Class XII Session 2026-27
Subject - Biology
Sample Question Paper - 7

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

General Instructions:

1. All questions are compulsory.
2. The question paper has five sections and 33 questions. All questions are compulsory.
3. Section–A has 16 questions of 1 mark each; Section–B has 5 questions of 2 marks each; Section– C has 7 questions of 3 marks each; Section– D has 2 case-based questions of 4 marks each; and Section–E has 3 questions of 5 marks each.
4. There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.
5. Wherever necessary, neat and properly labeled diagrams should be drawn.

Section A

1. Which of the following is a secondary consumer? **[1]**

   a) Fish b) Hawk

   c) Grasshopper d) Cow

2. A female undergoing IVF treatment has blocked fallopian tube. The technique by which the embryo with more than 8 blastomeres will be transferred into the female for further development is: **[1]**

   a) IUT b) AI

   c) GIFT d) ZIFT

3. The species becomes extinct most easily by: **[1]**

   a) Sliding of hills b) Deforestation

   c) Heavy rains d) Urbanisation

4. Which of the following is not a category of contraceptive method? **[1]**

   a) Artificial insemination b) Surgical method

   c) Barrier method d) Natural method

5. The technique for the early detection of a disease based on the principle of antigen-antibody interaction is: **[1]**

   a) RNAi b) EST

   c) PCR d) ELISA

6. Which one of the following is incorrect about the characteristics of protobionts (coacervates and microspheres) as envisaged in the abiogenic origin of life? **[1]**

a) They could separate combinations of molecules from the surroundings.

b) They were partially isolated from the surrounding.

c) They could maintain an internal environment.

d) They were able to reproduce.

7. Some cyanobacteria in aquatic and terrestrial environment that enrich the soil by fixing nitrogen are: **[1]**

a) Azospirillum and Glomus

b) Anabaena and Nostoc

c) Rhizobium and Azotobacter

d) Azospirillum and Azotobacter

8. In which of the following biomes, maximum number of plants & animals are found in? **[1]**

a) Deserts

b) Tundra

c) Temperate deciduous forests

d) Tropical rain forests

9. How many kinds of gametes can be produced by an individual of genotype $\frac{A}{a}\frac{B}{b}\frac{C}{c}\frac{D}{d}\frac{e}{e}\frac{F}{f}$:- **[1]**

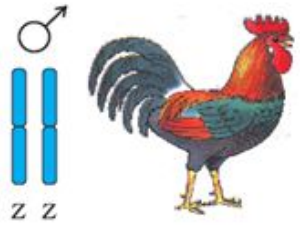
a) 8

b) 16

c) 4

d) 32

10. On the basis of the sex chromosome shown below, the bird shown is **[1]**



a) Female

b) Cannot be decided

c) Male

d) Transgender

11. For retting of jute, the fermenting microbe is: **[1]**

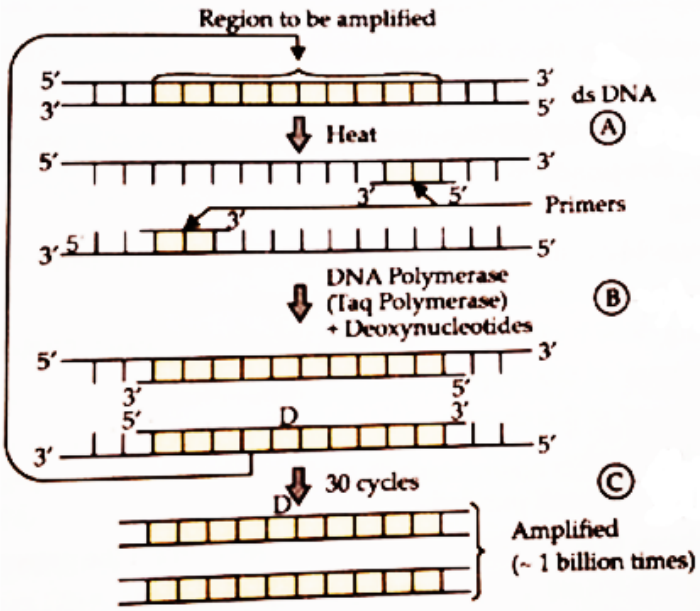
a) Butyric acid bacteria

b) Streptococcus lactis

c) Helicobacter pylori

d) Methanophilic bacteria

12. Figure given below represents the reactions associated with Polymer Chain Reaction (PCR). Name the steps A, B, C in the process. **[1]**



a) A - Annealing, B - Primer Extension, C - Denaturation

b) A - Annealing, B - Denaturation, C - Primer Extension

c) A - Primer Extension, B - Annealing, C - Denaturation

d) A - Denaturation, B - Annealing, C - Primer Extension

13. **Assertion (A):** Amniocentesis is usually not performed these days. **[1]**

Reason (R): Actually it was made for the diagnosis of congenital diseases in the early embryo but unfortunately it was misused for sex determination of foetus.

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

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

14. **Assertion (A):** Only Lactobacillus lactis causes curdling of milk. **[1]**

Reason (R): Only these bacteria can produce lactic acid.

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

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) If both A and R are false.

15. **Assertion (A):** Unidirectional flow of energy from the sun to producers and then to consumers. **[1]**

Reason (R): Except for the deep sea hydro-thermal ecosystem, the sun is the only source of energy for all ecosystems on Earth.

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

b) Both A and R are true but R is not the correct explanation of A

c) A is true but R is false.

d) A is false but R is true.

16. **Assertion:** When the frequency of allele of a gene measured in a population and it differs from expected values, the difference (direction) indicates the extent of evolutionary change. **[1]**

Reason: Change of frequency of alleles in a population would be interpreted as evolution.

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

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

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

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

Section B

17. Name some techniques used for early molecular diagnosis of pathogens and genetic disorders. **[2]**

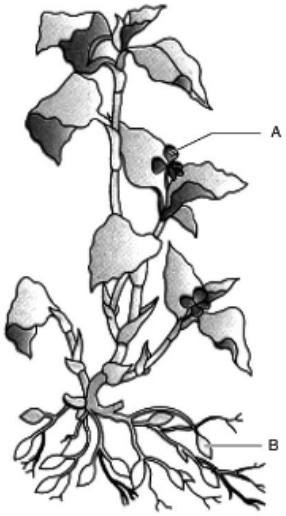
OR

With respect to understanding diseases, discuss the importance of transgenic animal models.

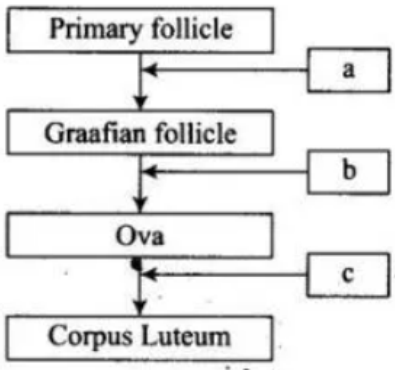
18. Examine the diagram of mRNA given below. Mark the 5' and 3' ends of the mRNA by giving reasons. **[2]**



19. Identify the types of flower shown in A and B. Which out of the two will produce an assured seed set. **[2]**



20. Given below is a flow chart showing ovarian changes during the menstrual cycle. Fill in the spaces giving the name of the hormones responsible for the events shown. **[2]**



OR

A spermatogonial cell has 30 chromosomes. How many chromosomes will be found in

(i) the primary spermatocyte

(ii) the spermatid?

21. How is curd prepared? How preparation of curd improves nutritional value of the milk? **[2]**

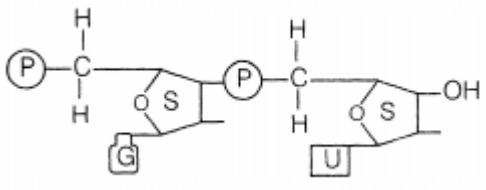
OR

Arrange the following in the decreasing order (most important first) of their importance, for the welfare of human society. Give reasons for your answer.

Biogas, Citric acid, Penicillin and curd

Section C

22. Answer the questions based on the dinucleotide show below. **[3]**



i. Name the type of sugar to which guanine base is attached to.

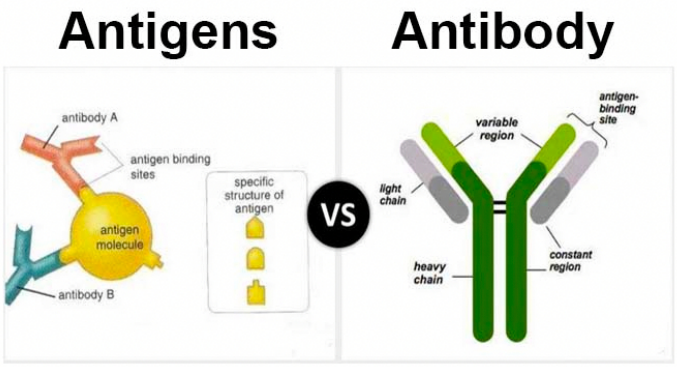
ii. Name the linkage connecting the two nucleotides.

iii. Identify the 3' end of the dinucleotide. Give a reason for your answer.

23. The male fruit fly and female fowl are heterogametic while the female fruit fly and the male fowl are homogametic. Why are they called so? **[3]**

24. Differentiate between an **Expanding age pyramid** and a **Stable age pyramid**. Substantiate your answer with diagrams. **[3]**

25. The image here compares Antigens and Antibody. **[3]**



i. Define the terms Antigen and Antibody.

ii. Name any two diagnostic kits based upon them.

26. A. Who is having more species diversity - Columbia or Greenland and why? **[3]**

B. Explain the concept proposed by Paul Ehlrich.

27. a. State what does the study of Fossils indicate. **[3]**

b. Rearrange the following group of plants according to their evolution from Palaeozoic to Cenozoic periods:

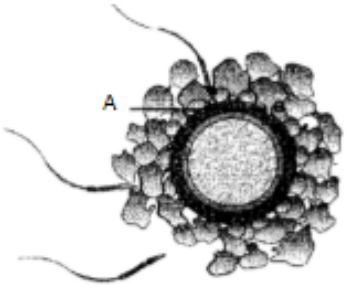
Rhynia; Arborescent Lycopods; Conifers; Dicotytedon.

28. What is the basic principle of vaccination? How do vaccines prevent microbial infections? Name the organism from which hepatitis B vaccine is produced. **[3]**

Section D

29. **Read the following text carefully and answer the questions that follow:** **[4]**

Study the image below:



i. One of the sperms is observed to penetrate 'a' of the ovum, as shown in the above diagram. Name 'a'. (1)

ii. How is the sperm able to do so? (1)

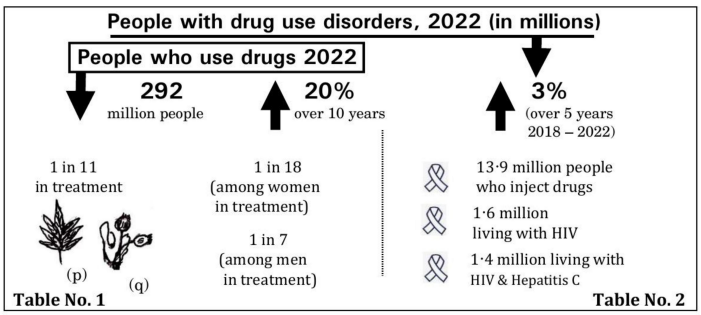
iii. Where exactly in the fallopian tube does this occur? (2)

OR

Explain the events thereafter upto morula stage. (2)

30. **Read the following passage and answer the questions that follow.** **[4]**

Prevention is the frontline response to drug use. Effective interventions address the underlying conditions contributing to family or community, instability, insecurity, trauma, mental health issues, etc. When addressed, these factors can effectively prevent the initiation of drug use and the progression to drug use disorders. Study the few key figures of drug use given below and answer the questions that follow.



a. What do you infer from the figures in Table No. 1 about the people with drug use disorders, 2022 (in million)? State any two of your observations. (1)

b. How are Hepatitis C and HIV related to drug use disorders by people, as shown in Table No. 2? State the correlation between the two. (2)

c. i. Give the scientific name of (p) shown in Table No. 1. (1)

OR

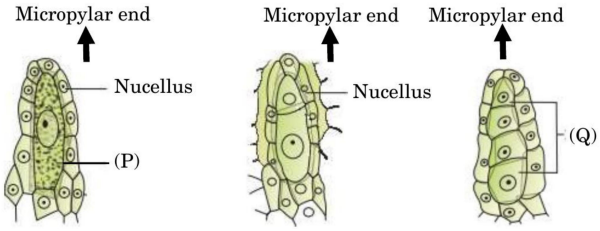
ii. Give the scientific name of (q) shown in Table No. 1. (1)

Section E

31. Differentiate between microsporogenesis and megasporogensis. Which type of cell division occurs during these events? Name the structures formed at the end of these two events. **[5]**

OR

Study the figures given below showing initial stages in the formation of female gametophyte and answer the questions that follow.



i. Identify (P) and (Q).

ii. I. What kind of division does cell (P) undergo to form (Q)?

II. How many (Q) cells form the embryo sac? What is the name given to such kind of development?

III. How many free nuclear mitotic divisions will the functional megaspore undergo to form the embryo sac?

IV. Describe the structure of a mature female gametophyte.

32. Explain Griffith's experiment conducted in search of genetic material and write the conclusion he arrived at. How did Avery, MacLeod and McCarty establish the biochemical nature of the "Genetic Material" identified by Griffith? **[5]**

OR

The following questions are based on the classic experiment conducted by Hershey and Chase.

i. Why were bacteriophages chosen by the scientists?

ii. Name the radioactive isotopes used and state the reason for using them.

iii. Describe the steps of the experiment.

iv. Why is this experiment considered a major breakthrough in the field of molecular biology?

33. Explain the role(s) of the following in biotechnology **[5]**

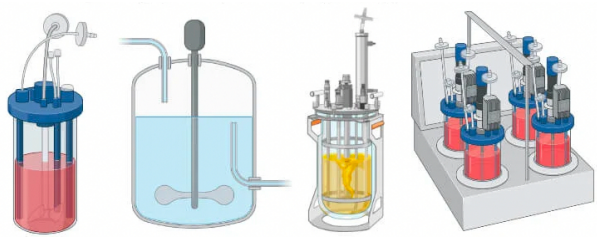
i. Restriction endonuclease

ii. Gel-electrophoresis

iii. Selectable markers in pBR322

OR

Bioreactors are vessels that have been designed and produced to provide an effective environment for enzymes or whole cells to transform biochemicals into products. In some cases, inactivation of cells or sterilization is carried out in the bioreactor such as in water treatment. The development of bioreactors is required to produced large quantities of products.



i. Give optimum growth conditions used in bioreactors.

ii. Draw a well labelled diagram of simple stirred-tank bioreactor.

iii. How does a simple stirred tank bioreactor differ from sparged stirred tank bioreactor ?

Solution

Section A

1. **(a)** Fish
   Explanation:
   Producers (green plants, phytoplankton) make their own food. Primary consumers are herbivores that eat producers (for example, grasshopper and cow are herbivores and so are primary consumers).
   Secondary consumers are animals that feed on primary consumers (they are carnivores or insectivores that eat herbivores). In typical food chains, many fish feed on herbivorous organisms such as zooplankton or insect larvae, so they occupy the secondary-consumer level. The hawk, which eats other carnivores or larger animals, is a higher-level (tertiary) predator, not a secondary consumer.

2. **(a)** IUT
   Explanation:
   In IVF the choice of transfer method depends on what is being transferred and where it must be placed. GIFT (gamete intrafallopian transfer) places eggs and sperm into the fallopian tube, and ZIFT (zygote intrafallopian transfer) places the fertilized zygote into the tube - both require a patent fallopian tube and so are unsuitable when the tube is blocked. IUT (intrauterine transfer or embryo transfer) is the procedure in which an embryo at the cleavage stage (typically an embryo of about 8 or more blastomeres) is placed directly into the uterine cavity for further development. AI (artificial insemination) involves placing sperm, not embryos, and therefore is not applicable. Because the patient has blocked tubes and the embryo has more than 8 blastomeres (cleavage-stage embryo), the appropriate technique is IUT.

3. **(b)** Deforestation
   Explanation:
   Deforestation

4. **(a)** Artificial insemination
   Explanation:
   Artificial insemination is not a contraceptive device. It is an assisted reproductive technology for infertile people. The natural method, barrier method, and surgical methods are categories of contraceptive methods.

5. **(d)** ELISA
   Explanation:
   ELISA

6. **(a)** They could separate combinations of molecules from the surroundings.
   Explanation:

Protobionts that include coacervates and microspheres are involved in the origin of life from the inorganic substances. Coacervate and microspheres are separate combinations of molecules from surroundings that lead to the formation of the first life on earth.

7.

(b) Anabaena and Nostoc

Explanation:

Anabaena and Nostoc are filamentous cyanobacteria (blue-green algae) that occur in both aquatic and terrestrial habitats and are capable of biological nitrogen fixation. They develop specialized nitrogen-fixing cells called heterocysts in which the oxygen-sensitive enzyme nitrogenase functions; atmospheric N_2 is reduced to ammonia and this fixed nitrogen is released into the surroundings, thereby enriching the soil. For example, Anabaena lives in symbiosis with the water fern Azolla in paddy fields, and Nostoc forms soil crusts and symbiotic associations with some plants, both contributing to soil fertility. The other named organisms are nitrogen-fixers of different groups: Rhizobium (bacterial symbiont of legume roots), Azotobacter and Azospirillum (free-living or associative bacteria), and Glomus (a mycorrhizal fungus) - none of these are cyanobacteria, so they do not match the description in the question.

8.

(d) Tropical rain forests

Explanation:

Tropical rain forests

9.

(d) 32

Explanation:

To determine the number of different gametes produced by an individual with the genotype $\frac{A}{a}\frac{B}{b}\frac{C}{c}\frac{D}{d}\frac{e}{e}\frac{F}{f}$, we need to consider the alleles at each locus. 1. For the loci with two different alleles (A/a, B/b, C/c, D/d, F/f), each can contribute 2 possible alleles to the gamete. 2. The locus e/e has only one type of allele, contributing just 1 possible allele. Now, we calculate the total number of combinations of alleles: - For A/a: 2 options - For B/b: 2 options - For C/c: 2 options - For D/d: 2 options - For e/e: 1 option - For F/f: 2 options The total number of gametes is the product of the options from each locus: $2 \times 2 \times 2 \times 2 \times 1 \times 2 = 2^5 = 32$ Thus, the individual can produce 32 different kinds of gametes.

10.

(c) Male

Explanation:

Male birds bear ZZ sex chromosome as sex determination is ZO type, in which ZZ is male and ZO is female.

11. **(a)** Butyric acid bacteria

Explanation:

Butyric acid bacteria

12.

(d) A - Denaturation, B - Annealing, C - Primer Extension

Explanation:

A - Denaturation, B - Annealing, C - Primer Extension

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

Explanation:

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

14. **(d)** If both A and R are false.
Explanation:
If both A and R are false.

15. **(b)** Both A and R are true but R is not the correct explanation of A
Explanation:
Both A and R are true but R is not the correct explanation of A

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

Section B

17. Recombinant DNA technology, polymerase chain reaction (PCR) and enzyme Linked Immuno Sorbent Assay (ELISA).

OR

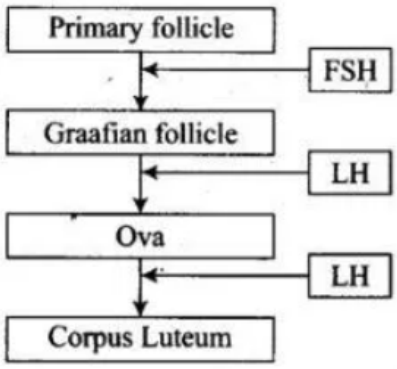
Transgenic animals can serve as models to understand progression of various disease in human. Transgenic models exist for many human diseases like cancer, cystic fibrosis, rheumatoid arthritis and Alzheimer's. These animals can be observed to understand the causative gene for a particular disease. This can help in devising suitable treatment for a particular diseases.

18. The presence of adenine bases from the poly-A tail which denotes the 3' end of the mRNA.



19. A - Chasmogamous flower
B - Cleistogamous flower
Cleistogamous flower produces assured seed set.

20.



OR

(I) Primary spermatocyte will also have 30 chromosomes because it is formed by mitotic division from spermatogonial cell.
(ii) The spermatid is produced by meiotic division (reductional division) from primary spermatocyte and will have only half (15) chromosomes.
The primary spermatocyte first undergoes meiosis I to produce two haploid secondary spermatocytes.
The secondary spermatocytes undergo meiosis II to produce four haploid spermatids.

21. Microorganisms such as Lactobacillus and others commonly called lactic acid bacteria (LAB) grow in milk and convert it into curd. During growth, the LAB produces acids that coagulate and partially digest the milk proteins. A small amount of curd added into the fresh milk as inoculum or starter contain millions of LAB which at suitable temperatures multiply, thus converting milk

to curd, which also improves its nutritional quality by increasing vitamin B_{12}. In our stomach, the LAB plays a very beneficial role in checking disease-causing microbes.

OR

The order of arrangement of products according to their decreasing importance is:

Penicillin- Biogas – Citric acid – Curd

- Penicillin is the most important product for the welfare of human society. It is an antibiotic, which is used for controlling various bacterial diseases.
- The second most important product is biogas. It is an eco-friendly source of energy.
- The next important product is citric acid, which is used as a food preservative.
- The least important product is curd, a food item obtained by the action of lacto bacillus bacteria on milk.

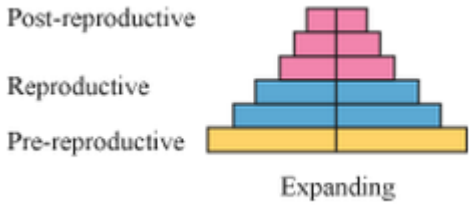
Section C

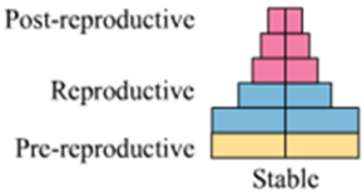
22. i. Pentose sugar or deoxyribose sugar.
ii. Two nucleotides are linked through 3'-5' phosphodiester linkage to form a dinucleotide.
iii. The ribose sugar has a free 3'-OH group which is referred to as 3' end of the polynucleotide chain.

23. Cell type of male fruit fly - XY
Female fowl - ZW
The sex chromosomes are different, hence, they are called heterogametic.
While female fruit fly has XX and male fowl has ZZ. The sex of chromosomes are similar hence homogametic.

24.

Expanding age pyramid	Stable age pyramid
The population of pre-reproductive age is greater than population of reproductive age	The population of pre-reproductive age equals to population of reproductive age





25. An antigen is a foreign substance that elicits the formation of an antibody. The antibody is a protein that is synthesised in response to an antigen. Antigen and antibody show a high degree of specificity in binding each other. Two-diagnostic kits based on antigen-antibody interaction are:
i. ELISA for HIV
ii. Pregnancy test kits.

26. A. Columbia, as it is located near the equator / as we move from equator towards poles the biodiversity decreases.
B. Paul Ehrlich gave rivet popper hypothesis in an airplane (ecosystem) all parts are joined together using thousands of rivets (species), If every passenger travelling starts popping a rivet to home (causing a species to become extinct) it may not affect flight safety (ecosystem functioning) initially, but as more and more rivets are removed, the plane becomes dangerously weak over a period of time, furthermore which rivet is removed may also be critical loss of rivets on wings (key species) is more serious threat to flight safety.

27. a. Study of fossil fuel indicate the following
They are evidence of evolution and they represent extinct. The life forms varied over time and certain life forms were restricted to certain geological time spans.
b. Rhynia $\Rightarrow$ Arborescent Lycopods $\Rightarrow$ Conifers $\Rightarrow$ Dicotyledon

28. The principle of vaccination is based on the property of memory of the immune system. In vaccination, a preparation of antigenic proteins of pathogens or inactivated/live but weakened pathogens are introduced into the body. The antigens generate the primary immune response by

producing antibodies. The vaccines also generate memory B-cells and T-cells. When the vaccinated person is attacked by the same pathogens, the existing memory B-cells or T-cells recognise the antigen quickly and overwhelm the invaders with massive production of lymphocytes and antibodies. Hepatitis B vaccine is produced from yeast.

Section D

29. i. Zona pellucida

ii. The sperms in the female genital tract undergo activation by the secretions of the genital tract. The activated sperms undergo acrosomal reactions releasing chemicals contained in the acrosome. These chemicals act on follicle cells, corona radiata, and digest zona pellucida. The plasma membrane of the sperm fuses with the plasma membrane of secondary oocyte so that only the sperm nucleus enters the oocyte.

iii. It occurs in the ampullary-isthmic junction of the fallopian tube.
Penetration of sperm nucleus induces meiotic division II to form ovum (ootid) and a secondary polar body. The fusion of the sperm with the ovum, nucleus form zygote, a process called fertilisation.

OR

The zygote undergoes within hours after fertilisation and the young embryo is slowly moving down the fallopian tube towards the uterus. At the end of the 4th day, the embryo reaches the uterus. It has 8-16 blastomeres and this solid mass of cells is known as morula (little mulberry) as it looks like a mulberry. The morula develops into a blastocyst (64-cells) with a cavity called blastocoel. It undergoes implantation.

30. a. Number of men taking treatment was higher than women /1 woman out of 18 was treated/ 1 man out of 7 was treated/ 1 in 11 persons was addicted to Cannabis sativa or Papaver somniferum / drug user have increased by 20% / 292 million people were consuming drugs in 2022

b. Contaminated needles sharing between drug addicts transmits diseases like Hepatitis B and HIV. Both diseases are primarily caused by viruses.

c. i. Cannabis sativa

OR

ii. Papaver somniferum

Section E

31.

	Microsporogenesis		**Megasporogenesis**
1.	It is process of formation of microspores from microspore mother cell.	1.	It is the process of formation of megaspores from megaspore mother cell.
2.	It occurs inside the pollen sacs of anthers.	2.	It occurs in nucellus part of ovule.

- In both the events meiosis cell division occurs.
- Microsporogenesis results in the formation of microspores while megasporogenesis forms megaspores.

OR

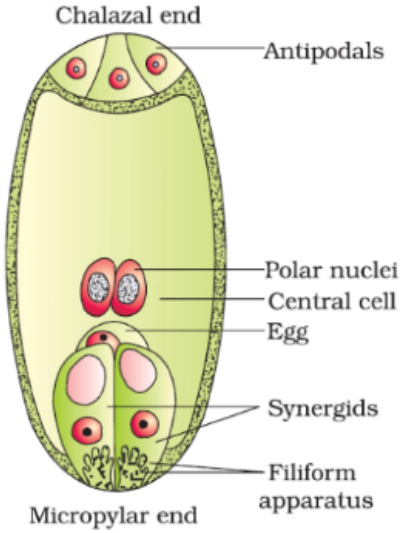
i. P- Megaspore mother cell
Q- Megaspores (four megaspores)

ii. I. Meiosis.
II.
- Only one cell
- Monosporic development

iii. Three free nuclear division

iv. The mature female gametophyte has 3 cells at micropylar end - Egg apparatus (two synergids and one egg cell) with thickenings called filiform apparatus in synergids, three cells at chalazal end- Antipodals, large central cell with two polar nuclei, so it is 8-nucleated and 7-

celled.



32. Griffith selected 'S' strain and 'R' strain bacteria Streptococcus pneumoniae, 'S' strain - Virulent causes pneumonia, 'R' strain - Non-virulent does not cause pneumonia

$$\left.\begin{array}{l} \text{' S ' strain} \xrightarrow{\text{Inject into mice}} \text{mice die} \\ \text{' R ' strain} \xrightarrow{\text{Inject into mice}} \text{mice live.} \end{array}\right]$$

$$\text{'S' strain (heat-killed)} \xrightarrow{\text{Inject into mice}} \text{mice live}$$

$$\text{Heat killed 'S' strain + 'R' strain (live)} \xrightarrow{\text{Inject into mice}} \text{mice die.}$$

Griffith concluded that the 'R' strain bacteria had somehow been transformed by the heat killed 'S' strain bacteria.

They purified biochemicals (Proteins, DNA, RNA etc.) from the heat killed 'S' cells and the fractions were added individually to the culture of the live 'R' cells,

DNA was able to cause transformation of 'R' cells into 'S' cells/they found that protein digesting enzyme or RNA digesting enzymes did not affect transformation or digestion with DNase did inhibit transformation indicating that the transforming substance is not a protein or RNA, This suggests that the DNA is the "genetic material".

Oswald Avery Colin Macleod and McCarty worked to determine the biochemical nature of transforming principle in Griffiths experiment. They purified biochemicals proteins DNA RNA etc. from the heat killed S cells to see which ones could transform live R cells into S cells.

OR

i.
- The structure of bacteriophages consists of only DNA and protein
- Bacteriophage infects bacteria (E. coli) by inserting its genetic material.

ii. Radioactive phosphorous $\left({}^{32}P\right)$ as phosphorous is present only in DNA and not in proteins.

Radioactive sulphur $\left({}^{35}S\right)$ as sulphur is present only in proteins not in DNA.

iii.
- Infection radioactive phage's were allowed to attach to E. coli bacteria
- Blendin Viral coats were removed from the bacteria by blending
- Centrifugation virus particles were separated from bacteria by spinning them in a centrifuge

iv. This established that DNA is Genetic material.

33. i. **Restriction endonucleases** -These are the bacterial enzymes that cut dsDNA into fragments after recognising and binding to the specific nucleotide sequences, known as recognition site. These enzymes are used to form recombinant molecules of DNA, composed of DNA from different sources.

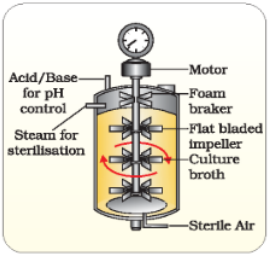
ii. **Gel-electrophoresis** is the technique which allows the separation and visualisation of fragments of DNA on an agarose gel matrix.
Since the DNA fragments are negatively-charged molecules, they separate and move towards the anode (+ve) under the influence of an electric field. DNA fragments are separated on the basis of their size through the sieving effect provided by the gel.

iii. **Selectable markers in pBR322** help in identification and selection of transformants. pBR322, an E coll cloning vector has two antibiotic resistance genes, i.e. for ampicillin and tetracycline, which act as a selectable marker. When a foreign DNA is ligated at the site of tetracycline resistance (tet^R) gene in pBR322, the recombinant plasmid will lose tetracycline resistance due to insertional inactivation of foreign DNA, but can still be selected out from non-recombinants by placing the transformants on ampicillin containing a medium. The transformants growing on ampicillin containing medium are then transferred on tetracycline containing a medium. The recombinants will grow on ampicillin containing medium but not on tetracycline one whereas non-recombinants grow on both.

OR

i. Temperature, pH, substrates, salts, vitamins and oxygen.

ii. Simple stirred-tank bioreactor



iii. The stirrer facilitates even mixing and oxygen availability throughout simple-stirred tank bioreactor, whereas in case of sparged stirred tank bioreactor, air is bubbled throughout the reactor for proper mixing.