SAMPLE QUESTION PAPER

BLUE PRINT

Time Allowed : 3 hours **Maximum Marks :** 70

S. No.		Chapter	VSA /Case based/ AR (1 mark)	SA-I (2 marks)	SA-II (3 marks)	LA (5 marks)	Total	
1.	Unit-VI	Sexual Reproduction in Flowering Plants	1(1)	–	–	1+1*(5)	**2(6)**	**14**
2.		Human Reproduction	2(2)	–	–	–	**2(2)**	
3.		Reproductive Health	1(1)	1+1*(2)	1(3)	–	**3(6)**	
4.	Unit-VII	Principles of Inheritance and Variation	3(6)	1(2)	1(3)	–	**5(11)**	**18**
5.		Molecular Basis of Inheritance	2(2)	–	–	1+1*(5)	**3(7)**	
6.	Unit-VIII	Human Health and Diseases	1(1)	2(4)	–	1(5)	**4(10)**	**14**
7.		Microbes in Human Welfare	1(1)	–	1(3)	1*	**2(4)**	
8.	Unit-IX	Biotechnology : Principles and Processes	2(2)	1+1*(2)	1(3)	–	**4(7)**	**12**
9.		Biotechnology and Its Applications	1+1*(1)	2(4)	–	–	**3(5)**	
10.	Unit-X	Organisms and Populations	1(4)	1(2)	1+1*(3)	–	**3(9)**	**12**
11.		Biodiversity and Conservation	1(1)	1(2)	–	–	**2(3)**	
		Total	**16(22)**	**9(18)**	**5(15)**	**3(15)**	**33(70)**	

*It is a choice based question.

Subject Code : **044**

BIOLOGY

Time allowed : 3 hours ***Maximum marks : 70***

General Instructions :

(i) All questions are compulsory.

(ii) The question paper has four sections: Section A, Section B, Section C and Section D. There are 33 questions in the question paper.

(iii) Section–A has 14 questions of 1 mark each and 02 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.

(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. State one advantage and one disadvantage of cleistogamy.

2. What is the key component of the oral pill developed by CDRI, Lucknow?

3. A scientist studied two semen samples A and B and found that sample A lacked fructose while sample B lacked citric acid. What can be the reason?

4. Write the dual purpose served by deoxyribonucleoside triphosphates in polymerisation.

5. Mention two contrasting flower related traits studied by Mendel in his pea plant experiments.

6. State a difference between a gene and an allele.

7. Name the source of energy for the replication of DNA.

8. Name the first restriction endonuclease isolated and also give its recognition sequence.

9. Which technique serves the purpose of detection of mutations in a suspected cancer patient?

10. Name the type of biodiversity represented by the following:
(i) 50,000 different strains of rice in India
(ii) Estuaries and alpine meadows in India.

11. **Assertion :** YAC vectors have been exploited extensively in mapping the large genomes.
Reason : YAC vectors have a composite structure made of bacteriophage and plasmid.
(a) Both assertion and reason are true, and reason is the correct explanation of assertion.
(b) Both assertion and reason are true, but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Both assertion and reason are false.

OR

Assertion : *Agrobacterium tumefaciens* is called natural genetic engineer.

Reason : *Agrobacterium tumefaciens* infects all broad-leaved agricultural crops but does not infect cereal crops.

(a) Both assertion and reason are true, and reason is the correct explanation of assertion.
(b) Both assertion and reason are true, but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Both assertion and reason are false.

12. Assertion : In a mature oocyte, the endoplasmic reticulum membranes are perforated by pores.

Reason : The endoplasmic membrane of mature oocyte have usually ribosomes embedded in them.

(a) Both assertion and reason are true, and reason is the correct explanation of assertion.
(b) Both assertion and reason are true, but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Both assertion and reason are false.

13. Assertion : All immunoglobulin molecules have a basic structure composed of four polypeptide chains.

Reason : The polypeptide chains consists two identical heavy and light chain connected by disulphide bonds.

(a) Both assertion and reason are true, and reason is the correct explanation of assertion.
(b) Both assertion and reason are true, but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Both assertion and reason are false.

14. Assertion : Amylases are used for clearing turbidity in juices caused by starch.

Reason : Amylases degrade starch.

(a) Both assertion and reason are true, and reason is the correct explanation of assertion.
(b) Both assertion and reason are true, but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Both assertion and reason are false.

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

Each organism has an invariably defined range of conditions that it can tolerate, diversity in the resources it utilises and a distinct functional role in the ecological system, all these together comprise its niche. There are various environmental factors such as water, temperature, light etc. that affect the organism in many ways. *E.g.,* the plants grow everywhere but the vegetation of a place entirely depends on the geographical and weather conditions of the place, such as mango trees do not and cannot grow in temperate countries like Canada and Germany. Similarly the fauna of the place also depends on the same environmental factors as snow leopards are not found in Kerala forests and tuna fish are rarely caught beyond tropical latitudes in the ocean. The reason behind is temperature that affects the kinetics of enzymes and through it the metabolic activity and other physiological functions of the organism. In deserts, the flora and fauna are limited by the temperature, availability of water and light only special adaptations in an organism make it possible for them to live there.

(i) Niche defines

(a) the position of an organism in an ecosystem (b) the role of an organism in an ecosystem
(c) the structure of an organism (d) both (a) and (b).

(ii) Which abiotic factor affects the organism mainly?

(a) Temperature (b) Water
(c) Light (d) All of these

(iii) The desert plants adapt to low water condition in the area by

(a) broad green leaves (b) bright flowers
(c) reduced leaves as spines (d) water accumulation in roots.

(iv) Mango tree cannot grow in temperate countries because of specific

(a) water requirement (b) light requirement

(c) temperature requirement (d) soil requirement.

(v) **Assertion :** Temperature, rainfall, light and soil affect the organisms.

Reason : Temperature, light and water are abiotic environmental factors.

(a) Both assertion and reason are true, and reason is the correct explanation of assertion.

(b) Both assertion and reason are true, but reason is not the correct explanation of assertion.

(c) Assertion is true but reason is false.

(d) Both assertion and reason are false.

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

Haemophilia is a genetic disorder of rare blood condition where people do not have the clotting factor which enables their blood to clot when bleeding. It's an inherited disease that's usually passed from mother to son. Haemophilia has been called a "royal disease". This is because the haemophilia gene was passed from Queen Victoria, who became Queen of England in 1837, to the ruling families of Russia, Spain and Germany. Queen Victoria's gene for hemophilia was caused by spontaneous mutation. Of her children, one son, Leopold, had haemophilia, and two daughters, Alice and Beatrice, were carriers. Beatrice's daughter married into the Spanish royal family. She passed the gene to the male heir to the Spanish throne. Queen Victoria's other daughter, Alice, had a carrier daughter, Alix. Alix became Empress Alexandra at her marriage to Russia's Czar Nicholas in 1894. Their son, born in 1904 and named Alexis, inherited haemophilia from his mother.

Haemophilia is a recessive disorder and it can be only appear in a generation if mother is carrier for disease or mother is carrier for disease and father has haemophilia or both parents have haemophilia.

(i) Haemophilia is a/ an _____ disease.

(a) X linked (b) autosomal dominant

(c) autosomal recessive (d) Y linked

(ii) If the mother is carrier and father is normal than the chances of having normal son would be

(a) 0% (b) 25 % (c) 50% (d) 75%

(iii) If the maternal grandfather of a boy is haemophilic, maternal grandmother is normal and father is normal then what are the chances that he could have haemophilia disease?

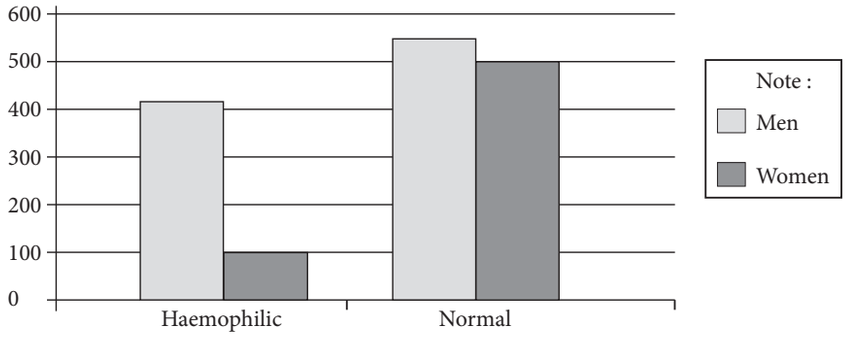
(a) 25 % (b) 50 % (c) 75% (d) 0%

(iv) If haemophilia is not present in a population than sudden appearance of haemophilia in a population would be due to

(a) recombination (b) mutation

(c) replication (d) none of these.

(v) During a population study of haemophilia disease, following results are obtained.



Study the given graph and select the correct statement.

(a) Men and women have equal chances to have haemophilia.

(b) There is more probability that men have haemophilia as genetic disorder.

(c) There is more probability that women have haemophilia as genetic disorder.

(d) No conclusion can be drawn by studying the given graph.

SECTION - B

17. In the table given select and provide correct device(s) from the following :

Oral pill, Condom, Copper-T, Saheli, Vasectomy, Diaphragm, Tubectomy, Cervical cap.

Methods of birth control	**Device(s)**
Barrier	
IUD	
Surgical technique	
Hormonal administration	

OR

Name the IUDs which release copper ions. Why they are considered good contraceptives?

18. For how many years did Gregor Mendel conduct hybridisation experiments on garden peas? Why did Mendel select garden pea for his experiments?

19. Riya, a 10 years old girl suffers from a bacterial disease. She has red coloured spots on her chest. She also suffers from adominal pain, light fever, low pulse rate and diarrhoea.

(i) From which disease does she suffer? Name the pathogen that infected her.

(ii) Which diagnostic test is used for its confirmation?

20. What is the role of '*ori*' and 'cloning sites' during cloning into a vector.

OR

Explain palindromic nucleotide sequence with the help of a suitable example.

21. What is gene therapy? When was the first gene therapy given and for which deficiency?

22. State the role of Ti plasmids in biotechnology.

23. **(a)** Explain the concept of endemism.

(b) Name four regions in an around our country that are considered hotspots.

24. Mention how have plants developed mechanical and chemical defence against herbivores to protect themselves with the help of one example of each.

25. **(a)** What precaution(s) would you recommend to a patient requiring repeated blood transfusion?

(b) If the advise is not followed by the patient, there is an apprehension that the patient might contract a disease that would destroy the immune system of his/her body. Explain with the help of schematic diagram only how the immune system would get affected and destroyed.

SECTION - C

26. Name the pathogens of the following STDs:

(i) Syphilis (ii) Gonorrhoea (iii) Hepatitis B

(iv) Genital herpes (v) Genital warts (vi) Chlamydiasis

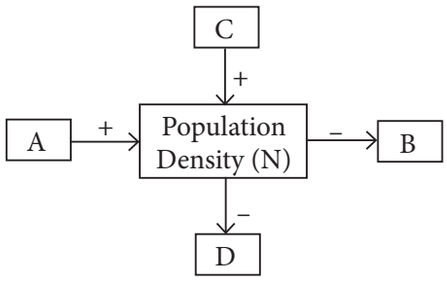
27. Why is colour blindness generally observed in human males? Explain the conditions under which a human female can be colour blind.

28. **(a)** A farmer adds *Azotobacter* culture to the soil before sowing maize. How will it increase the yield of maize?

(b) Explain the role of *Lactobacillus* in preparation of household products.

29. Explain the role of selectable markers in cloning.

30.



Study the schematic representation given above and answer the following questions:

(i) Identify A and C in it.

(ii) Identify B and D in it.

(iii) When population density at time t is N as shown above, write the population density at time t + 1 in the form of an equation using appropriate symbols.

OR

The population of a metro city experiences fluctuations in its population density over a period of time.

(i) When does the population in a metro city tend to increase?

(ii) When does the population in a metro city tend to decline?

(iii) Write the equation for Verhulst-Pearl logistic growth.

SECTION - D

31. **(a)** Everyday humans are exposed to a large number of infectious agents in the environment, but only a few of these exposures result in disease. What is the reason for this?

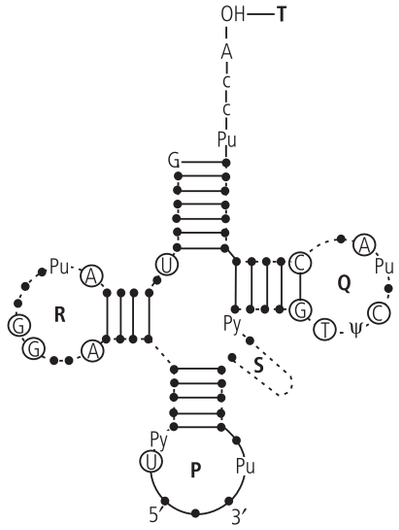
(b) Explain the different barriers of innate immunity.

OR

(a) Draw a labelled diagram of a biogas plant and explain its structure. How is biogas produced in the biogas plant?

(b) Name the source of cyclosporin - A and streptokinase. Explain their importance in medical science.

32. Refer to the given figure and answer the following questions.



(i) Identify the parts P, Q, R, S and T in the given figure.

(ii) State the function of Q and R in the molecule.

(iii) What is the above molecule called? Name the site for recognition and attachment of *m*RNA codon.

OR

Describe Frederick Griffith's experiment on *Streptococcus pneumoniae*. Discuss the conclusion he arrived at.

33. **(a)** Draw a neat diagram of T.S. of young anther of angiosperms and label the following parts:

(i) Tapetum (ii) Middle layers

(iii) Conducting strand (iv) Region of dehiscence

(b) Arrange the following terms in a correct developmental sequence :

Pollen grain, Sporogenous tissue, Microspore tetrad, Pollen mother cell, Male gametes.

(c) Explain the following by giving reasons:

(i) Pollen grains are well preserved as fossils.

(ii) Bee pollen is used by people in the form of tablets these days.

OR

(a) Why fertilisation in angiosperms is referred to as 'double fertilisation'? Explain.

(b) Give suitable terms for the following:

(i) Pollen tube enters the ovule through micropyle.

(ii) Pollen tube enters the ovule through chalaza.

(iii) Insects act as agents for pollination and subsequent fertilisation.

(c) Name the pollinating agent of flowers like maize and *Cannabis*. Give any two characteristic features of these flowers favouring this kind of pollination.

SOLUTIONS

1. Cleistogamous flowers are flowers which do not open at all. This is an adaptation of plants for self pollination.
Advantage of cleistogamy : Cleistogamous flowers produce assured seed-set even in the absence of pollinators.
Disadvantage of cleistogamy : Cleistogamous flowers undergo self pollination which reduces the chances of variation and evolution of genetically superior progeny. It also results in inbreeding depression.

2. CDRI, Lucknow developed a non-steroidal oral pill named 'saheli' which has centchroman as its key component.

3. Men from which samples A and B were collected may have some dysfunctioning of seminal vesicles and prostate gland respectively.

4. Deoxyribonucleoside triphosphates such as dATP, dCTP, dGTP and dTTP serve dual purpose during DNA replication. They act as substrates, *i.e.,* nucleotides for the replication process as well as provide energy for the polymerisation of nucleotides by cleavage of high energy terminal phosphate bonds.

5. Traits related to flower studied by Mendel were flower colour [violet (V) dominant over white (v) and flower position [axial (A) dominant over terminal (a)].

6. Differences between a gene and an allele are as follows :

S.No.	Gene	Allele
(i)	A gene is the unit of DNA responsible for the appearance and inheritance of a character.	An allele is one of the forms in which a gene can exist. Normally there are two alleles for a given gene that are located at the same locus in the homologous chromosomes.
(ii)	It refers to section of DNA that controls certain traits, *e.g.,* eye colour, blood group type, skin colour, etc.	It refers to specific variation of a gene, *e.g.*, blue eyes, green eyes, blood group A, B, etc.

7. The sources of energy for the replication of DNA are phosphorylated nucleotides or deoxy-ribonucleoside triphosphates, *i.e.,* dATP, dCTP, dGTP and dTTP.

8. The first restriction endonuclease isolated was *Hin*d II. Its recognition sequence is

$$5' - G - T - \underset{\downarrow}{C} - G - A - C - 3'$$
$$3' - C - A - G - \underset{\uparrow}{C} - T - G - 5'$$

9. Polymerase chain reaction (PCR) technique serves the purpose of detection of mutations in a suspected cancer patient.

10. (i) 50,000 different strains of rice in India represent genetic diversity
(ii) Estuaries and alpine meadows in India represent ecological diversity.

11. (c) : YAC vectors are yeast artificial chromosome vectors. Phagemid vector is a composite structure made of bacteriophage and plasmid.

OR

(b)

12. (c) : In mature oocytes the membranes of endoplasmic reticulum usually do not have ribosomes but are perforated by pores.

13. (b)

14. (a)

15. (i) (d) : The niche of an organism is the position of an organism and its functional role that it plays within an ecosystem.

(ii) (d) : Various environmental factors such as water, temperature, light, etc. affect the organisms in many ways.

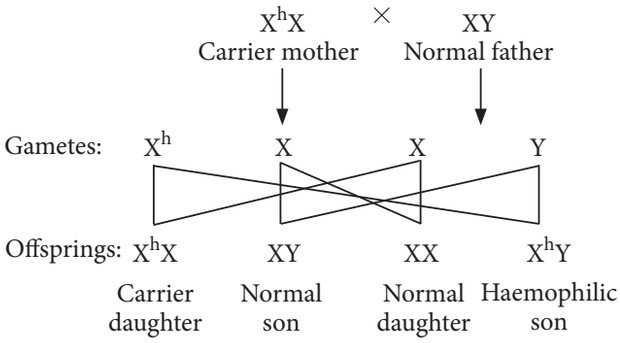
(iii) (c) : In desert plants like *Opuntia*, leaves reduces into spines to lessen the water loss through transpiration.

(iv) (c) : Mango tree has specific temperature requirement therefore it can not grow in temperate countries like Canada.

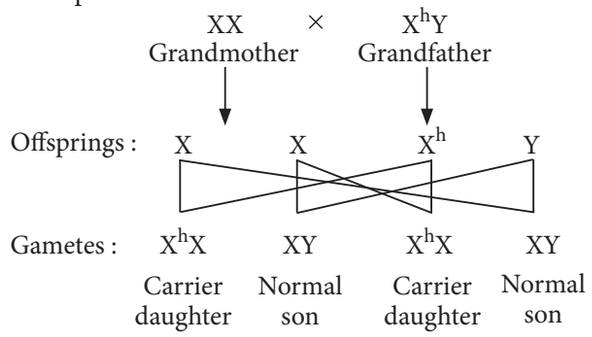
(v) (b)

16. (i) (a) : Haemophilia is a X linked disease. It's an inherited disease that's usually passed from mother to son.

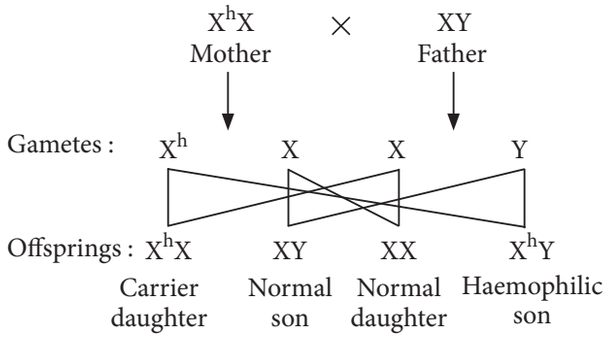
(ii) (c) : If the mother is carrier and father is normal than the chances of having normal son would be 50%.



(iii) (b) : If the maternal grandfather of a boy is haemophilic then her mother will be carrier.



If mother is carrier and father is normal then the chances that boy could have haemophilia is 50%.



(iv) (b) : Haemophilia is caused by a mutation or change in one of the genes, that provides instructions for making the clotting factor proteins needed to form a blood clot. This change or mutation can prevent the clotting protein from working properly or to be missing altogether.

(v) (b)

17. Barrier : Diaphragm / Condom / Cervical cap
IUD : Copper-T
Surgical technique : Vasectomy / Tubectomy
Hormonal administrations : Oral pill/Saheli

OR

There are copper releasing IUDs which release Cu ions. For example, CuT, Multiload 375. The Cu ions released by the IUDs suppress sperm motility and the fertilising capacity of the sperms.

18. Gregor Johann Mendel worked on the pea plant for 7 years (1856-1863). He selected garden pea as his experimental material, because it has the following advantages :
(i) The pea plant has a number of well-defined contrasting characters.
(ii) It has perfect bisexual flowers, containing both male and female parts.
(iii) The flowers are predominantly self pollinating.
(iv) Due to self fertilisation, plants are homozygous. It is, therefore, easy to get purelines.
(v) It is an annual plant. Its short life cycle makes it possible to study several generations, within a short period.

19. (i) She suffers from typhoid fever. *Salmonella typhi* is the pathogenic bacterium that infected her.
(ii) Typhoid is confirmed by Widal test.

20. '*Ori*' is a sequence of DNA from where replication starts and any piece of DNA when linked to this sequence can be made to replicate within the host cells.
Cloning sites are the specific sites in vector that possess recognition sequences for a particular enzyme. It enables insertion of foreign DNA segment into that particular site.

OR

The palindrome sequence in DNA is a sequence of base pairs that reads same on the two strands when orientation of reading is kept the same.
For example, the following sequences reads the same on the two strands in 5′ → 3′ direction. This is also true if read in the 3′ → 5′ direction in both the strands.

5′ - GAATTC-3′
3′ - CTTAAG-5′

21. Gene therapy is a collection of methods that allows to replace a faulty gene by a normal healthy functional gene that has been diagnosed in a child or embryo.
The first clinical gene therapy was given in 1990 to a 4-year old girl for adenosine deaminase (ADA) deficiency.

22. Ti (tumor inducing) plasmid isolated from the soil bacterium *Agrobacterium tumefaciens* is effectively used as vector for gene transfer to plant cells. This is so called because in nature, it induces tumors in broad leaf plants such as tomato, tobacco and soybean. Its tumor producing ability is deleted for the use in gene transfer.

23. (a) Endemism is the ecological state of a species being unique to a defined geographical location such as an island, nation, country or other defined zone. *E.g.*, The Tasmanian Devil is the largest carnivorous marsupial in the world and found only on the Australian island state of Tasmania.

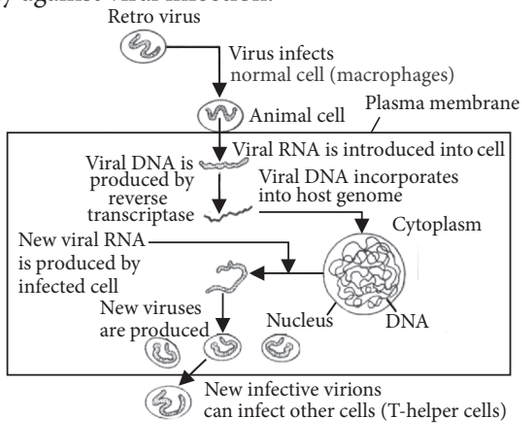
(b) Western Ghats and Sri Lanka, Indo-Burma and Himalayas are hotspots in India. Others include mountains of southwest China, Caribbean Island hotspot, etc.

24. Plants cannot run away from their predators or herbivores. They therefore have evolved an astonishing variety of morphological (mechanical) and chemical defences against herbivores. Thorns and spines (*Acacia*, Cactus) are the most common morphological means of defence. Many plants produce and store chemicals that make the herbivores sick when eaten, inhibit feeding or digestion, disrupt its reproduction or even kill it. *E.g. Calotropis* produces highly poisonous cardiac glycosides to prevent herbivory.

25. (a) If a patient requires repeated blood transfusion, it should be ensured that donor's blood has been screened for HIV and the syringes used should be new and disposable.

(b) If the patient does not follow these precautions, then he might be infected with HIV which causes AIDS (Acquired Immuno Deficiency Syndrome).

AIDS is a disorder of cell mediated immune system of the body. There is a reduction in the number of helper T-cells which stimulate antibody production by B-cells. This results in the loss of natural defence of the body against viral infection.



Thus, the immune system gets hampered due to the action of AIDS virus on T-lymphocytes and macrophages.

26. (i) *Treponema pallidum*
(ii) *Neisseria gonorrhoeae*
(iii) Hepatitis B virus
(iv) Herpes simplex virus
(v) Human papilloma virus
(vi) *Chlamydia trachomatis*

27. Colour blindness is due to the presence of a recessive sex linked gene 'c', carried by X chromosome. It is generally observed in males as a single gene for the defect is able to express itself as the Y chromosome is devoid of any corresponding allele (X^cY). Women will suffer from this disorder when a carrier woman (XX^c) marries with colour blind man (X^cY). 50% girl babies will be carriers (XX^c) while the remaining 50% will be colour blind (X^cX^c).

28. (a) Free-living nitrogen fixing bacteria fix atmospheric nitrogen in the soil and make it available for the higher plants. *Azotobacter* occurring in fields of cotton, maize, jowar and rice, not only increases yield but also saves about 10-25 kg/ha of nitrogen fertiliser.

(b) Microorganisms commonly called lactic acid bacteria (LAB), *e.g.*, *Lactobacillus* are added to milk for production of curd. They convert lactose sugar of milk into lactic acid. Lactic acid causes coagulation and partial digestion of milk protein, casein, thereby changing milk into curd, yoghurt and cheese. The starter or inoculum used in preparation of milk products actually contains millions of LAB. In this way, *Lactobacillus* plays an important role in preparation of household products.

29. Selectable markers are the genes that help in selecting those host cells which are transformed while eliminating the non-transformants. Transformation is a process through which a piece of DNA is introduced in host bacterium. Generally, the genes encoding resistance to antibiotics such as tetracycline, ampicillin, kanamycin or chloramphenicol, etc., are useful selectable markers for *E. coli*. The common *E. coli* cells are not resistant against any of these antibiotics. Plasmid pBR322 has two resistance genes — ampicillin resistance (amp^R) and tetracycline resistance (tet^R) which are considered as useful for selectable markers.

30. (i) In the given figure, A is natality and C is immigration.

(ii) In the given figure, B is mortality and D is emigration.

(iii) If N is the population density of time t, then its density at time t + 1 will be

$N_{t+1} = N_t + [(B + I) - (D + E)]$

Where B = Natality

I = Immigration

D = Mortality

E = Emigration

OR

(i) Population of a metro city tends to increase when natality rate exceeds mortality rate due to better health services and also due to lack of unplanned population control measures. Also when immigration exceeds emigration, population of a city tends to increase.

(ii) Population of a city tends to decline when mortality rate is higher than natality rate and emigration exceeds immigration.

(iii) Verhulst-Pearl logistic growth as explained by the following equation :

$$\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$$

Where N = population density at a time t; r = intrinsic rate of natural increase and K = carrying capacity.

31. (a) Everyday we are exposed to a large number of infectious agents. However, only a few of these exposures result in disease. This is due to the fact that the body is able to defend itself from most of these foreign agents. This overall ability of the host to fight the disease-causing organisms, conferred by the immune system is called immunity.

(b) Innate immunity consist of four types of barriers. These are-

(i) Physical barriers : The skin on our body is the main barrier which prevents entry of the micro-organisms. Mucus coating of the epithelium lining the respiratory, gastrointestinal and urogenital tracts also help in trapping microbes entering our body.

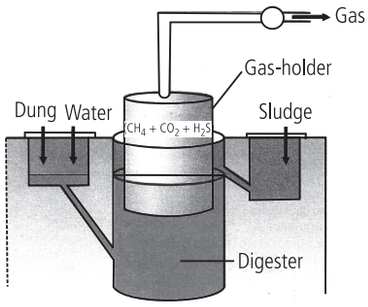
(ii) Physiological barriers: The acid in the stomach, saliva in the mouth, tears from eyes - all prevent microbial growth.

(iii) Cellular barriers: Certain types of leukocytes of our body like polymorpho-nuclear leukocytes (PMNL-neutrophils), monocytes and natural killer (type of lymphocytes) in the blood, as well as macrophages in tissues, can phagocytose and destroy microbes.

(iv) Cytokine barriers: Virus-infected cells secrete proteins called interferons which protect non-infected cells from further viral infection.

OR

(a) The labelled diagram of a biogas plant is as follows:-



Biogas is a mixture of gases (containing predominantly methane) produced by the microbial activity and used as fuel for cooking and lighting.

The biogas plant consists of a concrete tank (10-15 feet deep) in which bio-wastes are collected and a slurry of dung is fed. A floating cover is placed over slurry, which keeps on rising as the gas is produced in the tank due to the microbial activity.

The biogas plant has an outlet, which is connected to a pipe to supply biogas to nearby houses. The spent slurry is removed through another outlet and may be used as fertiliser.

Cattle dung is available in large quantities in rural areas where cattle are used for a variety of purposes. So biogas plants are more often built in rural areas.

(b) Cyclosporin A, that is used as an immuno-suppressive agent in organ-transplant patients, is produced by the fungus *Trichoderma polysporum*.

Streptokinase produced by the bacterium *Streptococcus* and modified by genetic engineering is used as a 'clot buster' for removing clots from the blood vessels through dissolution of intravascular fibrin.

32. (i) P-Anticodon loop, Q-TΨC loop, R-DHU loop, S-Variable arm and T-Amino acid attaching site

(ii) In the given figure, Q is the T Ψ C loop that provides site for attachment to ribosome while R is DHU loop which acts as binding site for aminoacyl synthetase enzyme, during protein synthesis.

(iii) The above molecule is called adapter molecule. Anticodon loop (part P) is the site that has three bases out of seven which help in recognising and attaching to the codon of *m*RNA.

OR

Transformation is the phenomenon by which the DNA isolated from one type of cell, when introduced (artificially or naturally) into another type, is able to bestow some of the properties of the former to the latter.

Griffith observed transformation in *Streptococcus pneumoniae* (bacterium responsible for causing pneumonia). He grew bacteria on a culture plate, some produced smooth shiny colonies (S) while others produced rough colonies (R). Mice infected with the S strain (virulent) die from pneumonia infection but mice infected with the R strain do not develop pneumonia.

S strain → Injected into mice → Mice die

R strain → Injected into mice → Mice live

Griffith observed that heat-killed S strain bacteria, when injected into the mice, did not kill them.

S strain (heat-killed) → Inject into mice → Mice live

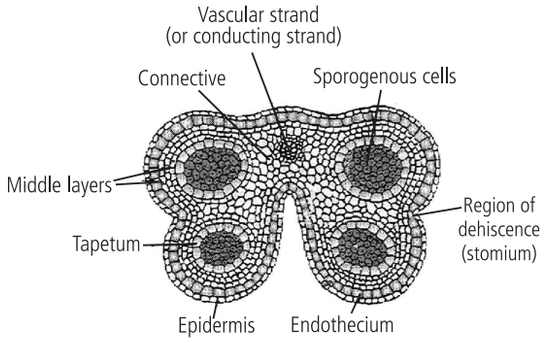
When he injected a mixture of heat-killed S strain and live R bacteria, the mice died. Moreover, he recovered living S strain bacteria from the dead mice.

S strain (heat - killed) + R strain (live)

→ Injected into mice → Mice die

From the experiment Griffith concluded that the R strain bacteria had been transformed by the heat-killed S strain bacteria as some 'transforming principle' transferred from heat killed S strain enabled the R strain to become virulent.

33. (a) T.S. of young anther of angiosperms is as follows:



(b) Sporogenous tissue → Pollen mother cell → Microspore tetrad → Pollen grain → Male gametes.

(c) (i) Wall of a pollen grain is called as sporoderm which is comprised of an outer exine and an inner intine. The exine is made of a highly resistant fatty substance called sporopollenin which cannot be degraded by any enzyme and is not affected by high temperature, strong acid or alkali. Due to this property of sporopollenin, pollen grains are well preserved as fossils.

(ii) Bee pollen refers to the pollen grains collected by honey bees from various flowers. It is considered as one of the nature's most nourishing and complete foods as it contains nearly all the nutrients required by humans. Bee pollen is taken in the form of tablets or syrups to improve health, enhance performance of athletes, race horses etc.

OR

(a) In angiosperms, one of the male gametes fuses with the egg cell to form the zygote (syngamy). The other male gamete fuses with the two polar nuclei to produce a triploid primary endosperm nucleus (triple fusion). Since two types of fusions, syngamy and triple fusion take place in an embryo sac, the phenomenon is termed as double fertilisation.

(b) (i) Porogamy

(ii) Chalazogamy

(iii) Entomophily

(c) Wind is the pollinating agent for flowers like maize and *Cannabis*. The two characteristics of these anemophilous flowers are :

(i) Flowers are small and inconspicuous.

(ii) Flowers produce pollen grains in very large number.

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