

SAMPLE Question Paper 6

(Questions-Answers)*

BIOLOGY

A Highly Simulated Practice Question Paper for
CBSE Class XII Examination

Time : 3 hrs

Max. Marks : 70

General Instructions

1. All questions are compulsory.
2. The question paper has four sections: Section A, Section B, Section C and Section D. There are 33 questions in the question paper.
3. Section-A has 14 questions of 1 mark each and 2 case-based questions. Section-B has 9 questions of 2 marks each. Section-C has 5 questions of 3 marks each and Section-D 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 labelled diagrams should be drawn.

SECTION A

(1 Mark)

1. What is the genotype of a person with Turner's syndrome? $(45+XO)$ ♀
2. At which level does the control of gene expression takes place? transcription.
3. What are transgenic animals? Give an example.
4. What happens during annealing in polymerase chain reaction?
5. What is genetic diversity in biosphere?
6. Name the source organism of the gene cry IAc and its target pest. *Bacillus thuringiensis* & cotton
7. Mention the information that the health workers derive by measuring BOD of a water body.
8. How does smoking tobacco in human lead to oxygen deficiency in their body?
9. Give an example of polygenic trait in humans.
10. Name the kind of virus Hershey and Chase worked with in their experiment and why?

* You are advised to attempt this sample paper without referring the explanations given here. However, cross check your explanations with the explanations given at the end of paper after you complete the paper.

Direction (Q. Nos. 11-14)

In each of the following questions, a statement of Assertion (A) is given followed by corresponding statement of Reason (R). Of the statements, mark the correct answer as

- (a) If both A and R are true and R is the correct explanation of A
- (b) If both A and R are true, but R is not the correct explanation of A
- (c) If A is true, but R is false
- (d) If both A and R are false

11. Assertion (A) Introduction of sex education in schools should be encouraged.

Reason (R) Sex education in schools will encourage children to believe in myths about sex related aspects.

12. Assertion (A) Turner's syndrome is caused due to the absence of the X chromosome.

Reason (R) Such individuals have rudimentary ovaries and lack secondary sexual characteristics.

Or

Assertion (A) The mechanism of DNA replication is semiconservative in nature.

Reason (R) Each of the complementary strands of the parental double helix is conserved during the process.

13. Assertion (A) IgG is the most abundant class of Igs in the body.

Reason (R) IgG is mainly found in sweat, tears, saliva, mucus, colostrum and gastro-intestinal secretions.

14. Assertion (A) Tropical regions have got a long evolutionary time for species diversification as compared to temperate regions.

Reason (R) Temperate regions have undergone frequent glaciations in the past whereas tropical regions have remained relatively undisturbed for million years.

15. Direction Read the following and answer any **four** questions from 15(i) to 15(v) given below

Selectable marker is a gene, which helps in selecting transformed host cells and eliminating non-transformants. The process of the selection of recombinants from non-recombinants occurs as the transformants containing tetracycline resistant gene are plated on an ampicillin containing medium. The mixture is then transferred on a medium containing antibiotic tetracycline. The recombinants will form colonies in ampicillin medium, but will not form colonies in tetracycline medium. The non-recombinants will grow on both the mediums thus separating out recombinants from non-recombinants. An alternative method used for the selection of transformed cell is known as insertional inactivation.

- (i) When an alien DNA is ligated in tetracycline resistant gene, the recombinant
 - (a) become tetracycline resistant
 - (b) will loose tetracycline resistant
 - (c) will remain same
 - (d) None of the above
- (ii) In insertional inactivation the recombinant DNA is inserted within the coding sequence of
 - (a) β -galactosidase
 - (b) tetracycline resistant gene
 - (c) restriction enzyme
 - (d) ampicillin resistant gene
- (iii) Recombinant colonies in insertional inactivation are differentiated on the basis of
 - (a) production of blue colour
 - (b) production of no colour
 - (c) production of red colour
 - (d) production of green colour
- (iv) Which of the following is/are function(s) of a selectable marker?
 - (a) Provides resistance against a substrate
 - (b) Inhibits the growth of normal cell in a culture
 - (c) Helps to create a chromosome map
 - (d) Both (a) and (b)

(v) **Assertion (A)** Selection of recombinants due to inactivation of antibiotics is cumbersome procedure.

Reason (R) It requires simultaneous plating on two plates having different antibiotics.

- (a) If both A and R are true and R is the correct explanation of A
- (b) If both A and R are true, but R is not the correct explanation of A
- (c) If A is true, but R is false
- (d) If both A and R are false

16. **Direction** Read the following and answer any **four** questions from 16(i) to 16(v) given below

A codon is a trinucleotide sequence of DNA or RNA that corresponds to a specific amino acid. The genetic code describes the relationship between the sequence of DNA bases (A, C, G and T) in a gene and the corresponding protein sequence that it encodes. The cell reads the sequence of the gene in groups of three bases. There are 64 different codons out of which 61 specify amino acids while the remaining three are used as stop signals.

So, each sequence of three codes for an amino acid and proteins are made up of sometimes hundreds of amino acids. So the code that would make one protein could have hundreds, sometimes even thousands of triplets contained in it.

- (i) Degeneracy refers to
 - (a) one amino acid has more than one code triplet
 - (b) one amino acid has only one code triplet
 - (c) codons which specify the same amino acids differ only in the third base of the triplet
 - (d) Both (a) and (c)

- (ii) Codons are non-ambiguous, which means that one codon codes for
 - (a) more than one amino acids
 - (b) two amino acid
 - (c) only one amino acid
 - (d) non-sense amino acid
- (iii) The features of genetic code that allow bacteria to produce human insulin by recombinant DNA technology is
 - (a) genetic code is redundant
 - (b) genetic code is nearly universal
 - (c) genetic code is specific
 - (d) genetic code is not ambiguous
- (iv) The codons of glycine are
 - (a) CCU, CCC, CCA, CCG
 - (b) CGU, CGC, CGA, CGG
 - (c) GGU, GGC, GGA, GGG
 - (d) ACU, ACC, ACA, ACG
- (v) Read the sequence of nucleotide in the given segment of *mRNA* and the respective amino acid sequence in the polypeptide chain to answer the question as follows.

mRNA AUG UUU AUG CCUGUU UCU UAA
 polypeptide Met—Phe—Met—Pro—Val—Ser

Following conclusion can be made from this.

- I. The nucleotide sequence of the DNA strand from which this *mRNA* was transcribed is TAC AAU TAC GCA CAA AGA ATT.
- II. Codes for proline and valine are CCU and GUU, respectively.
- III. AUG is also known as start codon.
- IV. UAA does not code any amino acid.
 - (a) I and II are incorrect
 - (b) III and IV are correct
 - (c) I and IV are incorrect
 - (d) I, II and III and IV are correct

SECTION B

(2 Marks)

17. The female fruitfly and the male fowl are homogametic while the male fruitfly and female fowl are heterogametic, suggest why are they called so?

18. Alien species are known to be highly invasive and are considered as a threat to the indigenous species of an area. Substantiate this statement with any two examples.

19. A mature embryo sac in a flowering plant may possess 7-cells, but 8-nuclei. Explain with the help of a diagram only.

20. Write the location and function of the seminal vesicle.

Or

List the different parts of human oviduct through which the ovum travels till it meets the sperm for fertilisation.

21. How is the length of DNA usually calculated?

Or

Describe the structure of a nucleosome.

22. Differentiate between insulin produced by rDNA and insulin produced by pancreas.

23. What is triple fusion? Where and how does it take place? Give the name of nuclei involved in triple fusion. What is the product of this process?

24. Explain why the use of tobacco in any form is considered to be injurious to health.

25. An infertile couple is advised to adopt test-tube baby programme. Describe the two principle procedures adopted for such technologies.

SECTION C

(3 Marks)

26. Give any three adaptive features of plants and animals found in arid (desert) areas.

Or

Give reason for the following.

(i) *Penicillium* does not allow the growth of *Staphylococcus* bacterium on a culture plate.

(ii) Sucker fish (*Echeneis*) attaches itself to the under surface of the shark with the help of its dorsal fin, modified as a hold fast.

(iii) Lichens represent an intimate relationship between a fungus and photosynthetic algae or cyanobacteria.

27. Explain the role of the type of lymphocytes involved in cell-mediated immunity.

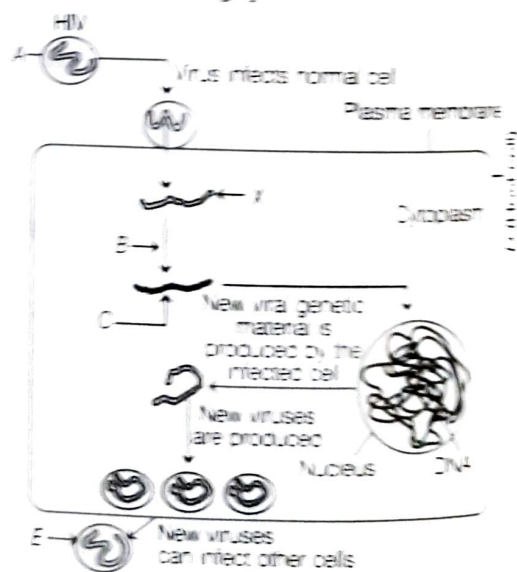
28. *Eco* RI is used to cut a segment of foreign DNA and that of the vector DNA to form recombinant DNA. Show the following with the help of schematic diagrams.

(i) The site at which *Eco* RI act and cut both the segments.

(ii) Sticky ends formed on both the segments where the two DNA segments join to form a recombinant DNA.

29. Antibiotics are regarded as one of the most significant discoveries of the twentieth century. These have greatly contributed towards the welfare of the human society. Analyse and compile a report on how the discovery of antibiotics has helped mankind in the field of medicine.

30. Study the diagram showing replication of HIV in humans and answer the questions accordingly.



- (i) Write the chemical nature of the coat A. Also name the enzyme B that acts on B to produce molecule C. Give the name of molecule C.
- (ii) Mention the name of the host cell D the HIV attacks first when it enters into the human body.

SECTION D

(5 Marks)

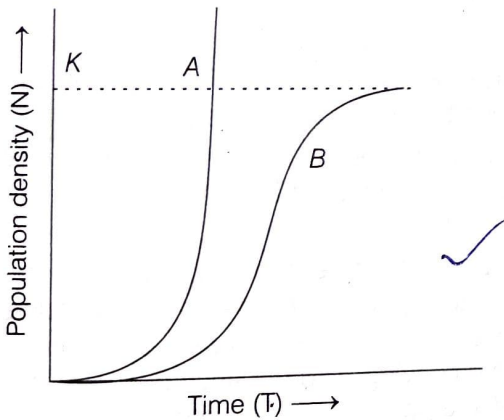
31. Explain the processes which help the sperms to gain entry into the female oocyte during fertilisation. Mention the significance of the point of entry of the sperm.

Or

(i) Plan an experiment and prepare flowchart of the steps that you would follow to ensure that the seeds are formed only from the desired sets of pollen grains. Name the type of experiment that you carried out.

(ii) Write the importance of such experiments.

32. Study the graph given below and answer the questions that follows



(i) Write the status of food and space in the curves A and B.

(ii) In the absence of predators, which one of the two curves or growth models would appropriately depict the prey population?

(iii) According to you which growth curve is more realistic and why?

(iv) Among the growth curves mentioned which one you will apply to represent the population growth for the present scenario?

Or

(i) Why are herbivores considered similar to predators in the ecological context? Explain.

(ii) Differentiate between the following interspecific interactions in a population.

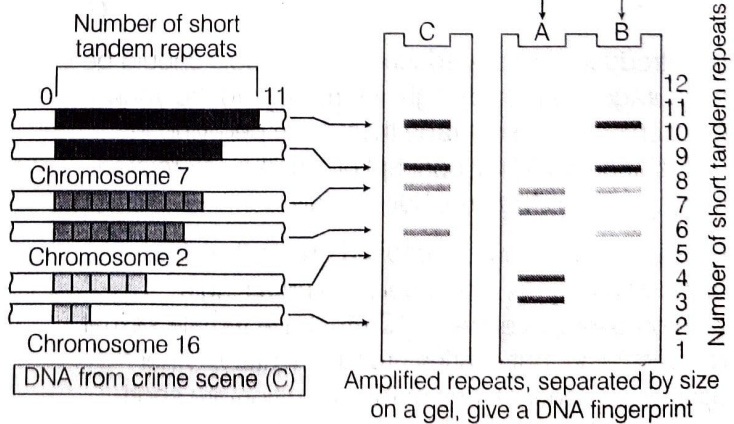
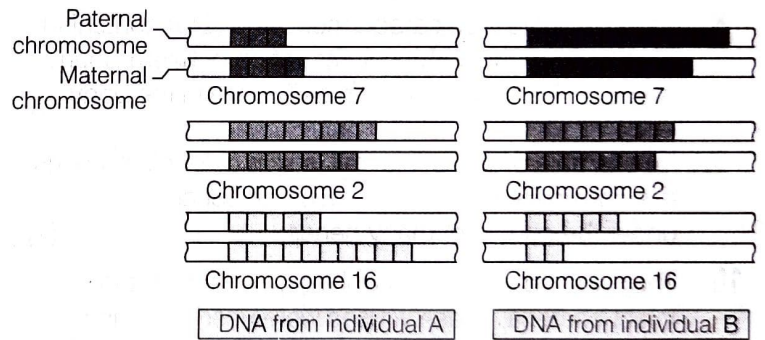
(a) Mutualism and competition

(b) Commensalism and amensalism

33. (i) A non-haemophilic couple was informed by their doctor that there is the possibility of a haemophilic child to be born to them. Explain the basis on which the doctor conveys this information. Give the genotypes and the phenotypes of all the possible children who could be born to them.

(ii) Human females are rarely haemophilic. Comment.

Or



The above given figure shows a very widely used technique for paternity disputes. Explain this technique.

EXPLANATIONS

1. The genotype of a person with Turner's syndrome is $44 + XO$. (1)
2. Control of gene expression takes place at the level of transcription. (1)
3. Animals with manipulated DNA to possess and express an extra (foreign) gene are known as transgenic animals, e.g. transgenic rats, rabbits, pigs, etc. (1)
4. Annealing is carried out by two sets of primers, which are added in the polymerase chain reaction. They anneal to the 3' end of each separated strand. (1)
5. Genetic diversity refers to the diversity of genes within a species. For example, there are more than 5000 genetically different strains of rice in India. (1)
6. Source of gene *cry IAc* is *Bacillus thuringiensis* and its target pest is cotton bollworm. (1)
7. BOD value indicates the polluting potential of water body. It can be used to determine whether water is fit for use or not. It is also used in sewage treatment plants. (1)
8. Smoking increases carbon monoxide (CO) content in blood and reduces the concentration of haem-bound oxygen. This causes oxygen deficiency in the body. (1)
9. An example of polygenic trait is skin colour in humans. It is considered to be polygenic trait because it is under the control of many genes. (1)
10. They worked with bacteriophage, i.e. viruses that infect bacteria. These viruses were used because during infection, they transfer their genetic material into bacteria. (1)
11. (c) Introduction of sex education in schools should be encouraged to provide right information to the young children and to discourage them from believing in myths and having misconceptions about sex-related aspects. Thus, A is true, but R is false. (1)
12. (a) Turner's syndrome is caused due to the absence of X-chromosome. Individuals having a single X-chromosome, i.e. $2A + XO$ (45) have female sexual differentiation, but ovaries are rudimentary. Other associated phenotypes of this condition are short stature, webbed neck, broad chest, lack of secondary sexual characteristics and sterility. Thus, both A and R are true and R is the correct explanation of A. (1)
Or
(a) DNA replication is semiconservative, a type of replication in which one strand of the daughter's duplex is derived from the parent, while the other strand is newly synthesised. Thus, A and R are true and R is the correct explanation of A. (1)
13. (c) IgG is the most abundant class of Igs in the body, constituting approximately 80% of the total Igs. It is found in the body, lymph and intestine. IgA is mainly found in sweat, tears, saliva, mucus, colostrum and gastro-intestinal secretions. Thus, A is true, but R is false. (1)
14. (a) Speciation is a function of time. Temperate regions have undergone frequent glaciations in the past due to which many species had been killed. However, tropical latitudes have remained relatively undisturbed for millions of years and thus, had a long evolutionary time for species distribution. Thus, both A and R are true and R is the correct explanation of A. (1)
15. (i) (b) When an alien DNA is ligated in tetracycline resistant gene, the recombinant will lose tetracycline resistant gene. (1)
(ii) (a) In insertional inactivation, the recombinant DNA is inserted within the coding sequence of the enzyme β -galactosidase. This results into inactivation of the gene synthesising this enzyme. (1)
(iii) (b) Recombinant colonies in insertional inactivation are differentiated on the basis of production of no colour. As recombinant produces no colour and non-recombinant gives blue colour in the presence of chromogenic substrate. (1)
(iv) (d) A selectable marker provides resistance against a substrate and inhibits the growth of normal cell in a culture. (1)
(v) (a) Selection of recombinants due to inactivation of antibiotics is a cumbersome procedure, because it requires simultaneous plating on two plates having different antibiotics. So, alternative selectable markers are developed which differentiate recombinants from non-recombinants on the basis of their ability to produce colour in the presence of a chromogenic substrate. Thus, both Assertion and Reason are true and Reason is the correct explanation of Assertion. (1)
16. (i) (d) Degeneracy refers to the fact that one amino acid has more than one code triplet and the codons which specify the same amino acids differ only in the third base of the triplet, e.g. both CAC and CAU code for the amino acid histidine. (1)
(ii) (c) Codons are non-ambiguous which means that one codon codes for only one amino acid. (1)
(iii) (b) Bacteria is able to produce human insulin because genetic code is nearly universal in all organism. For example, the codon AGG specifies amino acid arginine in bacteria, animals and plants. (1)
(iv) (c) The codons of glycine are GGU, GGC, GGA and GGG. (1)
(v) (d) All conclusions are correct for the given nucleotide sequence forming a polypeptide chain. (1)

17. It is due to the different types of sex-determination pattern in both cases.
In the first case, the female fruitfly has XX, while the male fruitfly has XY. The former is homogametic as it produces similar type of gametes whereas the latter is heterogametic as it produces different types of gametes.

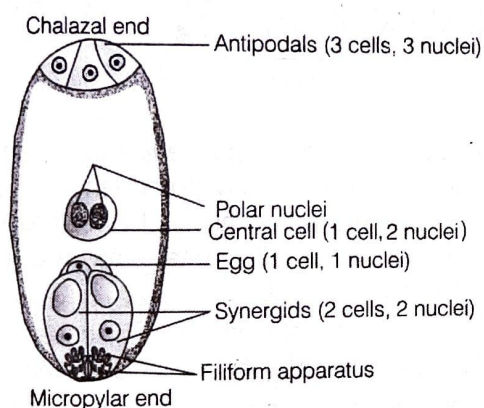
Similarly, in the second case, the male fowl produces similar gametes, i.e. ZZ (homogametic) whereas female fowl produces dissimilar gametes, i.e. ZW (heterogametic). (2)

18. Introduction of alien species causes the risk of extinction. When alien species are introduced in a region, some of them turn invasive and cause decline or extinction of indigenous species. For example,

(i) Nile perch, a large predator fish, when introduced into lake Victoria in East Africa, eventually led to the extinction of an ecologically unique assemblage of more than 200 species of cichlid fish in the lake.

(ii) *Eichhornia*, i.e. water hyacinth caused environmental damage and threatened the existence of the native species. (2)

19. A typical angiospermic embryo sac is 8-nucleated and 7-celled.



Embryo sac of an angiospermic plant (2)

20. Seminal vesicle are accessory glands of male reproductive system. These are located between the bladder and rectum. Seminal vesicle produces an alkaline secretion that neutralises the acidic environment of the male urethra as well as that of female reproductive tract. (1+1)

Or

The different parts of human oviduct through which the ovum travels, till it gets fertilised are given below in the sequence

- (i) **Fimbriae, Finger-like Projections** Collect or catch the ovum, after ovulation.
- (ii) **Infundibulum** Ovum from fimbriae is guided into funnel-shaped infundibulum, that is part of Fallopian tube.
- (iii) **Ampulla** A wider part of oviduct that leads ovum into isthmus.

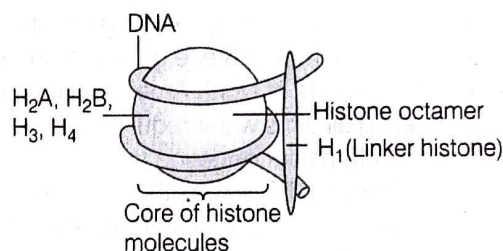
(iv) **Isthmus** With narrow lumen and in the portion or junction of **ampulla-isthmus**, the ovum gets fertilised. (2)

21. Length of DNA can be calculated by simply multiplying the total number of base pairs with distance between two consecutive bp, i.e. $6.6 \times 10^9 \text{ bp} \times 0.34 \times 10^{-9} \text{ m / bp}$. It is about 2.2 m ($0.34 \times 10^{-9} \text{ m}$ is the distance between two consecutive base pairs). (2)

Or

Nucleosome is a complex of negatively charged DNA wrapped around the positively charged histone octamer (unit of 8 molecules of histone).

It is made up of four types of proteins; H_2A, H_2B, H_3 and H_4 occurring in pairs. H_1 acts as linker histone that connect one histone octamer to another. A typical nucleosome consists of 200 base pairs of DNA helix.



A nucleosome (2)

22. Differences between insulin produced by rDNA and insulin produced by pancreas are

Insulin Produced by rDNA	Insulin Produced by Pancreas
It is processed has A and B- polypeptides.	It has three polypeptides. A, B and C-chains before maturing, called the prohormone.
It directly synthesises mature hormone.	It undergoes processing to form mature and functional hormone.

(2)

23. Triple fusion refers to the process of fusion of three haploid nuclei. It takes place in embryo sac. The three nuclei that fuse together are nucleus of the male gamete and two polar nuclei of the central cell. They produce a triploid primary endosperm nucleus. (2)

24. Tobacco consumption is injurious to health as it can cause cancer, respiratory disorders, ulcers and can increase the level of carbon monoxide in blood leading to oxygen deficiency. (2)

25. The two principle procedures adopted for test tube baby programme are ZIFT (Zygote Intra Fallopian Transfer) and IUT (Intra Uterine Transfer). In ZIFT the zygote or early embryo with upto 8 blastomeres is transferred into the Fallopian tube of female. Whereas in IUT, embryo with more than 8 blastomeres is transferred into the uterus. (2)

26. Some adaptive features of plants and animals growing in arid region are as follows

Plants

- Desert plants who live in scarcity of water show thick cuticle on their leaf surface to prevent excess loss of water.
- Stomata are sunken to minimise water loss through transpiration.
- Special photosynthesis pathway (CAM plants) enables their stomata to remain closed during day time, e.g. in *Opuntia*. Leaves are reduced to spines and the photosynthetic function is performed by the flattened stems. (1½)

Animals

- The animals found in desert areas usually possess a thick coat to minimise evaporative desiccation.
- They produce concentrated urine.
- In some desert animals, sweating occurs only at very high temperature, e.g. kangaroo rat, found in deserts of North America is capable of meeting all of its water requirements through internal fat oxidation (in which water is a byproduct). It also has the ability to concentrate its urine to ensure minimal loss of water. (1½)

Or

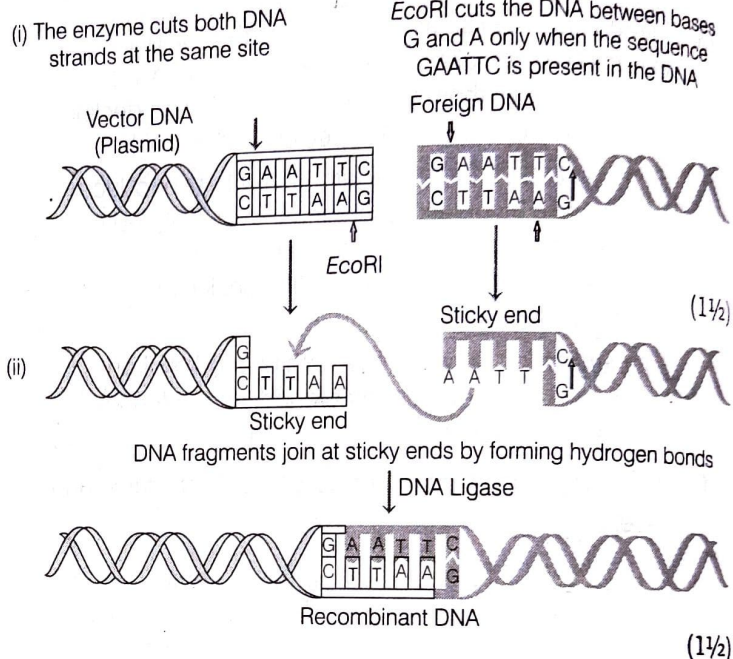
- Amensalism is an interaction between two living individuals of different species, in which one species is harmed and the other is neither benefitted nor harmed. For example, *Penicillium*, a mould secretes penicillin which kills bacteria, but the mould itself remains unaffected. (1)
- Commensalism is an interaction between two different organisms where one is always benefitted, while the other is neither benefitted nor harmed. For example, sucker fish gets a free ride and the remains of food which a shark eats, while being attached to its under surface. On the other hand, shark is neither benefitted nor harmed. (1)
- Mutualism is the interaction which confers benefits to both the interacting species. For example, lichens represent a mutualistic relationship between a fungus and an alga (photosynthesising). In this, the fungus helps in nutrient absorption and provides protection, while the algae prepare the food. (1)

27. Cell-mediated immunity is an immune response that does not involve antibodies. It is mediated by T-lymphocytes. It plays an important role in organ transplantation and is responsible for body's

ability to differentiate between 'self' and 'non-self' tissues/organs. There are two groups of T-lymphocytes which are responsible for cell-mediated immunity

- Cytotoxic/Killer T-cells** These cells kill the specific target cells by a variety of mechanisms.
- Helper T-cells** These cells activate the specific B-cells to produce antibodies. (3)

28. *EcoRI* recognises the palindromic sequence GAATTC in a given fragment of DNA.



29. Antibiotics (a Greek word, where *anti*-against and *bio*-life, i.e. against life in the context of pathogenic microorganisms) are chemical substances produced by some microbes that can kill or retard the growth of other (disease-causing) microbes.

Penicillin was the first antibiotic to be discovered that inhibited the growth of *Staphylococcus* bacteria. After discovering its full potential as an antibiotic, it was extensively used to treat wounded American soldiers during World War II. Many more antibiotics have been identified and purified from other microbes to conquer the various diseases and their causative agents.

Antibiotics have thus, greatly improved our capacity to treat deadly diseases such as plague, whooping cough (kali khansi), diphtheria (gal ghotu) and leprosy (kusht rog), which had killed millions all over the globe. (3)

- The chemical nature of the coat A is protein (viral protein). Enzyme B is reverse transcriptase which converts X, i.e. viral RNA into viral DNA (C). (2)
 - The host cell can be macrophages (animal or human cell). (1)

31. The processes that help the sperms to gain entry into the female oocyte are as follows

I. Capacitation

After the sperms reach the female genital tract, they undergo capacitation. It is the process in which the

sperms acquire the capacity to fertilise the eggs by the secretions of female genital tracts. These secretions remove coating substances deposited on the surface of the sperms especially present on acrosome.

II. Fertilizin-Antifertilizin Reaction

The agglutination of the spermatozoa by egg and adhesion of the spermatozoa to egg membranes or egg surface is known as fertilizin-antifertilizin reaction (a species-specific reaction). Fertilizin is a glycoprotein present on the surface of layer of eggs, while antifertilizin is another chemical substance on surface layer of cytoplasm of spermatozoa.

III. Acrosomal Reaction

In this reaction, acrosome releases hydrolytic enzymes called sperm lysins after coming in contact with surface of egg covering.

The three sperm lysins are

- (i) **Hyaluronidase** which acts on ground substance of follicle cells.
- (ii) **Corona penetrating enzyme** which dissolves the corona radiata cells that surround the female gamete.
- (iii) **Acrosin** which dissolves zona pellucida layer surrounding the oocyte, to enable the sperm to reach ovum.

The point of entry of sperm's head into the ovum is of great significance. It is the area which extrudes the polar bodies. This area is called animal pole. It determines the polarity and first cleavage of the zygote, which is along the animal-vegetal pole. (5)

Or

Artificial hybridisation is carried out to ensure that seeds are formed from the desired set of pollen grains. This is done by **emasculation** and **bagging**. The flowchart below shows the steps involved in it. Emasculation—stamens are removed in bud condition from a bisexual flower.

↓

Female flower is obtained.

↓

Emasculated flower is enclosed in a bag made up of butter paper or plastic (Bagging).

↓

Mature and viable pollen grains are collected from male plant.

↓

Bag opened, pollen grains dusted on the stigma.

↓

Bag replaced immediately.

↓

Artificial pollination takes place. (3)

Importance of such experiments are

(a) Creation of new genetic recombination with better qualities.

(b) Incorporation of a large number of desirable characters into a single variety. (2)

32. (i) The status of food and space in curve A is unlimited resources, while in curve B, the sources of food and space are limited. (1)
- (ii) In the absence of predators, the curve B would appropriately depict the competition for limited food and shelter resources within the prey population. (2)
- (iii) Since, resources for growth of most animal populations are finite and become limiting sooner or later, the logistic growth model for population is considered a more realistic one. (1)
- (iv) The human population at present can be represented by an exponential growth curve. (1)

Or

(i) Herbivores feed on plants. They are considered as predators because they also transfer energy across the trophic levels. Besides this, they also keep the population of their prey under control. For example, when the prickly pear cactus was introduced in Australia in early 1920, they spread rapidly causing havoc.

Their population was controlled by introducing cactus-feeding predator (a moth). (2)

- (ii) (a) Differences between mutualism and competition are as follows

Mutualism	Competition
It benefits both the interacting species.	Both the interacting species suffer.
Two individuals may be physically or physiologically associated.	No physical association between competitors.
Lichens represent mutualism between fungus and algae, where fungus absorbs nutrition and provides protection, while algae prepares food for fungi.	In some South American lakes, visiting flamingoes and resident species compete for the common food.

(1½)

- (b) Differences between commensalism and amensalism are as follows

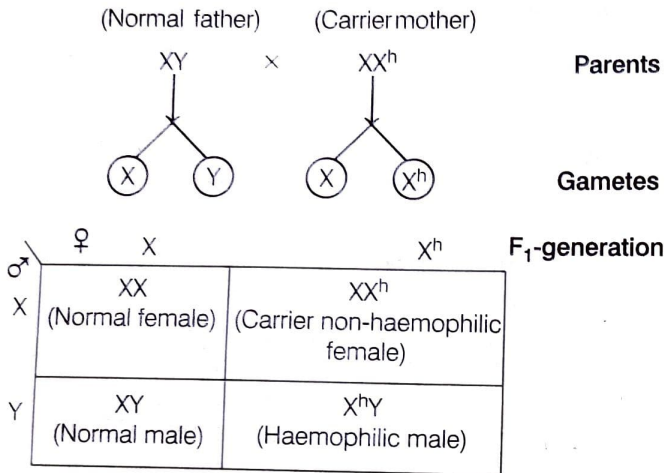
Commensalism	Amensalism
Interaction between two species where one species is benefitted and the other is neither harmed nor benefitted.	Interaction between two different species, in which one species is harmed and the other is neither benefitted nor harmed.
Example, an orchid growing as an epiphyte on a mango tree benefits by getting shelter and nutrition but the mango tree is not harmed or benefitted.	Example, <i>Penicillium</i> produces a toxin that kill other microorganisms but itself is not affected.

(1½)

33. (i) The possibility of one of their child being haemophilic can be predicted by performing the following cross

Father Genotype – XY (normal)

Mother Genotype – XX^h (carrier non-haemophilic)



Genotypic and phenotypic ratio

XX	:	XX ^h	:	XY	:	X ^h Y
Normal female		Carrier non-haemophilic female		Normal male		Haemophilic male
1	:	1	:	1	:	1

(3)

- (ii) Haemophilia is an X-linked recessive disease. Therefore, the female having haemophilic allele on single X-chromosome does not produce haemophilic phenotype.

Mother of such female has to be atleast carrier and father should be haemophilic (unavailable in entire life). Due to these reasons, human females are rarely haemophilic.

Or

(2)

The technique given in the question which helps in solving paternity disputes is called DNA fingerprinting. (1/2)

Procedure of DNA Fingerprinting

- (i) **Extraction** DNA is extracted from cells by using high-speed, refrigerated centrifuge.
- (ii) **Amplification** Several copies of extracted DNA containing Variable Number Tandem Repeats (VNTRs) are made by Polymerase Chain Reaction (PCR).
- (iii) **Restriction Digestion** DNA is cut into fragments with restriction enzymes into precise reproducible sequences.
- (iv) **Separation of DNA Sequences** Cut DNA fragments are introduced and passed through electrophoresis set-up containing agarose polymer gel.
- (v) **Southern Blotting** Separated DNA sequences are transferred onto a nitrocellulose or nylon membrane sheet placed over gel.
- (vi) Radioactive DNA probes with base sequences complementary to the possible VNTRs are introduced/poured over the membrane.
- (vii) VNTR form the basis of DNA fingerprinting. The repeats of it show high degree of polymorphism.
- (viii) After hybridisation with the radiolabelled VNTR probe and autoradiography, bands of various sizes are formed.
- (ix) Bands form a characteristic pattern, which varies from person to person. (1/2 × 9)