky ends.

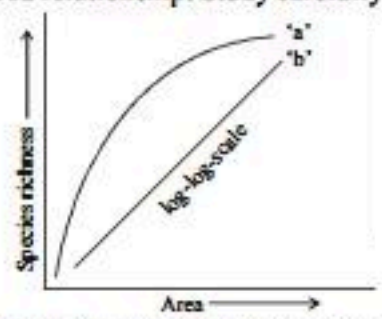
SECTION-B

17. (a) Where is female reproductive system situated in the human body?
(b) Enumerate the events occured in the ovary of a human female during follicular phase.

18. Identify the figure shown below. Why it is used in biotechnology?



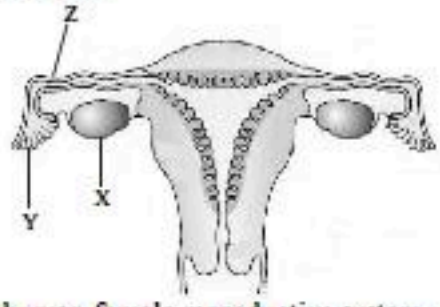
19. (i) Mention the cause and the body system affected by ADA deficiency in humans.
    (ii) Name the vector used for transferring ADA-DNA into the recipient cells in humans. Name the recipient cells.
20. Differentiate between primary treatment and secondary treatment of wastewater.
21. The following graph shows the species-area relationship. Study carefully and answer the questions given below.



    (a) Name the naturalist who studied the kind of relationship shown in the graph. Write the observation made by him.
    (b) Write the situations as discovered by the ecologists when the value of 'Z' (slope of the lines) lies in the range of 0.1 to 0.2 and 0.6 to 1.2. What does 'Z' stand for?
    (c) When would be the slope of the line 'b' becomes steeper?

SECTION-C

22. (a) Why should we conserve biodiversity ? How can we do it?
    (b) Explain the importance of biodiversity hot-spots and sacred groves.
23. After a brief medical examination, a healthy couple came to know that both of them are unable to produce functional gametes and was adviced to go for an 'ART' (Assisted Reproductive Technique). Name some 'ART' and the procedure involved that you will suggest which help them to bear a child.
24.



    The above diagram shows a part of the human female reproductive system.
    (a) Name 'X' marked in above diagram and the gamete cells that would be present in 'X' if taken from a newborn baby.
    (b) Name 'Y' and write its function. (c) Name 'Z' and write the event that takes place here.
25. Draw a schematic representation of dinucleotide and Label the following.
    (a) The components of a nucleotide (b) 3' end and 5' end
    (c) N-glycosidic linkage (d) Phosphodiester linkage
26. Why women are rarely affected by haemophilia? What kind of progenies are produced by a normal man and carrier woman ? Show it by punnett square.
27. Write the source and the effect on the human body of the following drugs.
    (i) Morphine (ii) Cocaine (iii) Marijuana
28. (a) Give the scientific name of the soil bacterium which produces crystal (Cry) proteins.
    (b) How are these proteins useful in agriculture?
    (c) What do the differently written terms 'Cry' and '*cry*' represent respectively?

SECTION-D

29. Read the following and answer any four questions from 29(i) to 29(iv) given below:

Pollination:

Pollination is the mechanism to achieve this objective. Transfer of pollen grains (shed from the anther) to the stigma of a pistil is termed pollination. Flowering plants have evolved an amazing array of adaptations to achieve pollination. Autogamy : In this type, pollination is achieved within the same flower. Transfer of pollen grains from the anther to the stigma of the same flower. In a normal flower which opens and exposes the anthers and the stigma, complete autogamy is rather rare. Autogamy in such flowers requires synchrony in pollen release and stigma receptivity and also, the anthers and the stigma should lie close to each other so that self-pollination can occur. Some plants such as *Viola* (common pansy), *Oxalis*, and *Commelina* produce two types of flowers - chasmogamous flowers which are similar to flowers of other species with exposed anthers and stigma, and cleistogamous flowers which do not open at all (Figure 2.9c). In such flowers, the anthers and stigma lie close to each other. When anthers dehisce in the flower buds, pollen grains come in contact with the stigma to effect pollination. Thus, cleistogamous flowers are invariably autogamous as there is no chance of cross-pollen landing on the stigma. Cleistogamous flowers produce assured seed-set even in the absence of pollinators. Transfer of pollen grains from the anther to the stigma of another flower of the same plant. Although geitonogamy is functionally cross-pollination involving a pollinating agent, genetically it is similar to autogamy since the pollen grains come from the same plant. Transfer of pollen grains from anther to the stigma of a different plant. This is the only type of pollination which during pollination brings genetically different types of pollen grains to the stigma.

(i) Write the condition occur in chasmogamous?
(ii) Which pollinating agents used in water hyacinth and water lily for pollination?
(iii) Give two examples of cleistogamous flower.
(iv) What is geitonogamy?

30. Read the following and answer any four questions from 30(i) to 30(iv) given below:

Haemophilia :

This is an sex linked recessive disease, which shows its transmission from unaffected carrier female to some of the male progeny has been widely studied. In this disease, a single protein that is a part of the cascade of proteins involved in the clotting of blood is affected. Due to this, in an affected individual a simple cut will result in non-stop bleeding. The heterozygous female (carrier) for haemophilia may transmit the disease to sons. The possibility of a female becoming a haemophilic is extremely rare because mother of such a female has to be at least carrier and the father should be haemophilic (unviable in the later stage of life). The family pedigree of Queen Victoria shows a number of haemophilic descendents as she was a carrier of the disease.

(i) Give reason why haemophillia is more commonly observed in human males than in females?
(ii) Haemophilia is mentioned as a trait carried by the mother and passed to her sons. What is the pattern of inheritance for this trait.
(iii) Name disorder which is sex-linked?
(iv) What is the root cause of haemophilia?

SECTION-E

31. (a) How does a single HIV virus infect a host cell & multiply to produce many new viruses? Support your answer with a suitable diagram.
(b) What blood test detects the presence of HIV?

OR

(a) (i) How is activated sludge produced during sewage treatment?
(ii) Explain how this sludge is used in biogas production.
(b) What are the differences between primary sludge and activated sludge?

32. (a) Why are Thalassemia and haemophilia categorised as Mendelian disorders?
(b) Explain pattern of inheritance of thalassemia in humans.
(c) Write the symptoms of these diseases.

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 you view 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.

33. Write an account of the various factors which affect the population density in the habitat.

OR

(a) Write note on habitat fragmentation and alien species invasion.
(b) Give any two examples to explain how do certain organisms pull through the adverse conditions when unable to migrate under stessful period.

Solutions

SAMPLE PAPER-10

1. **(a)** Plant can be made disease resistant by breeding with their wild relatives. (1 mark)
2. **(c)** PCR is a technique for enzymatically replicating DNA without using a living organism such as E. coli or Yeast. It is commonly used in medical and biological research labs for a variety of tasks like detection of hereditary diseases, identification of genetic fingerprints etc.
   The correct steps shown in the given figure are:
   A – Denaturation at a temperature of about 94° to 98°C. During the denaturation, the double strand melts open to single stranded DNA, and all enzymatic reactions stop.
   B – Annealing (binding of DNA primer to the separated strands occurs at 50° to 65°C, which is lower than the optimal temperature of the DNA polymerase).
   C – Extension or elongation of the strands using the DNA primer with heat-stable DNA polymerases, most frequently Taq (Thermus aquaticus) polymerase at 72°C. (1 mark)
3. **(b)** In the given figure of Chlamydomonas (A), Penicillium (B), Hydra (C) and sponge (D), the asexual reproductive structure found in them are respectively zoospore, conidia, bud and gemmules. (1 mark)
4. **(a)** A palindromic sequence is a nucleic acid sequence (DNA or RNA) that is the same whether read 5' (five-prime) to 3' (three prime) on one strand or 5' to 3' on the complementary strand with which it forms a double helix.
   5' - GAATTC - 3'
   3' - CTTAAG - 5'
   It is a palindromic sequence of DNA cut by restriction enzyme Eco RI. (1 mark)
5. **(a)** Plant breeding refers to the modification and improvement of genetic material of plants resulting in the development of crops which are more beneficial to human beings.
   Crossing between the two genetically diverse parents to obtain a progeny with the desired traits is called hybridization. (1 mark)
6. **(a)** (1 mark)
7. **(b)** The marked structure in the given figure is offset. Offsets are one internode long runners that occur in some aquatic plants. Breaking of offsets helps in propagation, e.g., Eichhornia (Water Hyacinth), Pistia (Water Lettuce). (1 mark)
8. **(c)** (1 mark)
9. **(b)** The graph A, B and C shows stabilizing, directional and disruptive traits of natural selection. In stabilizing selection, the median phenotype is selected during natural selection and which does not tilt the bell curve in any way. Instead, it makes the peak of the bell curve even higher than what would be considered normal. Directional selection of natural selection derives its name from the shape of the approximate bell curve that is produced when all individuals' traits are plotted. Instead of the bell curve falling directly in the middle of the axes on which they are plotted, it tilts either to the left or the right by varying degrees. Hence, it has moved in one direction or the other. In disruptive selection instead of the bell curve having one peak in the middle, it has two peaks with a valley in the middle of them. (1 mark)
10. **(c)** (1 mark)
11. **(d)** The given figure represents the figure of replication fork of DNA. The new strands of DNA are formed in the 5' → 3' direction from the 3' → 5' template DNA by the addition of deoxyribonucleotides to the 3' end of primer RNA. (1 mark)
12. **(d)** Main objective of production/use of herbicide resistant GM crops is to reduce herbicide accumulation in food articles for health safety. GM plants have been useful in many ways. Genetic modifications has made crops more tolerant to abiotic stresses, reduced reliance on chemical pesticides and enhanced nutritional value of food. (1 mark)
13. **(a)** (1 mark)
14. **(d)** A soil inhabiting, plant pathogenic bacterium Agrobacterium tumefaciens infects broad leaved crops including tomato, soybean, sunflower and cotton but not the cereals. Tumour formation (crown galls) is induced by its plasmid (Ti) into the chromosomal DNA of its host plant. The T-DNA causes tumours. As gene transfer occurs without human efforts, the bacteria is known as **natural genetic engineer of plants**. (1 mark)
15. **(a)** Darwin finches found on Galapagos islands differ primarily in body size, feather colour, bill shape as adaptation to type of food available. It is a type of divergent evolution. (1 mark)
16. **(b)** Restriction endonucleases are molecular scissors, which cut a DNA molecule within certain specific site called restriction site. Common restriction endonucleases are Eco RI, Bam II, Hind III, etc. (1 mark)
17. (a) The female reproductive system includes a pair of ovaries along with oviducts, uterus, cervix, vagina and the external genitalia. These structures are situated in the pelvic region of the female.
    (b) Follicular phase is also called the **proliferative phase**. During this phase, FSH released by the pituitary gland stimulates the growth of the primary ovarian follicles and also causes maturation of the primary oocyte in this follicle.
    The follicular cells of the Graafian follicle secrete oestrogen.
    Due to an increased level of oestrogen, the uterine endometrium becomes thick, more vascular and more glandular.
    This phase lasts for about 10 to 14 days or until ovulation occurs. (1 + 1 marks)
18. • Simple stirred tank bioreactor.
    Bioreactors are required for the processing of cultures of large volumes (100-1000 litres). Bioreactors worked as vessels in which raw materials are biologically converted into specific products. It provides the optimal conditions for achieving the desired product by providing optimum growth conditions (temperature, pH, substrate, salts, vitamins and oxygen).

- Bioreactors are used in biotechnology because,

(i) In industrial biotechnology it is used for the production of fermented foods, wine, organic acids, etc.

(ii) In the pharmaceutical industry it is used for the growth of specialised pure cultures of bacteria, fungi, yeast and the production of enzyme, drugs, etc.

(1 + ½ + ½ marks)

19. Adenosine deaminase deficiency (ADA) or ADA-SCID is an autosomal recessive metabolic disorder that cause immuno-deficiency. It is due to a lack of the enzyme adenosine deaminase. (2 marks)

20. The difference between primary treatment and secondary treatment are as follows :

S.No.	Primary (1°) treatment	Secondary (2°) treatment
1.	Primary treatment involves mechanical treatment which removes coarse solid and settleable particles.	It involves biological treatment which removes smaller or dissolved particles with the help of microbial activity.
2.	Primary treatment takes a shorter time to finish.	Secondary treatment takes much longer time as organic microbes consume wastes.

(1 + 1 mark)

21. (a)
- Alexander Von Humboldt.
- He observed that within a region, species richness increased with increase in explored area but only up to a limit.

(b)
- Z value is fitted constant and it ranges between 0.1 to 0.2 regardless of the region or taxonomic groups *i.e.*, the slope is almost similar.
- Among large areas like continent, the slope tends to be much steeper because larger the area, larger will be the number of species. In this case, Z value will be in the range of 0.6 to 1.2.
- Z (slope of the line) is the regression co-efficient.

(c) When species richness would more *i.e.*, in the range of 0.6 – 1.2, the slope of the line 'b' would be steeper.

(½ + 1 + ½ marks)

22. (a) Biodiversity conservation is necessary because of the following reasons:

Many commercially important products such as food, fibre and wood and countless industrial products are obtained from nature.

Certain activities cannot be accomplished without the help of nature such as production of oxygen and pollination.

Intangible benefits such as aesthetic pleasure are derived from nature.

Conserving the species we share our planet with and passing the rich legacy of biodiversity to our future generations is our ethical duty.

Biodiversity can be conserved by the following means:

In situ conservation - In order to conserve biodiversity, some of the world's biodiversity hotspots (with high degree of biodiversity and endemism) have been identified and are being protected. In India, biosphere reserves, wildlife sanctuaries and national parks are built for this purpose.

Ex situ conservation - The threatened species of plants and animals are taken out of their habitats and are kept in special settings such as zoological parks, botanical gardens and wildlife parks. Nowadays, the gametes of endangered species can be viably preserved by methods such as cryopreservation and can be fertilised in vitro, followed by propagation through tissue culture methods. Similarly, seeds can be preserved in seed banks.

(b) Biodiversity hotspots and sacred groves are the regions that are rich in biodiversity. Experiments conducted by many ecologists have demonstrated that a system with greater biodiversity is more stable and has greater productivity. In the long run, biodiversity is related with overall health of our ecosystem and the survival of human race on the Earth.

Characteristics of a stable community are as follows:

It should not show much variation in productivity over the years.

It must be either resistant or resilient to occasional disturbances.

It must be resistant to invasion by alien species.

(2 + 1 marks)

23.
- *In vitro* fertilisation (IVF), popularly known as Test-tube baby programme, is preferred in this case because both the partners are unable to produce functional gametes.
- There are some ART techniques involved in this case. These are as follows:

(i) ICSI (Intra cytoplasmic sperm injection) : Sperm is directly injected into the ovum. ET-Embryo is transferred into reproductive tract *i.e.*, uterus.

(ii) ZIFT (Zygote intra fallopian transfer) : Zygote or early embryos upto eight blastomeres are transferred into fallopian tube.

(iii) IUT (Intra uterine transfer) : Embryos with more than eight blastomeres are transferred into uterus.

(1 + 2 marks)

24. (a) 'X' is Ovary and gamete cells present in ovary are primary oocytes.

(b) 'Y' is fimbriae. It help in collection of the ovum after ovulation.

(c) 'Z' is Ampullary – isthmic junction (part of fallopian tube). Fusion of sperm and the ovum *i.e.*, fertilisation takes place at this place. (1 + 1 + 1 marks)