



# PRINCE ACADEMY

## OF HIGHER EDUCATION

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### BOARD SAMPLE PAPER- II (2025-26)

Time : 03 : 00 Hours

CLASS :- XII-BIOLOGY (044)

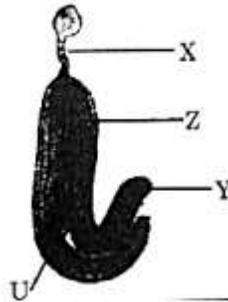
M.M. : 70

#### 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.

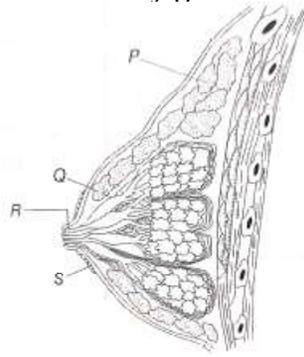
#### SECTION - A

1. Select the option that shows the correctly identified U, X, Y and Z in a developing dicot embryo.



- (a) X-Plumule (2n), Y-Suspensor (n), Z-Cotyledon (2n), U-Radicle (2n)
  - (b) X-Plumule (2n), Y-Suspensor (2n), Z-Radicle (2n), U-Cotyledon (2n)
  - (c) X-Suspensor (2n), Y-Cotyledon (2n), Z-Radicle (2n), U-Plumule (2n)
  - (d) X-Radicle (2n), Y-Cotyledon (n), Z-Plumule (n), U-Suspensor (n)
2. Which of the following is called as detritivore ?
- (a) Plant feeding on Animal
  - (b) An animal feeding on plant
  - (c) Animal feeding on dead decaying organic matter
  - (d) Animal feeding on another animals
3. A stretch of an euchromatin has 200 nucleosomes. How many bp will be there in the stretch and what would be the length of the typical euchromatin?
- (a) 20,000 bp and  $13,000 \times 10^{-9} m$
  - (b) 10,000 bp and  $10,000 \times 10^{-9} m$
  - (c) 40,000 bp and  $13,600 \times 10^{-9} m$
  - (d) 40,000 bp and  $13,900 \times 10^{-9} m$

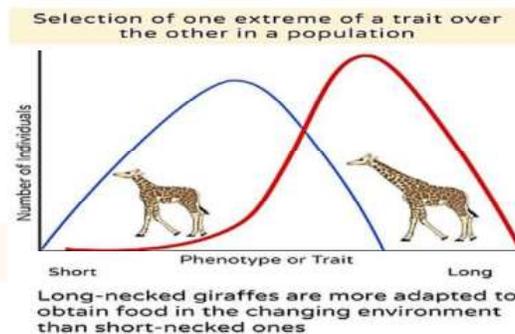
4. Given below is the sectional view of mammary gland. Identify P, Q, R and S



- (a) P-Alveolus, Q-Subcutaneous fat, R-Areola, S-Alveoli
  - (b) P-Alveolus, Q-Lactiferous duct, R-Mammary duct, S-Areola
  - (c) P-Alveolus, Q-Mammary duct, R-Lactiferous duct, S-Lactogenic spot
  - (d) P-Subcutaneous fat, Q-Mammary ampulla, R-Lactiferous duct, S-Areola
5. Which of the following will not result in variations among siblings.
- (a) Independent assortment of genes
  - (b) Crossing over
  - (c) Linkage
  - (d) Mutation
6. How many types of gametes can be produced by a diploid organism who is heterozygous for 4 loci.
- (a) 4
  - (b) 8
  - (c) 16
  - (d) 32
7. The diagram given below represents the skull of two different mammals. Choose the most appropriate difference between I and II.



- (a) Skull I has more brain capacity than skull II
  - (b) Skull I has more teeth than skull II
  - (c) Skull I is of an ape and skull II is of human
  - (d) Skull I is of human and skull II is of an ape
8. Ancestral population of giraffes consisted of giraffes of short, medium and long necked ones but present day only long necked giraffes are found. Which type of natural selection does the following graph represent?



- (a) Stabilising selection
  - (b) Disruptive selection
  - (c) Directional selection
  - (d) None of the above
9. "The soldiers of a country kill their own king". In your body, similar situation take place. Find out that process with a brief explanation.
- (a) AIDS. HIV attacks Helper T cells of the immune system causing weakening of immunity.
  - (b) Autoimmunity. Due to genetic and other unknown reasons, the immune system attacks self-cells, resulting in damage to the body.
  - (c) Graft rejection. When an organ from a donor is transplanted to the recipient body, the immune system tries to reject it
  - (d) Allergy. It is the exaggerated response of the immune system to certain antigens present in the environment

10. Which statement is true about T-DNA of Agrobacterium
- It is present in the nucleus
  - It is present in the plant cells and induces tumor in bacteria
  - It is a part of Ti plasmid of Agrobacterium.
  - All the above
11. Consider the following statements.
- BOD refers to the amount of oxygen that would consume all the organic matter in one litre of water which were oxidised by bacteria.
  - The BOD test is a measure of the organic matter present in the water.
  - STP contains human excreta and other organic waste.
  - STP contains a number of pathogenic microbes.
- Which of the statement/(s) given above is/are correct?
- Only I
  - I and IV
  - III, II and IV
  - I, II, III and IV
12. Column I contains the names of four taxonomic groups and column II gives the percentage of the species (in column I) facing the threat of extinction.

Column I		Column II	
A	Gymnosperms	1	32%
B	Mammals	2	12%
C	Birds	3	23%
D	Amphibians	4	31%

Select the option that correctly matches the species and the percent of it facing the threat of extinction.

- A-4, B-3, C-2, D-1
- A-3, B-4, C-2, D-1
- A-2, B-1 C-4, D-3
- A-4, B-1, C-2, D-3

**For Questions number (13-16) , two statements are given - one labelled as Assertion (A) and the other labelled as Reason (R) . Select the correct answer to these questions from the codes (a), (b), (c) , and (d) as given below.**

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

**(b) Both Assertion (A) and Reason (R) are true, but Reason(R) is not the correct explanation of the Assertion(A).**

**(c) Assertion (A) is true, but Reason (R) is false.**

**(d) Assertion (A) is false, but Reason (R) is true.**

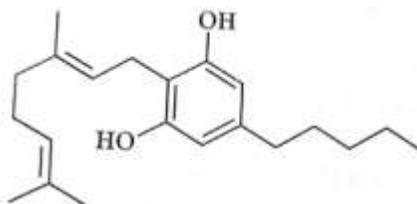
13. Assertion (A) Synergids have special cellular thickenings at the micropylar tip called filiform apparatus.

Reason (R) Filiform apparatus plays an important role in guiding the pollen tubes into the synergid.

14. Assertion (A) The total genes and their alleles in a population are called gene pool.

Reason (R) The gene pool are variable in a population.

15. Observe the diagram below and comment on the appropriateness of Assertion (A) and Reason (R).



Assertion (A) : Cannabinoids are drugs of abuse.

Reason (R) : Cannabinoids affects the cardiovascular system of the body.

16. Assertion (A) Transposons cause intentional mutations that can be treated using gene silencing.  
Reason (R) Transposons are mobile genetic elements that self-replicate via an RNA intermediate.

## SECTION - B

17. Attempt either option A or B.

A. "Continued self-pollination results in inbreeding depression".

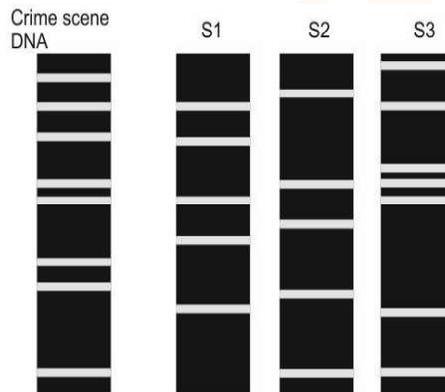
(a) Mention ONE impact of inbreeding depression on the upcoming generations in a farmland.

(b) State ONE way in which cross-pollination helps in avoiding inbreeding depression.

OR

B. Do you think apomixis can be compared to asexual reproduction? Justify your answer. State the benefits of apomixis to the farmers.

18. In a quiet neighborhood, a woman had been murdered at her home when her roommates were supposedly away. Her roommates were two twin brothers (S1 and S2) and another woman (S3). The investigating officer found the skin of the murderer under her fingernails. The officer sent the DNA from the skin sample along with DNA from the roommates for DNA profiling. Given below is an image of the bands obtained.



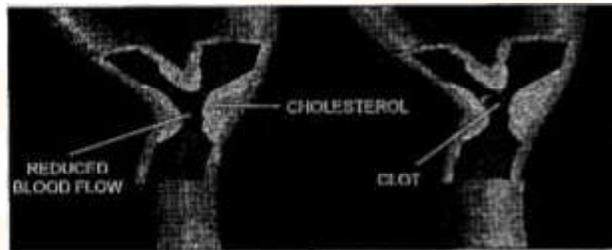
(a) Who is likely to be the murderer? Give a reason to support your answer.

(b) S1 and S2 are twin brothers. What can you conclude about them from the image?

19. A patient admitted in ICU was diagnosed to have suffered from myocardial infarction.

The condition of coronary artery is depicted in the image below.

Name two bioactive agents and their mode of action that can improve this condition.



20. Attempt either option A or B.

A. The Tundra desert's gross primary productivity (GPP) is 800 kilocalories/m<sup>2</sup> and respiration losses are about 200 kilocalories.

(i) What is the net primary productivity of the desert? Show calculations.

(ii) Why do deserts have the least NPP across most ecosystems?

OR

B. (i) When prickly pear cactus was introduced into Australia in early 1920s, it caused havoc and ecosystem instability by achieving very high population densities? Explain the reason for its rapid spread into millions of hectares of rangeland.

(ii) State the importance of Prey-predator relationship in a habitat.

21. Name the technique and the property of plant cells that can grow somaclones of certain desired variety of apple. Explain how somaclones of apple can be obtained in the lab, so as to get the desired variety on a large scale.

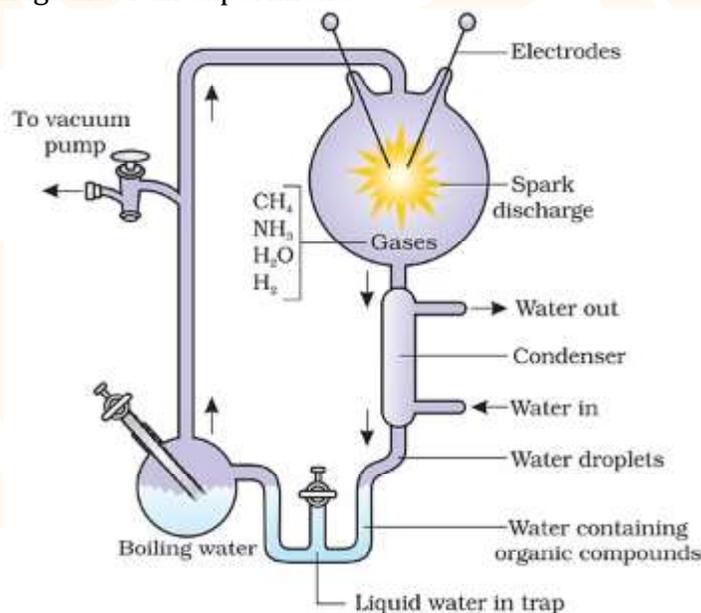
## SECTION - C

22. Meiotic arrest is a phenomenon noticed during oogenesis in human females where oocytes are arrested in the primary oocytes stage.
- (i) What is the chromosomal count of these primary oocytes?
- (ii) How are these primary oocytes converted to ovum? Explain.
23. Answer the following questions:
- (i) Based on the site of fertilization, state one difference between Intra-Uterine Transfer (IUT) of embryo and Intra-Uterine Insemination (IUI).
- (ii) All Assisted Reproductive Technologies (ARTs) require the extraction of the female gamete from the ovary. Is this statement TRUE or FALSE? Give a reason.
- (iii) State one characteristic each of the donor and recipient's reproductive system that enables them to participate in Gamete Intra Fallopian Transfer (GIFT).
24. Given below is a table detailing different types of RNAs and the type of RNA polymerase that aids the synthesis of these RNAs.

Type of RNA Polymerases	Synthesised RNA
RNA Polymerase 1	28s rRNA
A	soluble RNA
B	hnRNA
C	5.8s rRNA
D	snRNA
E	18s rRNA
F	5srRNA

Mention the parts A, B, C, D, E, F correctly.

25. Given below is the diagram of an experiment:



- (i) Name the scientists who conducted this experiment
- (ii) On the analysis of the liquid in the trap, what compounds were formed
- (iii) What was the conclusion of the experiment?
26. A dihybrid heterozygous, round yellow seeded garden pea was crossed with double recessive plant
- (i) Work out the cross & find genotype & phenotype of progeny.
- (ii) What principle of Mendel is illustrated here.

27. (i) Name the nematode (scientific name) that infects the roots of tobacco plant and reduce its yield.  
(ii) Name the vector that is used to introduce nematode-specific genes into the host plant (tobacco).  
(iii) How do sense and anti-sense RNAs function?  
(iv) Why could parasite not survive in a transgenic tobacco plant?
28. Refer to the diagram given below and answer the questions that follow:



- (i) Mention ONE case where the above mentioned procedure is compulsory and ONE where it is not required during such hybridisation processes.  
(ii) Why is bagging a compulsory technique even when emasculation is not required?

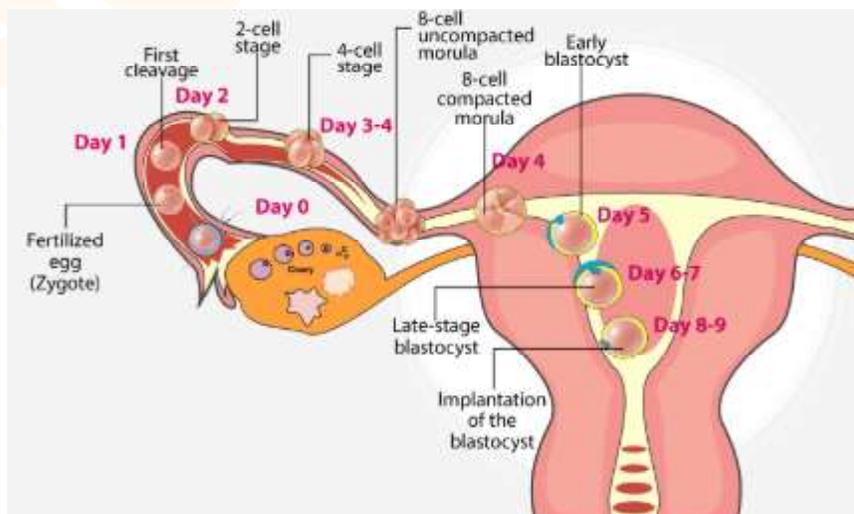
### SECTION - D

**Q.no. 29 and 30 are case based questions. Each question has sub-parts with internal choice in one sub-part.**

29. Read the following passage and answer the questions that follow.  
Pollen viability is the capability of pollen to get mature and then fertilize and after fertilization, it's the ability to develop into seed and fruit. Male gametophytes are pollen grains. They are made within microsporangia in anthers and discharged when the anther dehisces.
- A. Write the factors Pollen viability is dependent upon.  
B. How pollen grains are stored for longer period?  
**Attempt either subpart C or D.**  
C. Mention any two families whose pollens are viable for months.

OR

- D. Storage of pollen grains for longer periods is of any importance yes or no. Give reason in support of your answer.
30. Read the following text carefully and answer the questions that follow:  
Cleavage is the series of rapid mitotic divisions in the zygote and forms the blastula. The 2, 4, 8, 16 daughter cells are called blastomeres, An embryo with 64 blastomeres is known as blastocyst and has a blastocoel cavity. The blastocyst gets implanted in the uterine wall and leads to pregnancy.



- (a) Why are the cells of the inner cell mass of the blastocyst are called stem cells?  
 (b) At which stage of embryonic development does trophoectoderm develops?  
 (c) What is the site of implantation?

OR

- (d) What is the correct sequence of various structures formed during embryonic development?

### **SECTION - E**

31. Justify the following statements with suitable proof/examples:

- A. 'Competition is not limited to closely related species'  
 B. 'Competition is not always dependent on resources being limiting'  
 C. 'Competitive exclusion occurs in nature'  
 D. 'Competing species may evolve mechanisms for co-existence'  
 E. 'Competition in nature comes from what is called 'competitive release''

OR

- A. How does a simple food chain exemplify the First Law of Thermodynamics?  
 B. The table below shows the number of Species in different parts of the world.

Name of Place	Number of Bird Species
Columbia	1400
India	1200
Northern South America	1300
New York	105
Denmark	504

Identify the common factor in regions with a higher number of bird species and suggest at least two reasons for this greater diversity.

32. Given below is a stretch of DNA showing the coding strand of a structural gene of a transcription unit

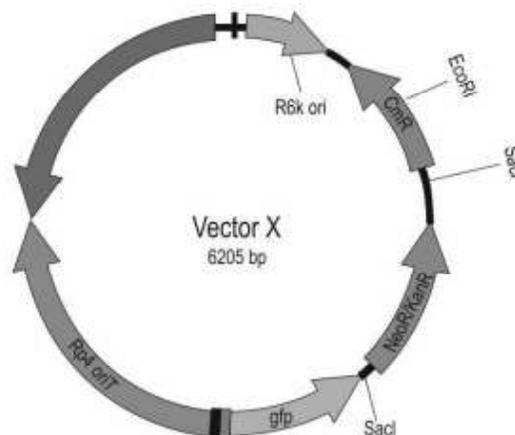
5'-ATG ATC GTA TTT TCT GTA ATC CCC ATC CAG TAA-3'

- (a) Write the corresponding template strand & the mRNA strand that will be transcribed.  
 (b) If AUC of the transcribed mRNA is an intron depict the sequence involved in the formation of mRNA/ the mature processed hnRNA stand.  
 (i) In a bacterium      (ii) In Homo sapiens  
 (c) Upon translation, how many amino acids will the resulting polypeptide have ? Justify.

OR

- (a) Write any six salient features of the human genome as shown from the Human Genome Project  
 (b) DNA replication is continuous and discontinuous on the two stands within the replication fork'. Give reasons.

33. A researcher used a vector X to insert a foreign gene to create a recombinant vector. The image of vector X is shown below.



It has sites for two restriction enzymes - *SacI* and *EcoRI*. The foreign gene can be cut using either of these two enzymes. The vector also has a green fluorescent protein (*gfp*) gene that can be used as a selectable marker, and two genes - chloramphenicol resistance (*CmR*) and neomycin resistance (*NeoR*) that provide antibiotic resistance. Chloramphenicol and neomycin are two different antibiotics.

(a) What is/are the possible end product(s) that will be obtained post-ligation if the researcher uses the following enzyme to insert the foreign gene:

(i) *SacI*

(ii) *EcoRI*

(b) Based on (a), which enzyme will be better to use to ensure that the foreign gene has been inserted in the vector? Why?

(c) If the well of an agarose gel is filled with a solution of the intact vector and the foreign gene, what will the DNA band closer to the well contain? Why?

OR

(a) Explain how the gene of interest is introduced into a vector.

(b) You are given the DNA shown below.

↓

5' ATTTTGAGGATCCGTAATGTCCT 3'

3' TAAAACTCC TAGGCATTACAGGA 5'

↑

If this DNA was cut with *BamHI*, how many DNA fragments would you expect? Write the sequence of these double-stranded DNA fragments with their respective polarity.

(c) A gene *M* was introduced into *E. coli* cloning vector *pBR322* at *BamHI* site. What will be its impact on the recombinant plasmids? Give a possible way by which you could differentiate non-recombinant to recombinant plasmids.

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