Class XII Session 2024-25
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. The phenomenon involved in the formation of female gametophyte is known as: **[1]**

   a) Hydrolysis b) Megasporogenesis

   c) Multisporogenesis d) Microsporogenesis

2. N_2 - fixing bacteria in non-legume plants are: **[1]**

   a) Frankia b) Aspergillus

   c) Rhizobia d) Plasmodium

3. Which one of the following plants shows very close relationships with a species of moth, where none of the two can complete its life cycle without the other? **[1]**

   a) Viola b) Yucca

   c) Hydrilla d) Banana

4. Which of the following restriction enzymes produces blunt ends ? **[1]**

   a) Eco RV b) Hind III

   c) Xho1 d) Sal I

5. Among the ecosystem mentioned below, where can one find maximum biodiversity? **[1]**

   a) Desert b) Coral reefs

   c) Alpine meadows d) Mangroves

6. The natural parthenogenesis is found in: **[1]**

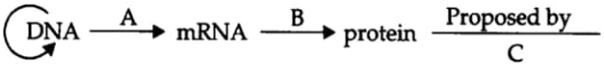
   a) Drosophila b) Sharks

c) Honey bee
d) Housefly

7. Rosie's milk is enriched nutritionally as it has: **[1]**

a) Beta lactalbumin
b) Human gene alpha lactalbumin
c) lactose
d) Vitamin A

8. The diagram shows an important concept in the genetic implication of DNA. Fill in the blanks A to C. **[1]**

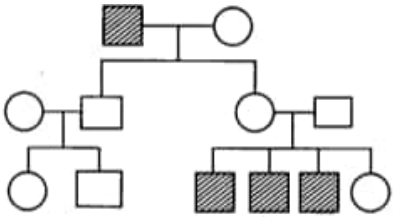


a) A - translation B - transcription C - Erevin Chargaff
b) A - translation B - extension C - Rosalind Franklin
c) A - transcription B - translation C - Francis Crick
d) A - transcription B - replication C - James Watson

9. Tapetum in pollen grains help in: **[1]**

a) Provide nourishment to the young microspore mother cell
b) Help in pollen grain germination
c) Provide protection to the microspore mother cell
d) Help in the dispersal of pollen grain

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



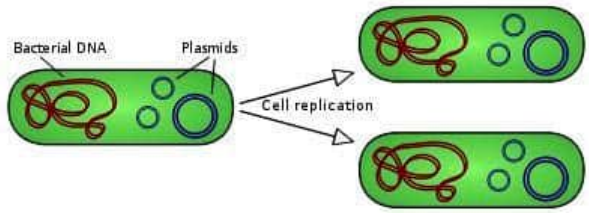
Which of the following is the most probable mode of inheritance of this trait?

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

11. DNA replication takes place during: **[1]**

a) S-phase
b) G_1 phase
c) G_2 phase
d) Prophase

12. Which of the following is true for a Plasmid - **[1]**



a) It can be replicate independently
b) It cannot replicate
c) It lies together with chromosomes
d) It shows independent assortment

13. **Assertion (A):** Siblings are monoparental in origin. **[1]**

Reason (R): Monoparental progenies are exact copies of the parent.

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):** Appetency is the formation of new structural or habit of the organism according to its need. **[1]**
Reason (R): It is also called Lamarckian doctrine.

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:** DNA fingerprinting is a very quick way to distinguish any two individuals. **[1]**
Reason: Any two individuals in the world except identical twins have not similar VNTR.

a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

c) Assertion is correct statement but reason is wrong statement.

d) Assertion is wrong statement but reason is correct statement.

16. **Assertion:** Escherichia coli, Shigella sp., and Salmonella sp. are all responsible for diarrhoeal diseases. **[1]**
Reason: Dehydration is common to all types of diarrhoeal diseases and an adequate supp|ly of fluids and electrolytes should be ensured.

a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

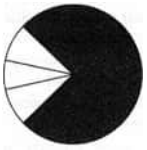
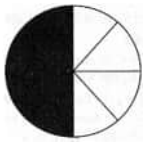
c) Assertion is correct statement but reason is wrong statement.

d) Assertion is wrong statement but reason is correct statement.

Section B

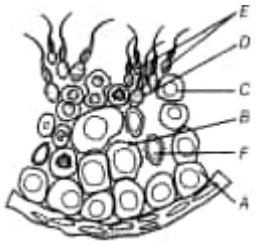
17. Antibiotics are sold in combination with Lactobacillus (reason) **[2]**

18. In the pie chart (a) and (b) drawn below to show the global animal diversity, which group of animals would you name and write on the areas shaded back in (a) and (b). In which kind of habitat would you find these groups of animals? **[2]**

1.  2. 

19. (A) bacterial cell is shown in the figure given below. Label the part (A) and (B). Also mention the use of part 'A' in rDNA technology. **[2]**

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



21. Why cannot a population live alone by itself in nature? **[2]**

OR

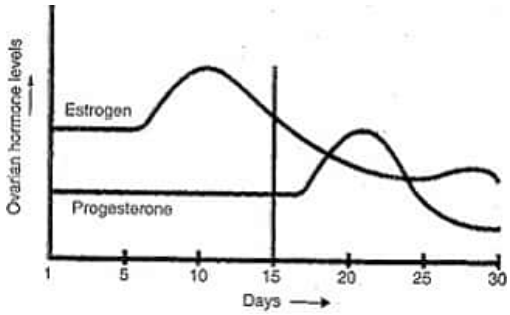
The density of a population in a habitat per unit area is measured in different units. Write the unit of measurement against the following:

i. Bacteria
ii. Banyan
iii. Deer
iv. Fish

Section C

22. Three water samples namely river water, untreated sewage water and secondary effluent discharged from a sewage treatment plant were subjected to BOD test. The samples were labelled A, B and C but the laboratory attendant did not note which was which. The BOD values of the three samples A, B and C were recorded as 20 mg/L, 8 mg/L and 400 mg/L respectively. Which sample of the water is most polluted? Can you assign the correct label to each assuming the river water is relatively clean? **[3]**

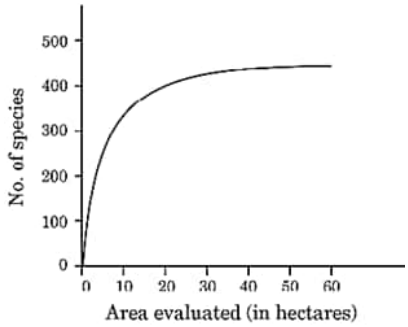
23. i. Read the graph given above and correlate the uterine events that take place according to the hormonal levels on: **[3]**
    a. 6-15 days
    b. 16-25 days
    c. 26-28 days
    ii. Specify the sources of the hormones mentioned in the graph.



24. Anita was happy when she gave birth to her first child. Her in-laws were dissatisfied at her not giving birth to a male child and blamed Anita. Anita tried to convince her in-laws that she had no role in the child's gender. They understood the biological reason but were yet to be satisfied. Anita's husband took up the matter and convinced the parents. **[3]**

i. What values did Anita's husband show in the above situation?
ii. What governs sex determination in humans? How is it different from birds?
iii. Why can't Anita be blamed for not giving birth to a male child?

25. The graph given below shows species-area relationship of a certain region. **[3]**



a. Study the graph and explain what it represents.

b. After a while, a small area was taken for constructing a road which divided the region into two. Write the impact this construction would have on species richness of the region.

26. i. Why is tender coconut considered as a healthy source of nutrition? **[3]**

ii. How are pea seeds different from castor seeds with respect to endosperm?

OR

Draw the diagram of a microsporangium and label its wall layers. Write briefly on the role of the endothecium.

27. i. Name an ideal pyramid existing in an ecosystem. Construct it up to its three trophic levels along with their names. **[3]**

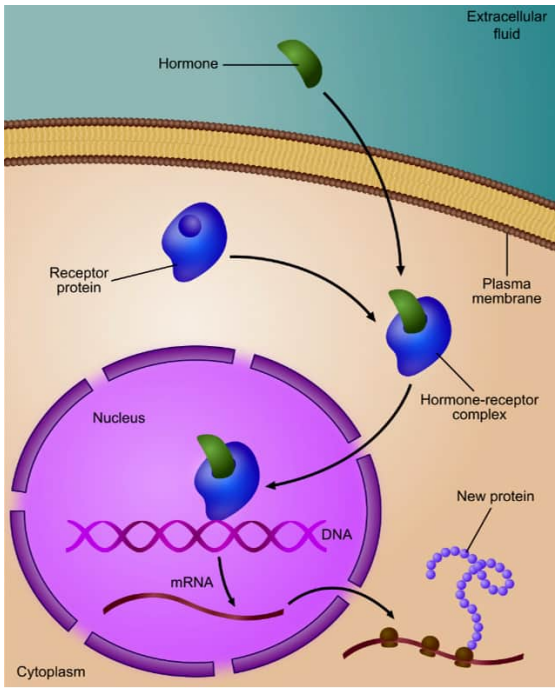
ii. The sun provides 1,000,000 J of sunlight (solar energy) to an ecosystem. Write the amount of energy that is available to the first and third trophic levels, respectively.

28. Why is **Saheli** considered an effective contraceptive for women to space children? **[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]**

Transgenic animals can serve as factories that in some cases, may produce large amounts of proteins more efficiently. Transgenic mice have been engineered to express human antibodies by introducing a large segment of human DNA encoding human immunoglobulin genes. In transgenic large animals such as cows or sheep proteins of pharmaceutical value can be produced in large quantities in milk which is later purified. Transgenes can be used to alter many phenotypic properties including growth rate, fat composition, milk production, hair texture, etc.

i. In transgenic animals, i.e. cow and sheep proteins of pharmaceutical value are produced in large quantities in which gland. (1)

ii. Why is mouse the most preferred animal for studies on gene transfer? (1)

iii. Why does the production of transgenic animals take place? (2)

OR

Assertion (A): Transgenic mice have been engineered to express human antibodies. (2)

Reason (R): Large segments of human DNA encoding human immunoglobulin have been transferred to mice.

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 E

31. i. Describe the phenomenon of adaptive radiation as explained by Darwin. **[5]**

ii. Is human evolution an example of adaptive radiation? Give reason in support of your answer.

OR

Describe the various evidences from palaeontology which support organic evolution.

32. What are the various advantages of using genetically modified plants to increase the overall yield of the crop? **[5]**

OR

A patient is suffering from ADA deficiency. Can the patient be cured? How?

33. i. What is the chemical name of **smack**? Why is the consumption of smack considered as an abuse? **[5]**

ii. Name the source plant and one effect of the following drugs on the human body:

1. Marijuana
2. Cocaine
3. Morphine

OR

What is the Pulse Polio Programme of Government of India? What is OPV? Why is it that India is yet to eradicate Polio?

Solution

Section A

1. **(b)** Megasporogenesis
   Explanation: The process of formation of female gametophyte inside the ovary by meiotic and mitotic division is called megasporogenesis.
2. **(a)** Frankia
   Explanation: Frankia
3. **(b)** Yucca
   Explanation: Yucca
4. **(a)** Eco RV
   Explanation: Eco RV
5. **(b)** Coral reefs
   Explanation: Coral reefs are believed by many to have the highest biodiversity of any ecosystem on the planet even more than a tropical rainforest. Occupying less than one percent of the ocean floor, coral reefs are home to more than twenty-five percent of marine life.
6. **(c)** Honey bee
   Explanation: Honey bee
7. **(b)** Human gene alpha lactalbumin
   Explanation: The first transgenic cow Rosie produced human protein-enriched milk. The milk contained Alpha-lactalbumin which was nutritionally more balanced than normal cow milk for babies.
8. **(c)** A - transcription B - translation C - Francis Crick
   Explanation: A - transcription B - translation C - Francis Crick
9. **(a)** Provide nourishment to the young microspore mother cell
   Explanation: Tapetum is the cells surrounding the microspore mother cells. These cells provide nourishment to the young microspore mother cells.
10. **(a)** X-linked recessive transmission
    Explanation: X-linked recessive transmission
11. **(a)** S-phase
    Explanation: S-phase
12. **(d)** It shows independent assortment
    Explanation: It shows independent assortment
13. **(d)** A is false but R is true.
    Explanation:
    Sibling are the product of sexual reproduction and commonly biparental in origin. In sexual reproduction meiosis takes place where crossing over occurs. The product of sexual reproduction thus resemble their parents, but this resemblance is never 100%. The monoparental progeny is derived from a single process through the process of mitosis. It possess exact copies of genetic characteristics of the parent.

14. **(c)** A is true but R is false.
Explanation: According to Lamarck, a change in environment brings about changes in organisms. It gives rise to new needs. New needs or desires produce new structures and change habits of the organisms. Doctrine of desire is called appetency. It can be shown by the following example-Water birds (duck etc.) developed their webbed feet by constant stretching of digits and the skin between them for skimming the water surface and for swimming. The transmission of acquired characters is the most important principle usually termed as the Lamarckian doctrine.

15. **(a)** Assertion and reason both are correct statements and reason is correct explanation for assertion.
Explanation: Assertion and reason both are correct statements and reason is the correct explanation for assertion.

16. **(b)** Assertion and reason both are correct statements but reason is not correct explanation for assertion.
Explanation: Assertion and reason both are correct statements but reason is not correct explanation for assertion.

Section B

17. Lactobacillus are the useful bacteria present in our digestive tract, vaginal tract etc. Antibiotics taken may kill these useful bacteria along with the harmful bacteria. The killing of useful bacteria may result in the overgrowth of harmful bacteria in gut or vaginal tract that may produce toxins and cause diarrhoea or inflammation. Thus, inorder to maintain balance and optimum number of useful bacteria in the gut or vaginal tract and prevent conditions like diarrhoea or inflammation, most of the antibiotics are sold with Lactobacillus these days
18. A - Insects. They are the most species-rich taxonomic group in the animal kingdom, making up more than 70 per cent of the total species found on earth. Insects are found in almost all types of habitats.
B - Fish. Among the vertebrates, fish form the largest group including both freshwater and seawater fish.
19. (A) - Plasmid, (B) - Nucleoid
Plasmid is used as vector to transfer the gene of interest in the host cell.
20. A-Spermatogonium
B-Primary spermatocyte
C-Secondary spermatocyte
D-Spermatid
E-Spermatozoa
F-Sertoli cell
21. No population can live alone in nature. It is dependent upon other populations for various requirements. Animals get food, shelter and oxygen from plants. Plants depend upon animals for carbon dioxide, pollination, food and ploughing of soil etc.

OR

i. Number unit volume
ii. Biomass/ square kilometer (Area)
iii. Number/of square kilometer (Area)
iv. Weight/square kilometer (Area)

Section C

22. Biological oxygen demand (BOD) is the method of determining the amount of oxygen required by micro-organisms to decompose the waste present in the water supply. If the quantity of organic wastes in the water supply is high, then the number of decomposing bacteria present in the water will also be high. As a result, the BOD value will increase.
Therefore, it can be concluded that if the water supply is more polluted, then it will have a higher BOD value. Out of the above three samples, sample C is the most polluted since it has the maximum BOD value of 400 mg/L. After untreated sewage water, secondary effluent discharge from a sewage treatment plant is most polluted.
Thus, sample A is secondary effluent discharge from a sewage treatment plant and has the BOD value of 20 mg/L, while sample B is river water and has the BOD value of 8 mg/L.
Hence, the correct label for each sample is:

Label	BOD value	Sample
A.	20 mg/L	Secondary effluent discharge from a sewage treatment plant
B.	8 mg/L	River water
C.	400 mg/L	Untreated sewage water

23. i. a. It is the follicular phase, when the endometrium regenerates through proliferation.

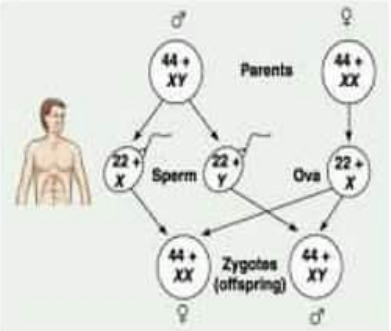
b. Progesterone increases (luteal phase) and maintains the endometrium essential for the implantation of the embryo.
c. If the ovum is not fertilized, the endometrium disintegrates, leading to menstruation.

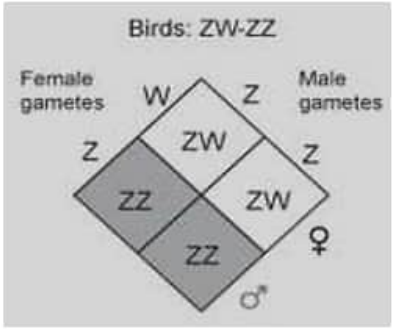
ii. Estrogen is secreted by the follicle cells.
Progesterone is secreted by the corpus luteum of the ovary.

24. i. Strong and determined personality with responsibility towards the family and respect for elders.

ii. Sex chromosomes. In human males it is XY and in the female it is XX. In birds, the male is ZZ while the female is ZW.

iii. Human females are homogametic i.e. produces only one type of gametes containing 22+X chromosomes only. Males are heterogametic and produce two types of gametes 22+X and 22+Y. It is the type of male gamete which determines the sex of the foetus. If X chromosome containing sperm fuses with the egg, it produces a female child whereas if Y chromosome containing sperm fuses with the egg, it produces a male child.





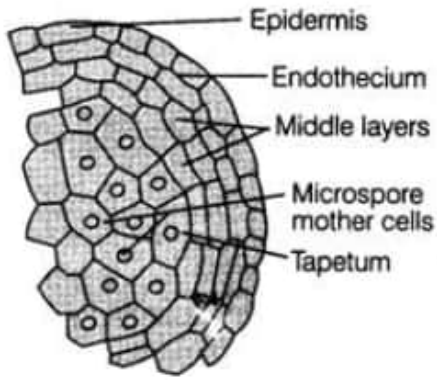
25. i. ‘‘Within a region species richness increased with increasing explored area, but only up to a limit.’’

ii. Very gradually impact on species diversity will be visible/species diversity will be gradually reduced/ negative impact on species diversity.

26. i. The tender coconut is immature with soft and gentle solid white kernel (it is Primary Endosperm Cell) also called coconut 'meat' and the central watery fluid, free nuclear endosperm, called coconut milk(it is Primary Endosperm Nucleus) or water is highly nutritious as it contains a large number of nucleus having high amount of proteins, oils, vitamins and minerals.

ii. The seeds of pea are dicot, non-endospermic/ex-albuminous because the whole of endosperm is consumed during embryogenesis. The food is stored in massive cotyledons and there are no remnants of endosperm in the mature pea, seeds. However, in castor seeds, the whole of endosperm is not consumed completely during embryogenesis. The cotyledons are papery and the fleshy massive endosperm is present in the mature castor seeds. Seeds are known as an endospermic seed or albuminous seeds.

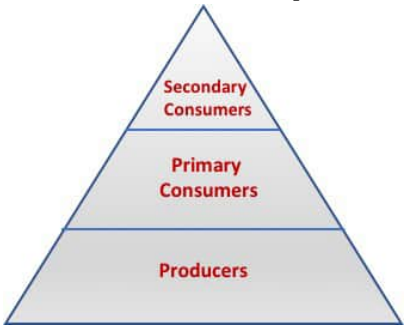
OR



Role of Endothecium: Endothecium; along with the epidermis and the middle layer; provides protection to the pollens during development. Once pollen grains are mature, the three layers (including endothecium) rupture and thus facilitate the dehiscence of pollens.

27. i. An ideal pyramid existing in an ecosystem is the pyramid of energy.
In the ecological pyramid, the first trophic level represents the producers which are the green plants. Primary consumers,

which are the herbivores, represent the second trophic level. Secondary consumers represent the third trophic level.



ii. Primary producers convert only 1% of the energy in the sunlight available to them. So, if the sun provides 1,000,000 J of solar energy, only 10,000 J is available at the producer or the first trophic level. Now, according to the 10% law of energy transfer, only 10% of energy is transferred from one trophic level to the next higher level. Therefore, the third trophic level will get 100 J of energy.

28. **Oral pills/Injections/Implants:** Hormonal preparations (Progestogens or progestogens and estrogen) inhibit ovulation and implantation. “Saheli", a new oral pill is used once-a-week". It's a steroid preparation with very fewer side effects and high contraceptive value developed by CDRI in Lucknow, India.

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. Mammary gland

ii. Short oestrus cycle.

iii. a. All of these Identification and separation of desired gene.
b. Combining the desired gene with appropriate vector.
c. Introduction of vector in cells, tissues or embryos.

OR

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

Section E

31. i. Many varieties of finches (black bird) were found on the island (Galapagos island),
Originally all birds had seed eating features, Gradually as they moved to other geographical areas, The beak structures changed according to the food available there and many other altered beaks arose.
Some becoming insectivorous that eat insect and others remaining vegetarian,
Hence the process of evolution starting from a point and radiating to other areas of habitats is called adaptive radiation.

ii. No human evolution is not an example of adoptive radiation it is an example of progressive evolution, parent species of Homosapiens have evolved from Homo habilis and to homo erectus lineage.

OR

The evidence for organic evolution are as follow:

i. **Fossils/ Paleontology evidence:** Fossils of earliest life are scanty and only of prokaryotes mostly. Eukaryotes developed later on.

ii. **Disparity between fossils:** Present-day organisms seem to be related to the fossils of the quaternary period but differ from those of the tertiary period. Fossils of the quaternary period are similarly related to the tertiary period but differ from the ones

of the Cretaceous period. These differences are due to changes in the form, structure, and habits of organisms due to evolution.

iii. **Extinct organisms:** Lots of organisms existed on earth for some time and then got extinct like dinosaurs, toothed birds, pteridosperms, giant horsetails, ancestors of man, etc. Extinction happened due to many factors. Some of the extinct forms have left their modified descendants (Man, modern-day Horse) while others have perished without leaving any descendants (Pteridosperm, Dinosaurs).

iv. **Missing Links:** These are transitional or intermediate forms between two groups of organisms which occur only in the fossil state. E.g., *Seymouria*, a missing link between amphibia and reptilia.

v. **Plant vs Animal Fossils:** Ancestral animals have left more fossils as compared to plants evidently due to the presence of slow decaying harder structures in their exoskeleton and endoskeleton.

32. Advantage of using GM plants are as follows:

i. GM crops are more tolerant of abiotic stresses; like drought, salinity, high temperature, etc. Thus, GM modified crops can be also grown in areas that are not ideal for cultivation.

ii. GM crops reduce the need for chemical pesticides. This helps in saving many useful insects that otherwise get killed by chemical pesticides. It is important to remember that many insects facilitate pollination in crops.

iii. Mineral usage by the plant is more efficient in the case of GM crops. This prevents the early exhaustion of soil nutrients.

iv. GM crops can have enhanced nutritional value. For example; golden rice is fortified with vitamin A. Similarly; carrot has been fortified with iron. GM crops can be tailor-made to provide alternate resources to industries; such as starch or fuel.

OR

A person suffering from ADA deficiency can be cured by various methods which are discusses below:

i. **Bone Marrow Transplantation:** This procedure requires a suitable donor. An identical twin is supposed to be the best donor as the chances of tissue rejection are very high in bone marrow transplantation.

ii. **Enzyme Replacement Therapy:** Enzyme replacement therapy is based on administering the missing enzyme to the patient by injection.

iii. **Gene Therapy:** Gene therapy involves taking out the lymphocytes from the patient's blood. Then are lymphocytes are genetically engineered to add the missing gene. Recombinant lymphocytes are grown in a suitable medium and then administered to the patient. This too is not a permanent cure because lymphocytes have a certain lifespan. The patient needs to be administered lymphocytes after frequent intervals. However, the gene isolated from marrow cells producing ADA is introduced into cells at the early embryonic stage could be a permanent cure for this disease.

33. i. The chemical name of samck is Diacetylmorphine
The consumption of samck is considered as abuse because as it is highly addictive, and being a depressant it slows down body functions.

ii. I. Cannabis sativa, affects the cardiovascular system of the body.
II. Erythroxylum coca/coca plant, interferes with the transport of neurotransmitter dopamine/produces sense of euphoria/increased energy.
III. Papaver somniferum, acts as depressant/slows down body function/ reduces pain/sedative.

OR

Pulse Polio: This is a mass immunization program to eradicate poliomyelitis from India. This program was launched in 1995-96. This program has been undertaken with active cooperation from government agencies, NGOs, UNICEF, and CDC.

Key Objectives of Pulse Polio:

i. Not a single child should be missed.

ii. High level of surveillance.

iii. Reporting of any new case within 14 days.

Polio booths are settled throughout the country to cover all the children below 5 years of age. Volunteers are hired to administer the polio vaccine.

OPV (Oral Polio Vaccine): OPV is an attenuated vaccine. It is produced by the passage of the virus through non-human cells at a sub-physiological temperature. This produces spontaneous mutation in the viral genome.

A single vial of OPV usually contains 10-20 doses.

On 27th March 2014, WHO declared India a polio-free nation as no new case was reported in the last 3 years.