# Class XII Session 2026-27
# Subject - Biology
# Sample Question Paper -5

**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. In which of the following chromosomal disorders do individuals have short stature, underdeveloped feminine character and sterile ovaries? **[1]**

   a) Patau's syndrome
   b) Turner's syndrome
   c) Down's syndrome
   d) Klinefelter's syndrome

2. Which of the following species had been not recently extinct? **[1]**

   a) Dodo (Mauritius)
   b) Quagga (Africa)
   c) Steller's Sea cow (Russia)
   d) Bengal tiger (India)

3. Inability to conceive or produce children even after two years of unprotected sexual co-habitation is called: **[1]**

   a) Incapability
   b) Infertility
   c) Sterility
   d) Malfunction

4. A bacterial cell was transformed with a recombinant DNA molecule that was generated using a human gene. However, the transformed cells did not produce the desired protein. Reasons could be: **[1]**

   a) Human gene may have intron which bacteria cannot process.
   b) Amino acid codons for humans and bacteria are different.
   c) All of these
   d) Human protein is formed but degraded by bacteria.

5. What could be the reason of extinction of Abingdon Tortoise from Galapagos Islands? **[1]**

a) Parasitism
b) Interspecific Competition
c) Predation
d) Intraspecific Competition

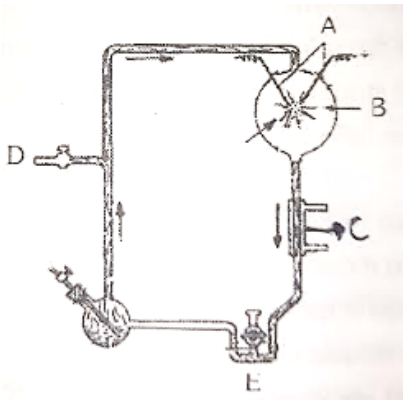
6. Mycorrhiza does not help the host plant in: **[1]**

a) Enhancing its phosphorus uptake capacity
b) Increasing its resistance to insects
c) Enhancing its resistance to root pathogens
d) Increasing its tolerance to drought

7. Bacillus thuringiensis (Bt) strains have been used for designing novel: **[1]**

a) Bio-mineralization processes
b) Bio-insecticidal plants
c) Bio-metallurgical technique
d) Bio-fertilizers

8. The diagram represents miller's experiment. Choose the correct combination of labelling. **[1]**

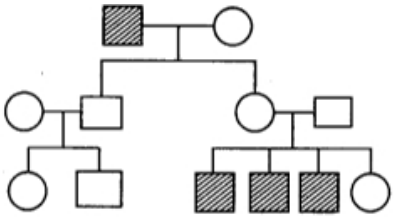



a) A-electrodes, B-$NH_3$ + $H_2O$, C-hot water, D-tap, E-U trap
b) A-electrodes, B-$NH_4$ + $H_2$ + $CO_2$ +$CH_3$, C-hot water, D-vacuum, E-U trap
c) A-electrodes, B-$NH_3$ + $H_2$ + $H_2O$ +$CH_4$, C-steam, D-vacuum, E-U trap
d) A-electrodes, B-$NH_3$ + $H_2$ + $H_2O$ +$CH_4$, C-cold water, D-vacuum, E-U trap

9. An inverted pyramid of number and an inverted pyramid of biomass are respectively seen in: **[1]**

a) Sea and grassland ecosystem
b) Sea and tree ecosystem
c) Grassland and tree ecosystem
d) Tree and sea ecosystem

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



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

a) Codominant relationship of a single pair of alleles
b) Simple Mendelian Recessive

c) X-linked recessive transmission
d) X-linked dominant transmission

11. Which of the following statement for sewage is correct? **[1]**

a) Contains large amount of organic matter and non-pathogenic microbes

b) Municipal waste-water, whose major component is human excreta

c) Can be discharged directly into natural water bodies like rivers and streams

d) It is generated in less quantities in cities and villages as compared to towns

12. Restriction enzymes belongs to a larger class of enzymes called: **[1]**

a) Glcucatase
b) Chitinase
c) Nucleases
d) Protease

13. **Assertion (A):** Determining the sex of an unborn child followed by MTP is an illegal practice. **[1]**
**Reason (R):** Amniocentesis is a practice to test the presence of genetic disorders also.

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):** Trichoderma species are free living fungi that are very common in the root ecosystems. **[1]**
**Reason (R):** They are effective bio-control agents of several plant pathogens.

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

15. **Assertion (A):** In open water zone up to the depth to which light can penetrate, called photic zone. **[1]**
**Reason (R):** The photic zone is categorized into the euphotic and disphotic zone.

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 (A):** Proconsul was intermediate between apes and man. **[1]**
**Reason (R):** It is considered as the ancestor of man.

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

## Section B

17. i. Construct a complete transcription unit with promotor and terminator on the **[2]**

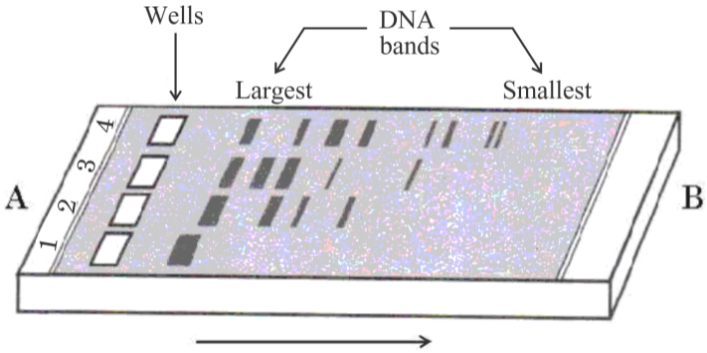
basis of the hypothetical template strand given below.




ii. Write the RNA strand transcribed from the above transcription unit along with its polarity.

OR

Given below is the diagram representing the observation made for separating DNA fragments by gel electrophoresis. Observe the illustration and answer the questions that follow:



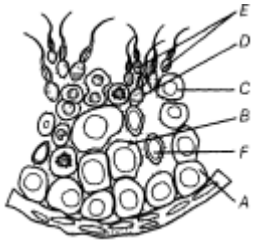

a. DNA fragments move in the direction A → B. Explain.

b. Name the matrix used and its role in gel electrophoresis.

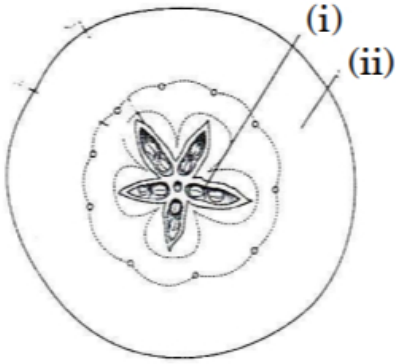
c. Mention how the separated fragments can be visualized for further technical use.

18. Name the effective biocontrol agents of several plant pathogens belonging to group of viruses. Also write about the ways they support the environment. **[2]**

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




20. Given below is a transverse sectional view of an apple. Label the following parts (i) and (ii) and write down their functions. **[2]**




OR

Mention the functions of each of the following:

i. Tassels of Corn Cob

ii. Scutellum

21. In spite of the statutory warning on cigarette packets against **smoking** and its **[2]**

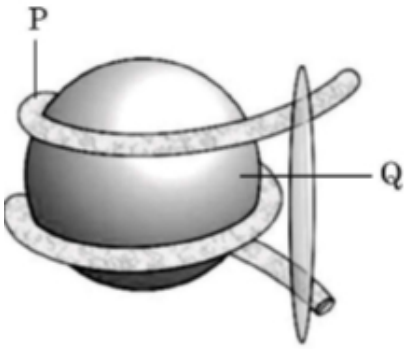
injurious effects on health, smoking is still prevalent in the society. Enumerate four important health hazards to a smoker.

OR

Explain how the immunity of a person is affected if there is atrophy (degeneration) of the thymus gland at an early stage of life.

## Section C

22. Study the diagram given below and answer the questions that follows: **[3]**

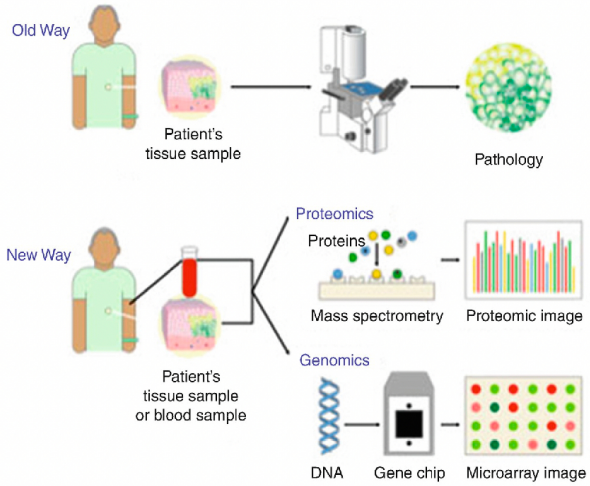



a. Identify the structure shown in the above figure.
b. Identify the labels P and Q.
c. Write the nature of histone proteins.
d. Distinguish between Euchromatin and Heterochromatin.

23. a. How is Hardy-Weinberg expression $\left(p^2+2pq+q^2\right)=1$ derived? **[3]**
b. List any two factors that disturb the genetic equilibrium.

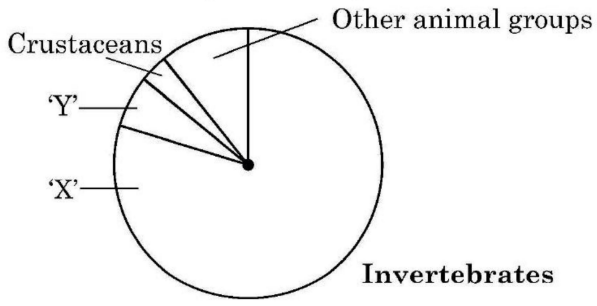
24. Answer the following questions: **[3]**
i. Define 'predation'.
ii. Why is predation required in a community of different organisms? Give any two points.
iii. Why are predators 'prudent' in nature?

25. The image below describes the molecular diagnostic procedures. **[3]**




i. Write any two biochemical/molecular diagnostic procedures for early detection of viral infection.
ii. Explain the principle of any one of them.

26. Study the pie chart given below, representing the global biodiversity and proportionate number of species of major taxa. **[3]**




Answer the following questions:

a. Identify 'X' and 'Y' in the given pie chart.

b. Which one of the two 'X' or 'Y', is the most species-rich taxonomic group and by what percentage?

c. Name the level of Biodiversity represented by the following:

i. Estuaries and alpine meadows in India

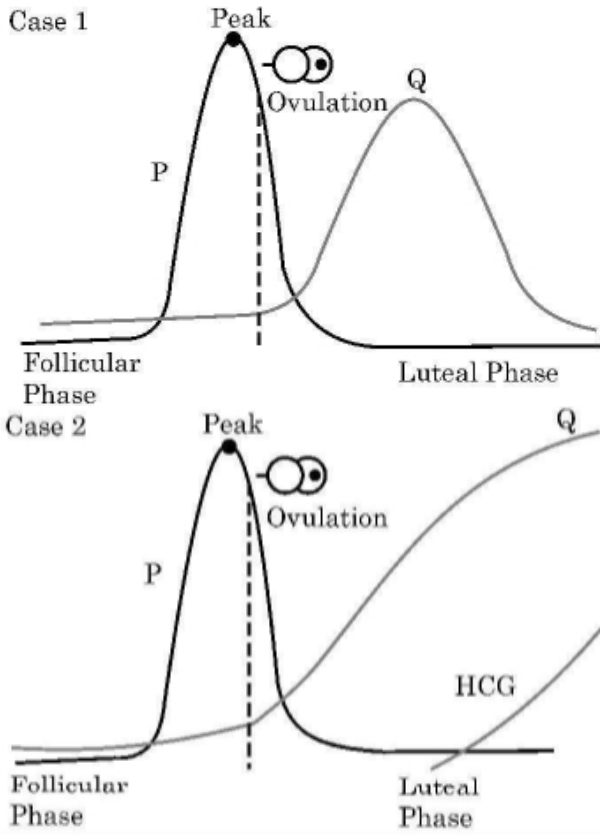
ii. The medicinal plant Rauwolfia vomitoria.

27. While creation and presence of variation are directionless, natural selection is directional as it is in the context of adaptation. Comment. **[3]**

28. Over the last century, vaccination has been the most effective medical strategy to control infectious diseases. Explain the principle on which **vaccinations** act. **[3]**

**Section D**

29. Study the graphs given below for Case 1 and Case 2 showing different levels of certain hormones and answer the questions that follows: **[4]**




a. Which hormone is responsible for the peak observed in Case 1 and Case 2? Write one function of that hormone.

b. Write changes that take place in the ovary and uterus during follicular phase.

**Student to attempt either sub-part (c) or (d):**

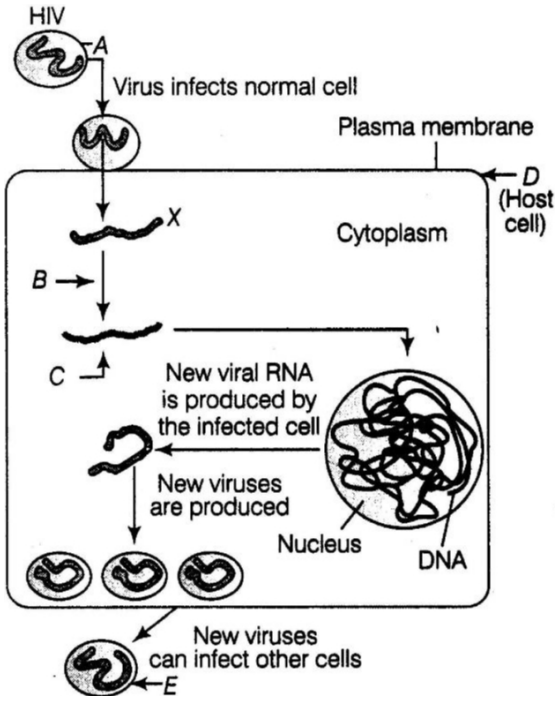
c. Name the hormone Q of Case 2. Write one function of hormone Q.

**OR**

d. Which structure in the ovary will remain functional in Case 2 ? How is it formed?

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

Study the diagram showing replication of HIV in humans:




i. Write the chemical nature of the coat A. (1)

ii. Name the enzyme B acting on X to produce molecule C. Name C. (1)

iii. Mention the name of the host cell D the HIV attacks first when it enters into the human body. (2)

**OR**

Name the two different cells the new viruses E subsequently attack. (2)

## Section E

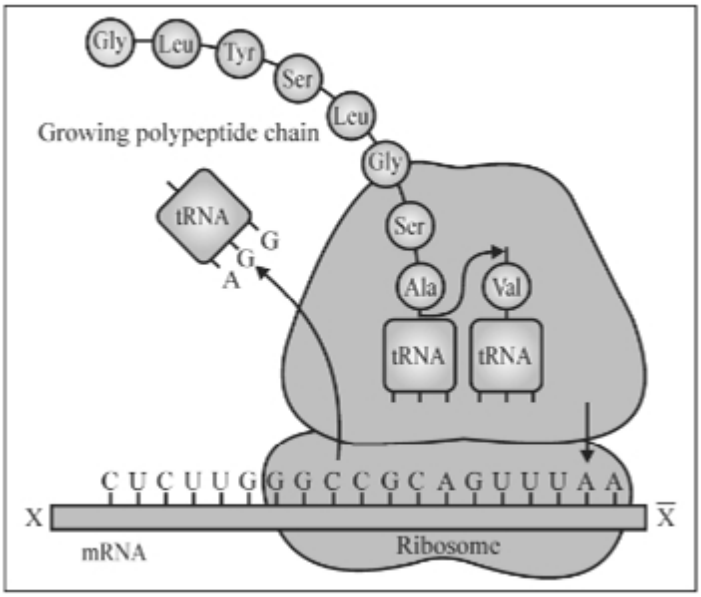
31. Draw a diagram of male gametophyte of an angiosperm. Label any four parts. Why is sporopollenin considered the most resistant organic material? **[5]**

OR

i. Explain the structure of a mature embryo sac of a typical flowering plant.

ii. How is triple fusion achieved in these plants?

32. Study the schematic diagram given below and answer the questions that follow: **[5]**




i. Identify the polarity from **X** to $\overline{X}$ in the mRNA segment shown. Mention how many more amino acids can be added to the polypeptide that is being translated and why.

ii. Write the initiating codon for translation, its anticodon and the amino acid it codes for.

iii. Explain the charging of an adaptor molecule. Why this molecule needs to be charged?

OR

a. Write the steps that lead to aminoacylation of tRNA in the cell.

b. Explain the events that occur in ribosomes during translation in prokaryotes.

33. Describe the technique of a typical agarose gel electrophoresis used for the separation and isolation of DNA fragments. **[5]**

OR

i. Explain the given methods of introducing the alien DNA in the host cells:

I. Biolistics

II. Microinjection.

ii. How is E. coli made 'competent' to take up a recombinant plasmid or DNA?

# Solution

## Section A

1.

**(b)** Turner's syndrome

**Explanation:**

Turner's syndrome is a random genetic disorder that affects females. The main characteristics include short stature and infertility. Usually, a female has two X chromosomes. However, in females with Turner's syndrome, one of these chromosomes is missing or abnormal.

2.

**(d)** Bengal tiger (India)

**Explanation:**

The species that had been recently extinct include Quagga (Africa), Steller's Sea cow (Russia), and Dodo (Mauritius). Bengal tiger is not extinct so far.

3.

**(b)** Infertility

**Explanation:**

The inability to conceive even after two years of unprotected sexual co-habitation is called infertility. This may be due to not functioning of the male or female reproductive system properly.

4. **(a)** Human gene may have intron which bacteria cannot process.

**Explanation:**

Human genes have two types as gene segments which are known as introns and exons. Exons are translationally active while introns are not. Transcripted mRNA undergoes an additional stem(splicing) to remove introns. Bacteria do not have a mechanism like splicing. That can be a reason for not expressing a human gene into bacteria.

5.

**(b)** Interspecific Competition

**Explanation:**

Interspecific competition means competition for the same resources between different species. On Pinta (Abingdon) Island the tortoise population declined because introduced animals (notably goats) and other invasive herbivores greatly reduced and altered the native vegetation, so the tortoises could not obtain enough food or suitable habitat and were outcompeted by these species. Intraspecific competition (competition within the tortoise species) would not explain the disappearance of the entire population on the island in the presence of resource loss by outsiders. Parasitism and predation may have contributed locally (for example on eggs or juveniles), but the principal cause that drove the adult population to extinction was loss of food and habitat through competition with introduced species, i.e. interspecific competition.

6.

**(b)** Increasing its resistance to insects

**Explanation:**

The fungal symbiont in mycorrhiza absorbs phosphorus from soil and passes it to the plant. Plants having such associations show other benefits also, such as resistance to root-borne pathogens, tolerance to salinity and drought, and an overall increase in plant growth and development.

7.

**(b)** Bio-insecticidal plants

**Explanation:**

Bio-insecticidal plants

8.

**(d)** A-electrodes, B-$NH_3$ + $H_2$ + $H_2O$ +$CH_4$, C-cold water, D-vacuum, E-U trap

**Explanation:**

A-electrodes, B-$NH_3$ + $H_2$ + $H_2O$ +$CH_4$, C-cold water, D-vacuum, E-U trap

9.

**(d)** Tree and sea ecosystem

**Explanation:**

Tree and sea ecosystem

10.

**(c)** X-linked recessive transmission

**Explanation:**

X-linked recessive transmission

11.

**(b)** Municipal waste-water, whose major component is human excreta

**Explanation:**

The statement is correct (because municipal sewage primarily consists of waste from households, which includes a significant amount of human excreta. This accurately describes the main component of municipal wastewater. The other options are incorrect as they either misrepresent the nature of sewage or its treatment and disposal.

12.

**(c)** Nucleases

**Explanation:**

A restriction enzyme (or restriction endonucleases) recognizes a specific base pair sequence in DNA called a restriction site and cleaves the DNA (hydrolyses the phosphodiester backbones) within the sequence. Restriction enzymes are widely found in prokaryotes and provide protection to the host cell by destroying foreign DNA that makes entry to it. It acts as a part of the defense mechanism.

Restriction enzymes belong to a larger class of enzymes called nucleases. They are of two types: endonucleases and exonucleases.

13.

**(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).
Determining the sex of an unborn child followed by MTP (medical termination of pregnancy) is an illegal practice in many countries, including India. The government has banned the use of prenatal diagnostic techniques to determine the sex of the unborn child to prevent female feticide.

14.

**(b)** Both A and R are true but R is not the correct explanation of A.
**Explanation:**
Both statements are true: Trichoderma species are saprophytic, free-living fungi commonly found in the rhizosphere and root ecosystems, and they are widely used as effective biocontrol agents against many plant pathogens. However, the reason given (they are effective biocontrol agents) does not explain why they are free-living and common in root ecosystems. Their biocontrol activity arises from specific biological traits - rapid growth and root colonization, competition for nutrients and space, mycoparasitism, production of cell-wall degrading enzymes and antibiotics, and induction of host systemic resistance - whereas their common occurrence in the rhizosphere is due to their saprophytic lifestyle and ability to utilize root exudates and soil organic matter. In other words, R describes what they do (their function), while A describes where and how they live; R is not the causal explanation of A.

15.

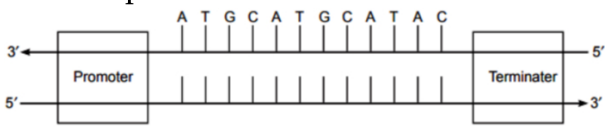
**(b)** Both A and R are true but R is not the correct explanation of A.
**Explanation:**
Both A and R are true but R is not the correct explanation of A.

16.

**(c)** A is true but R is false.
**Explanation:**
Proconsul lived in early Miocene epoch. It was morphologically intermediate between apes and man in many features. It has rounded man like forehead and long, pointed ape like canines. It moved upon land on all the four limbs and hence is not considered amongst the direct ancestors of man.

**Section B**

17. i. Transcription unit




ii. RNA strand transcribed from the above transcriptional unit




OR

a. DNA being negatively charged molecule (present at A end) gets attracted towards positive electrode or anode (B end).
b. Agarose gel, the DNA fragments separate according to their size through sieving effect provided by the agarose gel.
c. The separated DNA fragments can be visualised by staining them with ethidium bromide under UV radiation.

18. i. Baculoviruses / Nucleopolyhedrovirus
ii. Species specific, narrow spectrum insecticidal application, no negative impact on plants/ vertebrates / non-target insects, help to conserve beneficial insects, useful in IPM, useful in ecologically sensitive area

19. A-Spermatogonium
    B-Primary spermatocyte
    C-Secondary spermatocyte
    D-Spermatid
    E-Spermatozoa
    F-Sertoli cell
20. (i) Endocarp (ii) Thalamus
    **Functions-**
    i. Endocarp - Protects seed
    ii. Thalamus - Forms the edible part of the fruit

    OR

    i. Produce and release pollen grains (male flowers) for pollination.
    ii. It provides nourishment to the embryo.
21. Smoking causes **cancer, heart disease, stroke, lung diseases, diabetes, and chronic obstructive pulmonary disease (COPD), which includes emphysema and chronic bronchitis**.

    OR

    - The immunity will decrease.
    - Immature lymphocytes will not differentiate into antigen - sensitive lymphocytes / development and maturation of T-lymphocytes does not take place.

**Section C**

22. a. Nucleosome
    b. $P = DNAQ =$ Histone octamer
    c. Basic/ Positively charged
    d.

| Euchromatin | Heterochromatin |
|---|---|
| Loosely packed chromatin | Densely packed chromatin |
| Lightly stained | Darkly stained |
| Transcriptionally active chromatin | Transcriptionally inactive chromatin |

23. a. According to Hardy Weinberg principle-
    Sum total of all the Allelic frequencies in a population $= 1$.
    Let there be two alleles A and a in the population. Let their frequencies be '$p$' and '$q$' respectively.
    $p + q = 1$
    The frequency of AA will be $p^2$ because - the probability that an allele A with frequency 'p' would appear on both the chromosomes of a diploid individual will be product of probabilities i.e. $p^2$.
    Similarly frequency of '$a$' will be $q^2$,
    and Aa is 2 pq
    Hence $p^2 + 2pq + q^2 = 1$
    b. Gene migration or Gene flow, Genetic drift, Mutation, Genetic Recombination, Natural selection
24. i. Predation is the interspecific interaction in which a large animal called predator kills and consumes a smaller animals called prey.
    ii.
    - It keeps the prey population under control.
    - It helps in maintaining species diversity in a community by reducing the intensity of competition among competing prey species.
    - It acts as conduit for energy transfer across trophic level.
    - Biological control methods adopted in agricultural pest control are based on the ability of the predator to regulate prey population.

iii. If a predator is too efficient and over exploits its prey then the prey might become extinct and following it the predator will also become extinct for lack of food.

25.
- **Name of biochemical/molecular diagnostic tests for viruses:**
  - **ELISA** - Enzyme-Linked Immunosorbent Assay
  - **PCR** – Polymerase Chain Reaction
- **Principle of ELISA -** It is based on antigen-antibody interaction. Infection by a pathogen can be detected by the presence of antigens or by detecting the antibodies synthesized against the pathogen.

26. a. 'x' is Insects

b. '$y$' is Molluscs

'$x$' is most species rich taxonomic group -more than 70\% of the total animals.

c.
- Ecological diversity
- Genetic diversity

27. Variations keep on occurring in each subsequent generation. But most of them may not be retained by the organism because nature may not support such variations. When a particular variation passes the test of natural selection, then only it is inherited in a species in the long run. Hence, it can be said that creation and presence of variation is directionless but natural selection and adaptation are directional.

28. The basic principle of vaccination is the 'memory' of the immune system. Vaccines let the immune system learn how to fight the future attack of the pathogen for which the vaccine is being given. The body prepares antibodies in response to vaccination and remembers this act. When the related pathogen attacks in the future, the immune system uses its memory to fight against the infection.

**Section D**

29. a. Luteinsing hormone / LH , helps in ovulation / induce rupturing of graafian follicles

b. Ovary: Maturation of follicles.

Uterus : Proliferation of endometrium lining.

c. Q - Progesterone,

Maintains pregnancy / maintenance of endometrium

**OR**

d. Corpus luteum, Graafian follicle transforms into corpus luteum after ovulation

30. i. A - Protein coat

ii. B - Reverse transcriptase, X-viral RNA

C - Viral DNA

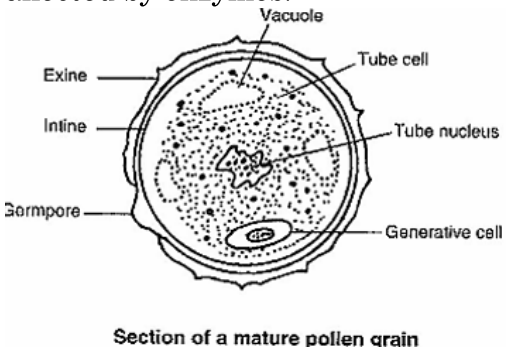
iii. D - Macrophages (animal or human cell)

**OR**

E - Macrophages and helper T-cells

**Section E**

31. Sporopollenin can stand with high temperatures and strong acids and alkali. It is also not affected by enzymes.

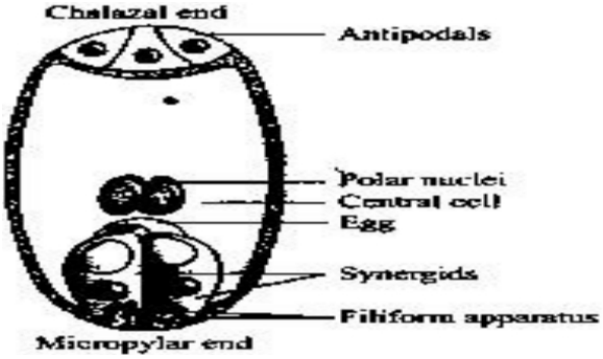



Section of a mature pollen grain

OR

i. Three cells are grouped together at the micropylar end of embryo sac, constitute the egg apparatus, the egg apparatus in turn consists of two synergids, one egg cell, the synergids

have special cellular thickenings at the micropylar tip called filiform apparatus, three cells are at the chalazal end and are called the antipodals, the large central cell has two polar nuclei, thus a typical angiosperm embryo sac at maturity though 8-nucleate is 7-celled.




ii. One of the two male gametes fuses with the two polar nuclei located in the central cell to produce a triploid primary endosperm nucleus (PEN).

32. i.
- X to $\overline{X}$ is 5' $\longrightarrow$ 3'
- No more amino acids will be added
- as the last codon UAA is a stop codon

ii.
- AUG
- Anticodon - UAC
- methionine

iii.
- Charging of adopted molecule - The amino acids are activated in the presence of ATP, and linked to their cognate tRNA or the adapter molecule,
- Amino acids needs to be charged so peptide bonds can be formed using this energy.

OR

a. Amino acids are activated in the presence of ATP, and linked to their cognate t-RNA which leads to aminoacylation if tRNA in the cell.

b. During translation in Prokaryotes the ribosome binds to the mRNA at the start codon (AUG) that is recognised only by the initiator tRNA, the ribosome proceeds to the elongation phase of protein synthesis, during this stage complexes composed of an amino acid linked to tRNA sequentially bind to the appropriate codon in mRNA by forming complementary base pairs with the tRNA anticodon, the ribosome moves from codon to codon along the mRNA, amino acids are added one by one, translated into Polypeptide sequences represented by mRNA, at the end-a release factor binds to the stop codon, terminating translation and releasing the complete polypeptide from the ribosome.

33.
- DNA fragments are negatively charged molecules, they can be separated by forcing them to move towards the anode under an electric field through a medium/matrix, the DNA fragments separate (resolve) according to their size through sieving effect, smaller DNA fragment move farther
- The separated DNA fragments can be visualized after staining the DNA with a compound known as ethidium bromide followed by exposure to UV radiation, The separated bands of DNA are cut out from the agarose gel and extracted from the gel piece. This step is known as elution.

OR

i. I. In biolistics cells are bombarded with high velocity micro-particles of gold or tungsten coated with DNA, into plant cells

II. In microinjections recombinant DNA is injected directly into the nucleus of, animal cell.

ii. E. coli is treated with a specific concentration of a divalent cation such as calcium, this creates (temporary) pores in the cell wall of bacterium which facilitates entry of plasmid or rDNA into the bacterium.