Class XII Session 2023-24
Subject - Biology
Sample Question Paper – 10

Maximum Marks: 70 **Time: 3 Hours**

General Instructions:

(i) All questions are compulsory.
(ii) The question paper has five sections and 33 questions. All questions are compulsory.
(iii) 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.
(iv) 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.
(v) Wherever necessary, neat and properly labeled diagrams should be drawn.

SECTION-A

1. Which of the following is incorrect regarding vasectomy?
(a) No sperm occurs in seminal fluid.
(c) Vasa deferentia is cut and tied.
(b) No sperm occurs in epididymis.
(d) Irreversible sterility

2. Match the following columns and select the correct option.

	Column I		Column II
A.	Contraceptive pill	(i)	Prevents sperms reaching the female reproductive tract
B.	Condom	(ii)	Inhibits ovulation and implantation
C.	Vasectomy	(iii)	Increases phagocytosis of sperms
D.	Copper T	(iv)	Blocks gamete transport

(a) A-(iv), B-(i), C-(ii), D-(iii)
(b) A-(i), B-(ii), C-(iii), D-(iv)
(c) A-(ii), B-(i), C-(iii), D-(iv)
(d) A-(ii), B-(i), C-(iv), D-(iii)

3. In the double-helical structure of DNA, the pitch of the helix is
(a) 3.4 nm
(b) 0.34 nm
(c) 6.6 n
(d) 34 nm.

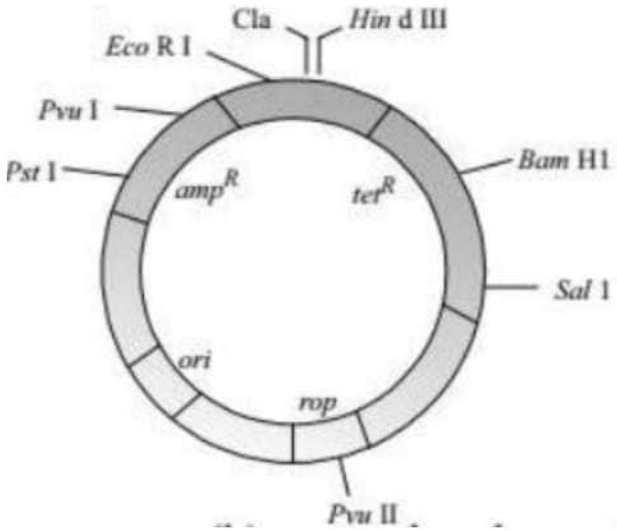
4. Replacement of the lighter-coloured variety of peppered moth (Biston betularia) to its darker variety (Biston carbonaria) in England is the example of
(a) natural selection
(b) regeneration
(c) genetic isolation
(d) temporal isolation.

5. Colostrum, the yellowish fluid, secreted by mother during the initial days of lactation is very essential to impart immunity to the new born infants because it contains
(a) immunoglobulin A
(c) monocytes
(b) natural killer cells
(d) macrophages.

6. The main reason why antibiotics could not always treat the bacteria mediated diseases is
(a) insensitivity of the individual following prolonged exposure to antibiotics
(b) inactivation of antibiotics by bacterial enzymes
(c) decreased efficiency of immune system
(d) the development of mutant bacterial strains resistant to antibiotics.

7. Which one of the following pairs is wrongly matched?
(a) Yeast Ethanol
(c) Coliform - Vinegar
(b) Streptomycetes - Antibiotic
(d) Methanogens - Gobar gas

8. The given figure is the diagrammatic representation of the E. coli vector pBR322. Which one of the given options correctly identifies its certain component(s)?



(a) ori-original restriction enzyme
(b) rop-reduced osmotic pressure
(c) HindIII, EcoRI - selectable markers
(d) amp, tet-antibiotic resistance genes

9. The birth and death rates of four countries are given below. Which one will have the least population growth rate?

Country	Birth rate/1000	Death rate / 1000
P	20	5
Q	15	3
R	50	18
S	48	41

(a) P
(b) Q
(c) R
(d) S

10. Cuscuta is an example of
(a) ectoparasitism
(b) brood parasitism
(c) predation
(d) endoparasitism.

11. Which one of the following animals may occupy more than one trophic levels in the same ecosystem at the same time?
(a) Sparrow
(b) Lion
(c) Goat
(d) Frog

12. World Summit on Sustainable Development, 2002 was held in
(a) Rio de Janeiro, Brazil
(b) Johannesburg, South Africa
(c) Dehradun, India
(d) New York, USA.

Question No. 13 to 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.

13. Assertion: In plants, apomixis is a form of asexual reproduction that mimics sexual reproduction.
Reason: Apomixis involves the production of seeds without the fusion of gametes.

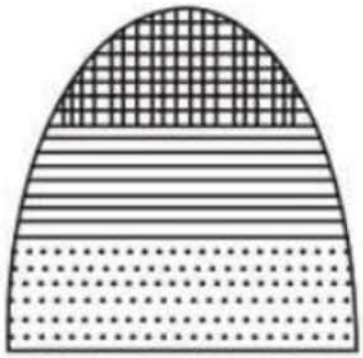
14. Assertion: In Mirabilis jalapa the pink coloured flowers appear in F_1 generation.
Reason: Pink colour is observed due complete suppression of white colour alleles in one of parental flowers by red colour alleles.

15. Assertion: GM plants are made tolerant to abiotic stress.
Reason: Golden rice is rich in B-carotene.

16. Assertion: Bell shaped age pyramid represents a stable population.
Reason: In a stable population, proportion of individuals in reproductive age group is higher than the individuals in pre-reproductive age group.

SECTION – B

17. What does the given age pyramid signify about the status of a population? (The bar at the base represents pre-reproductive individuals.)



18. How are sticky ends' formed on a DNA strand? Why are they so called?

19. With the help of an algebraic equation, how did Hardy-Weinberg explain that in a given population the frequency of occurrence of alleles of a gene is supposed to remain the same through generations?

20. How does a vaccine for a particular disease immunise the human body against that disease?

21. Why are copper containing intrauterine devices considered an ideal contraceptive for human females?

OR

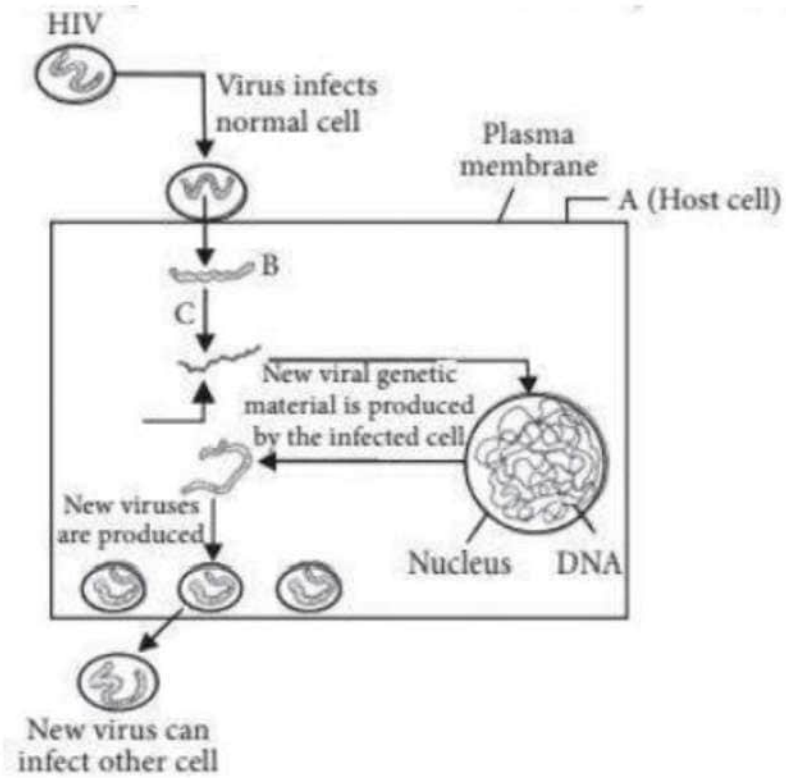
What is amniocentesis? How is it misused?

SECTION-C

22. Name the disorder humans suffer from as a result of monosomy of the sex chromosome. Give the karyotype and write the symptoms.

23. With the help of one example, explain the phenomena of co-dominance and multiple allelism in human population.

24. Study the diagram showing the entry of HIV into the human body and the process that follows.



(a) Name the human cells A, HIV enters into.
(b) Identify the genetic material (B) HIV releases into the cell.
(c) Identify enzyme C.

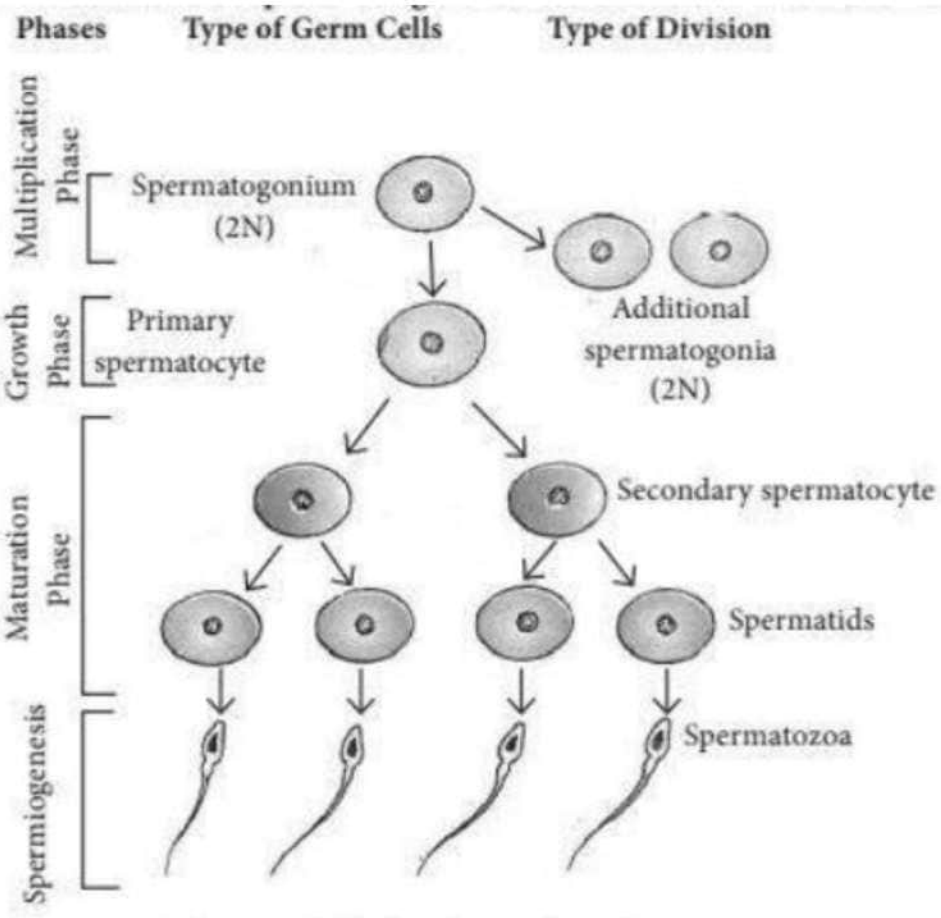
25. Explain the significance of palindromic nucleotide sequence' and restriction endonuclease in the formation of recombinant DNA.

26. Alien species are highly invasive and are a threat to indigenous species. Substantiate this statement with any three examples. Arti

OR

What are the two types of desirable approaches to conserve biodiversity? Explain with examples bringing out the difference between the two types.

27. Study the schematic representation of spermatogenesis and answer the following questions.



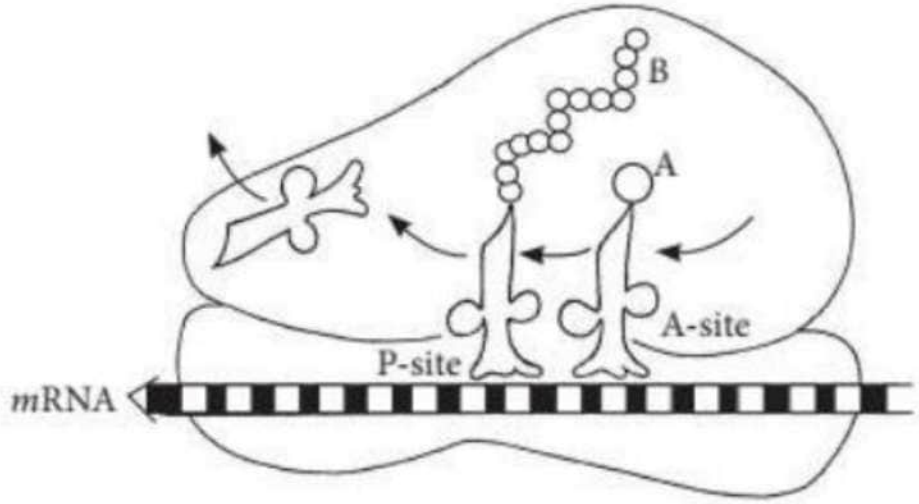
(a) Which cell division occurs during multiplication phase?
(b) How many chromosomes are present in secondary spermatocyte and spermatids respectively?
(c) Which hormone acts on spermatogonia to stimulate sperm production?

28. Differentiate between :
(i) Vasa efferentia and vas deferens
(ii) Spermatogenesis and spermiogenesis

SECTION – D

Q. No. 29 and 30 are case based questions. Each question has 3 subparts with internal choice in one subpart.

29. Observe the given figure and answer the following questions.



(a) Identify A and B in the given figure.

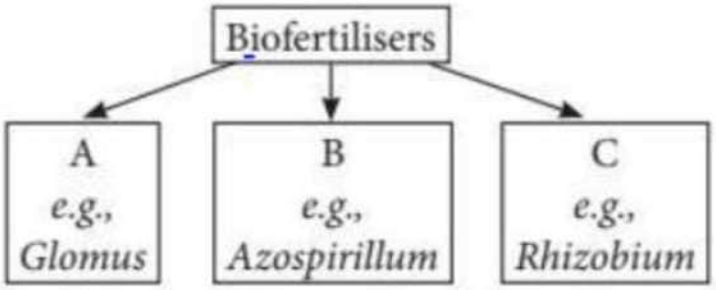
OR

Write the two specific codons that a translational unit of mRNA is flanked by one on either sides.

(b) State the functions of amino acyl (A) site and peptidyl transfer (P) site.

(c) How does elongation of B occur?

30. Study the given flow chart and answer the following questions.



(a) Identify A, B and C in the given flow chart.

(b) Give one another example of biofertiliser B.

(c) How does the application of the fungal genus, Glomus, to the agricultural farm increase the farm output?

OR

Why is Rhizobium act as a biofertiliser?

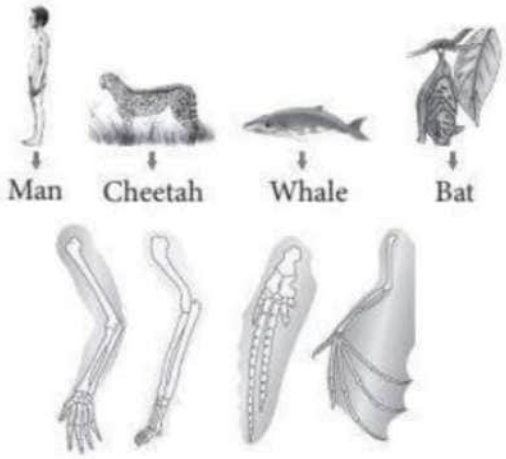
SECTION-E

31. Describe the roles of pituitary and ovarian hormones during the menstrual cycle in a human female.

OR

(i) Trace the development of megaspore mother cell up to the formation of a mature embryo sac in a flowering plant.
(ii) Draw a labelled diagram of the structure of mature dicot embryo.

32. (a) Forelimbs of given animals have the same basic structural plan. Such organs have similar developmental t pattern and they develop in related organisms, but these do differ morphologically. What type of to evolution and structure is exhibited by the organisms given in the figure.



(b) (i) Differentiate between analogy and homology giving one example each of plant and animal.
(ii) How analogy and homology considered as an evidence in support of evolution?

OR

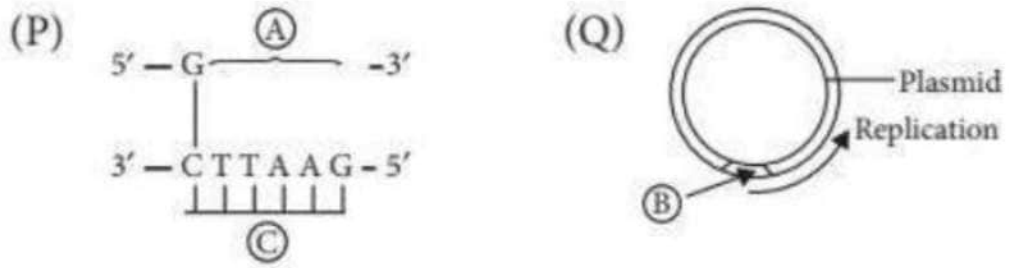
Refer to the given information regarding human evolution given below and answer the following questions. The fossil evidence clearly indicates that origin of man occured in Central Asia. About 15 mya, primates called Dryopithecus and Ramapithecus were existing. Among the stories of evolution, the story of evolution of modern man appears to parallel evolution of human brain and their charactristics development.
(a) Where did Australopithecus evolve?
(b) Write the scientific name of Java man.

(c) Name the first human like hominid. Mention his food habit and brain capacity.
(d) Write the characteristics of Ramapithecus and Neanderthal man.

33. (i) What is EcoRI? How does EcoRI differ from an exonuclease?
(ii) EcoRI is used to cut a segment of foreign DNA and that of a vector DNA to form a recombinant DNA. Show with the help of schematic diagrams.
(a) The set of palindromic nucleotide sequence of base pairs the EcoRI will recognise in both the DNA segments. Mark the site at which EcoRI will act and cut both the segments.
(b) Sticky ends formed on both the segments where the two DNA segments will join later to form a recombinant DNA.

OR

(i) (a) Identify and B illustrations in the following:



(b) Write the term given to A and C and why?
(ii) (a) Expand PCR. Mention its importance in biotechnology.
(b) Describe the roles of heat, primers and the bacterium Thermus aquaticus in the process of PCR.

SOLUTIONS

1. (b): Vasectomy is a surgical contraception method performed in males. In vasectomy, a small part of the vas deferens is removed or tied up through a small cut on the scrotum. This prevents sperm transport. Vasectomy has a poor reversibility. Seminal vesicles are one pair of sac like structures which join vasa deferentia to form ejaculatory duct. They secrete seminal fluid which contains fructose, prostaglandins and clotting protein, but no sperms. In a male who has undergone vasectomy, the ejaculatory duct will receive seminal fluid but due to cut in vasa deferentia sperms will not be transported from epididymis hence the semen will lack sperms.

2. (d)

3. (a) In B-DNA, one turn of the spiral has about 10 nucleotides on each strand of DNA. It occupies a distance of about 3.4 nm (34Å) so that adjacent nucleotides or their bases are separated by a space of about 0.34 nm (3.4 Å).

4. (a) In England, before industrialisation in 1860, it was observed that there were more white-winged moths on tree trunks than dark-winged or melanised moths. But after industrialisation in 1920, there were more dark-winged moths in the same area. This is because before industrialisation, the tree trunks were covered by white-coloured lichens. In that background, the white-winged moths survived but the dark-winged moths were eaten by predators. During post industrialisation period, the tree trunks became dark due to industrial smoke and soot. Therefore, the white winged moths could not survive due to attacks by predators but dark-winged moths survived, i.e., the moths that were hidden in background survived. Thus, industrial melanism supports evolution by natural selection.

5. (a) Colostrum (Mother's first milk) rich in immunoglobulin A (IgA) antibodies are passed to newborn through the breast feed and provides natural passive immunity.

6. (d): In response to antibiotics, bacteria develop mutant strains that become resistant to the antibiotics. Thus, these antibiotics become incapable against bacterial mediated diseases.

7. (c) Coliform bacteria are commonly used

bacterial indicator of sanitary quality of food and water. It is not involved in the production of vinegar.

8. (d): In pBR322, ori-represents site or origin of replication, rop-codes for proteins that take part in the replication of plasmid. Hind III, EcoRI- recognition sites of restriction endonucleases. amp and tet. antibiotic resistance genes.

9. (d): Growth rate = Birth rate - death rate For country P, it is 15/1000. For country Q, it is 12/1000. For country R, it is 32/1000 and for country S, it is 7/1000. Hence, country S has the least population growth rate.

10. (a): Cuscuta is a total stem parasite which is a good example of ectoparasitism. It is commonly found growing on hedge plants. It has lost chlorophyll and leaves in the course of evolution. It attaches and wraps itself around the stem of host plant and produces haustoria that gets inserted into the vascular system of host. The parasitic plant sucks all the nutrients from the host plant with the help of haustoria. Cuscuta is known to receive even the flower inducing hormone or florigen from the host.

11. (a) Sparrow can be herbivorous (eating seeds and fruits) or carnivorous (eating insects).

12. (b) The World Summit on Sustainable Development, 2002 was held in Johannesburg, South Africa. In this summit 190 countries pledged their
commitment to achieve a significant reduction in the current rate of biodiversity loss at global, regional and local levels by 2010.

13. (a)

14. (c) : The pink coloured flower appear in F_1 generation due to incomplete dominance of red (dominant) over white (recessive).

15. (b)

16. (c): In a bell-shaped age pyramid, the number of pre-reproductive and reproductive individuals is almost equal. Post-reproductive individuals are comparatively fewer. It represents a stable population.

17. Given figure is of bell-shaped age pyramid which signifies that the population is stable. Such age pyramid is formed when the number of pre-reproductive and reproductive individuals is almost equal and the post- reproductive individuals are comparatively fewer. It implies that the population is neither decreasing nor increasing, instead is maintained at a stable level.

18. When restriction enzymes cut the strand of DNA a little away from the centre of the palindromic sites, between the same two bases on the opposite strands, it leaves single stranded portions at the ends. This forms overhanging stretches called sticky ends on each strand. They are called sticky as they form hydrogen bonds with their complementary cut counterparts. The stickiness of the ends facilitates the action of the
enzyme DNA ligase.

19. Hardy-Weinberg principle stated that allele frequencies in a population are stable and is constant from generation to generation. The gene pool, i.e.,
total genes and their alleles in a population remains constant. This is called genetic equilibrium. Sum total of all the allelic frequencies is 1. Individual frequencies, for example, can be named 'p', 'q, etc. In a diploid organism, 'p' and 'q' represent the frequency of allele 'A' and allele a. The frequency of AA' individuals in a population is simply p^2. This is simply stated in another ways, i.e., the probability that an allele A with a frequency of 'p' appear on both the chromosomes of a diploid individual is simply the product of the probabilities, i.e., p. Similarly of 'aa' is 'q, of 'Aa' '2pq. Hence, $p^2+2pq+q^2= 1$. This is a binomial expansion of (p + q). When the measured frequency differs from expected values, the difference (direction) indicates the extent of evolutionary change. Disturbance in genetic equilibrium, or Hardy-Weinberg equilibrium, i.e., change of frequency of alleles in a population would then be interpreted as resulting in evolution.

20. Vaccine is suspension or extract of weakened (attenuated/dead) pathogens of disease which when injected into healthy person provides active acquired immunity against the disease. Vaccination stimulates the antibody production and formation of memory cells without causing the disease. This protects the human body by neutralising the pathogenic agents during infection.

21. Copper containing intrauterine devices (CuT, Cu7, etc) are considered effective contraceptives for human females as the Cu ions released by them
suppress sperm motility and fertilising capacity of the sperms. Hence, they act as effective birth control method.

OR

Amniocentesis is withdrawal of amniotic fluid surrounding a fetus in the uterus by piercing the amniotic sac. The amniotic fluid contains cells from the fetus. Amniocentesis is a prenatal diagnostic technique used to determine sex and metabolic disorder of an unborn fetus. This technique is often misused to kill normal female fetuses.

22. Turner's syndrome is a disorder caused due to the absence of one of X chromosomes (monosomy) where the individual has 22 pairs of autosomes and XO sex chromosomes i.e., 45 chromosomes. So, the karyotype will be 44 +XO. Symptoms: (i) Sterile females
(ii) Rudimentary ovaries
(iii) Lack of secondary sexual characters
(iv) Webbed neck and broad chest
(v) Underdeveloped breasts

23. In the ABO system, there are four blood groups A, B, AB and O. ABO blood groups are controlled by gene I. The gene I has three alleles 1A, 15 and i. When more than two alleles govern the same character, offspring resulting from it phenomenon is known as multiple allelism. 14 and 1B are completely dominant over i. When 1 and 18 are present together they both express themselves in the presence of each other and produce blood group AB. This shows the phenomenon of co-dominance.

24. (a) HIV enters into macrophages (A).
(b) B is viral RNA.
(c) Enzyme C is reverse transcriptase.

25. Palindromic nucleotide sequences are base pair sequences that are the same when read forward (left to right) or backward (right to left) from a central axis of symmetry. This special sequence in the DNA is recognised by restriction endonuclease (endonucleases are restriction enzymes that make cuts at specific positions within the DNA) and once restriction endonuclease recognises this specific palindromic sequence, it binds to the DNA and cuts each of the two strands of the double helix at specific points in their sugar phosphate backbone. Restriction enzymes cut the strand of DNA a little away from the centre of the palindrome sites but between the same two bases of the opposite strands. This leaves single stranded unpaired bases at cut ends. These ends with unpaired bases are called sticky ends or cohesive ends. The latter are named so because they form hydrogen bonds with their complementary cut counter parts. The sticky ends facilitate the action of
the enzyme DNA ligase.

26. Non-native or alien species are often introduced inadvertently by man for their economic and other uses. They often become invasive and drive away the local species. For example:
(i) Water hyacinth (Eichhornia crassipes) was introduced in Indian waters to reduce pollution but it turned out to be a problematic species. It has clogged water bodies including wetlands at many places resulting in death of several aquatic plants and animals.
(ii) Nile Perch (a predator fish) was introduced in lake Victoria of East Africa. It killed and eliminated ecologically unique assemblage of over 200 native species of small cichlid fish.
(iii) African catfish Clarias gariepinus introduced for aquaculture in India pose threat to indigenous catfishes.

OR

Conservation of biodiversity is protection, uplift and scientific management of biodiversity so as to maintain it at its optimum level and derive sustainable benefits for the present as well as future generations. There are two types of conservation strategies - in situ (on site) and ex situ

(offsite). In situ conservation is conservation and protection of the whole ecosystem and its biodiversity at all levels in their natural habitat in order to protect the threatened species. It involves hotspots and protected areas. Hotspots are areas of high endemism and high level of species richness. Protected areas are ecological/ biogeographical areas where biological diversity along with natural and cultural resources is protected, maintained and managed through legal or other effective measures. Protected areas include National parks, sanctuaries and biosphere reserves. Ex-situ conservation is conservation of threatened plants and animals in places outside their natural homes under full protection and supervision. It includes offsite collections and gene banks.

27. (a) In multiplication phase, the undifferentiated primordial germ cells divide several times by mitosis to produce large number of spermatogonia.

(b) Both secondary spermatocyte and spermatids are haploid. Thus, both contains 23 chromosomes.

(c) FSH acts on spermatogonia to stimulate sperm production.

28. (i) Differences between vasa efferentia and vas deferens are as follows:

S.No.	Vasa efferentia	Vas deferens
(i)	They arise from the rete testis.	They arise from the cauda epididymis.
(ii)	They vary from 15 to 20 in number.	They are only 2 in number.
(iii)	Vasa efferentia are fine.	Vas deferens are thick.
(iv)	Their lining bears many ciliated cells.	Their lining has many stereocilia.
(v)	It carries spermatozoa from the rete testis to the epididymis.	It carries spermatozoa from cauda epididymis to the ejaculatory duct.

(ii) Differences between spermatogenesis and spermiogenesis are as follows:

S.No.	Spermatogenesis	Spermiogenesis
(i)	It is the process of formation of haploid spermatozoa from germinal cells.	It is the process of differentiation of spermatozoon from a spermatid.
(ii)	It involves conversion of a diploid structure into haploid structures.	It changes a haploid structure into another haploid structure.

(iii)	There is growth and divisions during spermatogenesis.	There is reconstruction during spermiogenesis. Divisions and growth are absent.
(iv)	No organelle is lost.	Golgi bodies are lost during spermiogenesis.
(v)	A spermatogonium forms four spermatozoa.	Here a spermatid forms a single spermatozoon.

29. (a) In the given figure, 'A' is amino acid and 'B' is peptide chain.

OR

The two specific codons are initiation codon on one side (AUG or GUG) and termination codon (UAA, UAG or UGA) on the other side of mRNA.

(b) A-site or aminoacyl or acceptor site is situated on the larger subunit of ribosome. It faces the tunnel between the two subunits. P-site or peptidyl transfer or donor site is jointly contributed by the two ribosomal subunits.

(c) An aminoacyl tRNA complex reaches the A-site and attaches to mRNA codon next to initiation codon with the help of its anticodon. This step requires GTP and elongation factor. A peptide bond (-CO-NH-) is established between the carboxyl group of amino acid attached to tRNA at P-site and amino group of amino acid attached to tRNA at A-site. In the process, the connection between tRNA and the amino acid at the P-site breaks. The free tRNA of the P-site slips to E-site and from there to the outside of ribosome with the help of G-factor. The A-site carries peptidyl tRNA complex. After the establishment of first peptide linkage and slipping of the freed tRNA, the ribosome rotates slightly, as a result the A-site codon alongwith peptidyl-tRNA complex reaches the P-site. A new codon is exposed at the A-site. The process of bond formation and translocation is repeated.

30. (a) In the given flow chart A represents mycorrhiza, B represents free living nitrogen fixing bacteria and C represents symbiotic nitrogen fixing bacteria.

(b) Azotobacter is free living nitrogen fixing bacteria.

(c) Many members of the genus Glomus form symbiotic associations with plants to form mycorrhiza. Glomus helps to absorb phosphorus from soil and passes it to the plant. Plants having such associations show other benefits also, such as resistance to root- borne pathogens,

tolerance to salinity and drought and an overall increase in plant growth and development. Therefore, Glomus increases the farm yield.

OR

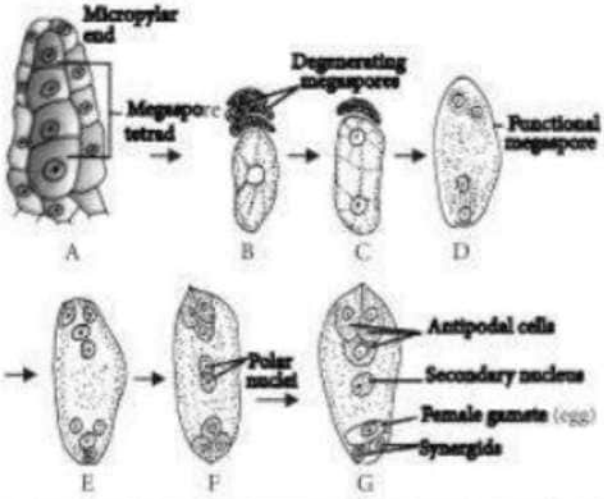
Rhizobium is a soil bacterium which either lives freely in soil or lives in symbiotic association with roots of leguminous plants. The bacterium forms nodules or roots of leguminous plants where it lie in groups. When it occurs freely in soil, it cannot fix nitrogen. Nitrogen fixing ability develops only when it is present inside root nodules. Hence, Rhizobium is categorised as symbiotic bacterium. It acts as a biofertiliser as it helps plants in obtaining their nitrogen nutrition.

31. Menstrual cycle in a human female consists of menstrual phase, proliferative phase (follicular phase), ovulatory phase and secretory phase (luteal phase). Days 1-5 of the cycle are known as the menstrual phase. During this phase, menstruation occurs. At the beginning of this stage, levels of progesterone and estrogen have dropped dramatically because of the degeneration of the last cycle's corpus luteum. This triggers the shedding of endometrium. The detached portion of the endometrium as well as blood will pass through the vagina as the menstrual flow. Days 5-14 are known as the proliferative phase. Proliferative phase consists of growth of endometrium of uterus, Fallopian tube and vagina. In ovary, a Graafian follicle grows, matures and secretes estrogen during this phase. The endometrium grows thicker and becomes more vascularised and glandular. Change in the levels of pituitary and ovarian hormones bring about these changes in the ovary and uterus. The levels of LH and FSH increase gradually during the follicular phase and stimulate follicular development as well as secretion of estrogens by the growing follicles. In ovulatory phase, both LH and FSH attain a peak level in the middle of cycle (about 14th day). Rapid secretion of LH leading to its maximum level during the mid- cycle called LH surge induces rupture of Graafian follicle and thereby the release of ovum (ovulation). After ovulation and in response to luteinising hormone, the portion of the Graafian follicle that remains in the ovary enlarges and is transformed into a corpus luteum containing yellow substance (called lutein) and the luteal phase begins. The corpus luteum secretes large amounts of progesterone which is essential for maintenance of endometrium. Such an endometrium is necessary for implantation of the fertilised ovum and other events of pregnancy. In the absence of fertilisation, the corpus luteum degenerates. This causes disintegration of the endometrium leading to menstruation, marking a new cycle.

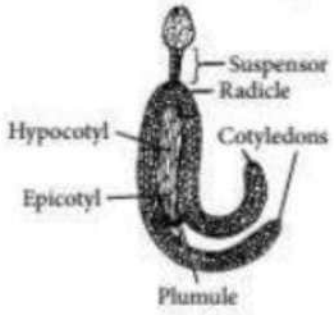
OR

(i) In an ovule, a large cell containing, dense cytoplasm and prominent nucleus in micropylar region functions as megaspore mother cell (MMC). The MMC undergoes meiotic division and

produce four haploid megaspores. One of the megaspore remains functional while other three degenerate. The functional megaspore is the first cell of female gametophyte or embryo sac. The nucleus of megaspore divides by mitosis into eight daughter nuclei. Out of eight nuclei two polar nuclei remains in centre. Three nuclei move towards base of embryo sac and the remaining three nuclei at the micropylar end. After eight nucleate stage cell walls are laid down leading to the organisation of typical embryo sac of female gametophyte. Different stages in the formation of embryo sac from functional megaspore are represented diagrammatically as follows:



(ii) Diagram of a mature dicot embryo is as follows:



32. (a) The forelimbs of these vertebrates have the same basic structural plan with different functions and shape. They are a result of divergent evolution. Forelimbs of given vertebrates indicates homologous type of structures.

(b) (i) The differences between homology and analogy are as follows:

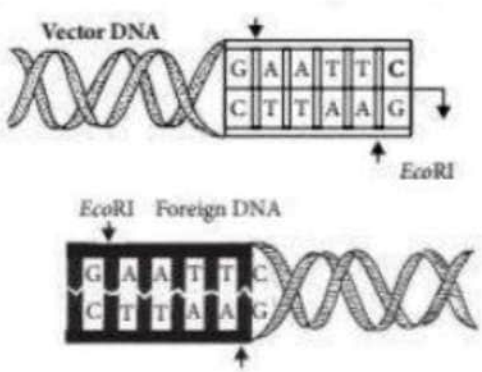
S.No.	Homology	Analogy
(i)	Homology is the similarity between organs of different animals based on common ancestry or common embryonic origin and built on same fundamental pattern, but perform varied functions and have different appearance.	Analogy is almost similar appearance of organs performing similar function but develop in totally different groups and have totally different basic structure and developmental origin.
(ii)	It illustrates divergent evolution.	It illustrates convergent evolution.
(iii)	Thorns of *Bougainvillea* and tendrils of *Cucurbita* are examples of homology in plants. They are anatomically stems but perform different functions.	The tendrils of grapevine and pea are examples of analogy in plants. Tendrils of pea are leaf modifications whereas in grapevine is modification of terminal bud.
(iv)	The fore-limbs of man and cheetah, have same anatomical structure, each consisting of humerus, radius-ulna, carpals, metacarpals and phalanges but perform different functions. In man they are used for grasping and in cheetah for running.	The wings of butterfly and bird serve the same purpose of flying but their basic structure is totally different.

(ii) Both homologous and analogous organs provide concrete evidence in support of evolution. Homology, indicates common ancestry, or common embryonic origin. Analogy shows that evolution of similar adaptive features in different groups of organisms is due to similar habitat.

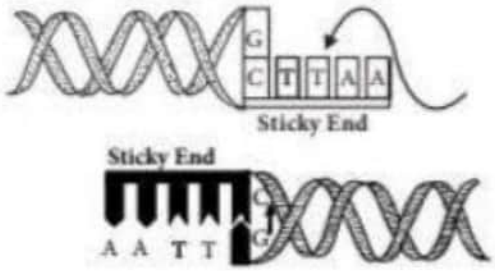
OR

(a) East Africa
(b) Homo erectus
(c) Homo habilis were first human like hominid. They probably did not eat meat and their brain capacities were between 650-800 c.c.
(d) The characteristics of Ramapithecus are as follow:
(i) They were primates that existed about 15 mya.
(ii) They were more man-like and perhaps walked erect on hind feet.
Characteristics of Neanderthal man:
(i) They lived in east and central Asia between
1,00,000 to 40,000 years back.
(ii) They possess a brain capacity of 1400 c.c.
(iii) They used hides to protect their body and bury their dead.

33 (1) EcoRI is a restriction endonuclease enzyme it
5'-GAATTC-3' 3'-CTTAAG-5' in DNA recognises base sequences duplex and cuts each of the two strands between G and
A. On the other hand, exonuclease remove nucleotide from the terminal ends of DNA in one strand of duplex. Hence, EcoRI cut each of the two strand of
DNA duplex at specific point whereas exonuclease remove nucleotide from the terminal ends (either 5' or 3') of DNA in one strand of duplex.
(ii) (a) Segments of a vector and a foreign DNA with the sequence of nucleotide recognised by EcoRI.



(b) Vector DNA segment and foreign DNA segment after the action of EcoRI.



(i) (a) A represents sticky end. B is a foreign DNA inserted into a vector.
(b) A and C are called palindromes because they are complementary strands of DNA and read the same in both directions, either from the 5-prime end or
3-prime end.
(ii) (a) PCR strands for polymerase chain reaction. It is used to amplify a segment of DNA or a gene of interest in vitro.
(b) In the process of PCR (polymerase chain reaction), the role of heat, primer and Thermus aquaticus is as follows:
(i) Heat - This step is known as denaturation. In this, the target DNA is heated to a high temperature (94° to 96°C) resulting in the separation of two strands.
(ii) Primer : In this step, i.e., annealing, the two oligonucleotide primers anneal to each of the ssDNA template since the sequence of the primers is complementary to the 3′ ends of the template DNA. Presence of primer is important for polymerisation to take place. Temperature (40°C-60°C) is kept low depending on the length and sequence of primers.
(iii) Thermus aquaticus: It is a source of thermostable DNA polymerase (Taq polymerase). It is used in the final step of PCR called polymerisation. This helps in synthesis of DNA region between the primers, using deoxynucleoside triphosphates and Mg2+.