

Pre-Board Examination (2025-26)

Subject-Biology

Class-XII

MM: 70

Time: 3 hours

General Instructions:

- (i) All questions are compulsory.
- (ii) The question paper has five sections and 33 questions.
- (iii) 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.
- (iv) There is no overall choice. Answer all 33 questions. 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

Q. No. 1 to 12 are multiple choice questions. Only one of the choices is correct. Select and write the correct choice as well as the answer to these questions.

Q. No.	Question	Marks
1	Which one of the following statements is not true? A. Pollen grains of many species cause severe allergies. B. Stored pollen in liquid nitrogen can be used in the crop breeding programme. C. Tapetum helps in the dehiscence of anther. D. Exine of pollen grains is made up of sporopollenin.	1
2	The three cells found in a pollen grain when it is shed at 3-celled stage are A. One vegetative cell, one generative cell, one male gamete B. One generative cell, one vegetative cell, one male gamete C. One generative cell, two male gametes D. One vegetative cell, two male gametes	1
3	Choose the correct statements: P. In the human pregnancy, the major organ systems are formed at the end of 12 weeks. Q. In human pregnancy the major organ systems are formed at the end of 8 weeks. R. In human pregnancy heart is formed after one month of gestation. S. In human pregnancy, limbs and digits develop by the end of second month. T. In human pregnancy the appearance of hair is usually observed in the fifth month. Select the correct answer from the options given below: A. Q, R, S and T only B. P, R, S and T Only C. P and T Only D. Q and R Only	1
4	With regard to mature mRNA in eukaryotes: A. Exons and introns do not appear in the mature RNA B. Exons appear but introns do not appear in the mature RNA C. Introns appear but exons do not appear in the mature RNA	1

	D. Both exons and introns appear in the mature RNA																					
5.	What is the primary lymphoid organ where T-lymphocytes mature?*	1																				
	A. Spleen B. Thymus C. Lymph nodes D. Bone marrow																					
6	If a genetic disease is transferred from a phenotypically normal but a carrier female to only some of the female progeny, the disease is:	1																				
	A. Autosomal dominant B. Autosomal recessive C. Autosomal dominant D. Sex-linked recessive																					
7	Chromosomal theory of inheritance was given by	1																				
	A. Morgan <i>et al</i> B. Sutton and Boveri C. Hugo deVries D. Gregor J. Mendel																					
8	Variations caused due to mutations are	1																				
	A. random and directionless B. random and directional C. random and small D. random, small and directional																					
9	Match List I with List II	1																				
	<table border="1"> <thead> <tr> <th></th> <th>LIST I</th> <th></th> <th>LIST II</th> </tr> </thead> <tbody> <tr> <td>P</td> <td><i>Clostridium butylicum</i></td> <td>I</td> <td>Ethanol</td> </tr> <tr> <td>Q</td> <td><i>Saccharomyces cerevisiae</i></td> <td>II</td> <td>Streptokinase</td> </tr> <tr> <td>R</td> <td><i>Trichoderma polysporum</i></td> <td>III</td> <td>Butyric Acid</td> </tr> <tr> <td>S</td> <td><i>Streptococcus sp</i></td> <td>IV</td> <td>Cyclosporin A</td> </tr> </tbody> </table>		LIST I		LIST II	P	<i>Clostridium butylicum</i>	I	Ethanol	Q	<i>Saccharomyces cerevisiae</i>	II	Streptokinase	R	<i>Trichoderma polysporum</i>	III	Butyric Acid	S	<i>Streptococcus sp</i>	IV	Cyclosporin A	
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	A. P -III, Q -I, R -II, S -IV B. P -II, Q -IV, R -III, S -I C. P -III, Q -I, R -IV, S -II D. P -IV, Q -I, R -III, S -II																					
10	What is the purpose of DNA sequencing?	1																				
	A. To amplify DNA sequences B. To identify genes C. To determine the order of nucleotides in DNA D. To clone genes																					
11	While isolating DNA from bacteria, which of the following enzymes is not required?	1																				
	A. Lysozyme B. Ribonuclease C. Deoxyribonuclease D. Protease																					
12	The role of DNA ligase in the construction of rDNA molecule is:	1																				
	A. formation of hydrogen bonds between sticky ends of DNA fragments B. ligation of all purine and pyrimidine bases																					

- C. Joining together of DNA fragments having the same kind of ‘sticky-ends’
 D. formation of phosphodiester bond between two DNA fragments having the same kind of ‘sticky-ends’

Question No. 13-16 consist of two statements - Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

- A. Both A and R are true and R is the correct explanation of A.
 B. Both A and R are true and R is not the correct explanation of A.
 C. A is true but R is false.
 D. A is false and R is true.

13 **Assertion:** Parturition is induced by neural signal in maternal pituitary.
Reason: At the end of gestation period, the maternal pituitary releases oxytocin which causes uterine contractions. 1

14 **Assertion:** Artificial insemination is the method of introduction of semen inside the female.
Reason: This technique is used in those cases where males have low sperm count. 1

15 **Assertion:** Thorns of *Bougainvillea* and tendrils of *Cucurbita* represent homology.
Reason: Homologous organs have similar functions but are different in their structural details and origin. 1

16 **Assertion:** Evolution is a continuous process that has shaped the diversity of life on Earth.
Reason: Evolution occurs exclusively through the process of natural selection. 1

SECTION B

17. **Attempt either option A or B.** 2
 A. Oral pills are very effective with lesser side effects and are well accepted by the females. Why is *Saheli* –the new oral contraceptive for females, preferred over oral pills?
OR
 B. How is Multiload 375 different from LNG-20?

18 Given below is the sequence of coding strand of DNA in a transcription unit:
 3' - A A T G C A G C T A T T A G G - 5'
 Write the sequence of:
 A. its complementary strand
 B. the mRNA 2

19 This is the table showing the prevalence of mentioned STIs in a Family Planning Clinic. Based on the information provided answer the questions that follow: 2

Causal organism	STIs	Prevalence
<i>Chlamydia trachomatis</i>	Chlamydia	23.0%
<i>Trichomonas vaginalis</i>	Trichomoniasis	5.6%
<i>Herpes simplex</i> viruses	Genital Herpes	4.6%
<i>Neisseria gonorrhoeae</i>	Gonorrhoea	3.1%
<i>Treponema pallidum</i>	Syphilis	1.02%

- A. Based on the table, which STI has the highest prevalence in the population? What preventive measures can be taken to control its spread?
 B. Prevalence of bacterial STIs is more than the viral STIs according to the data in the above table from a Family Planning Clinic. Discuss briefly.

20.

Attempt either option A or B.

2

A. Name the organism where *Ti* plasmid is found. Now it is a powerful tool in genetic engineering with applications in crop improvement and nutritional enhancement. Support the statement with your understanding of biotechnology.

OR

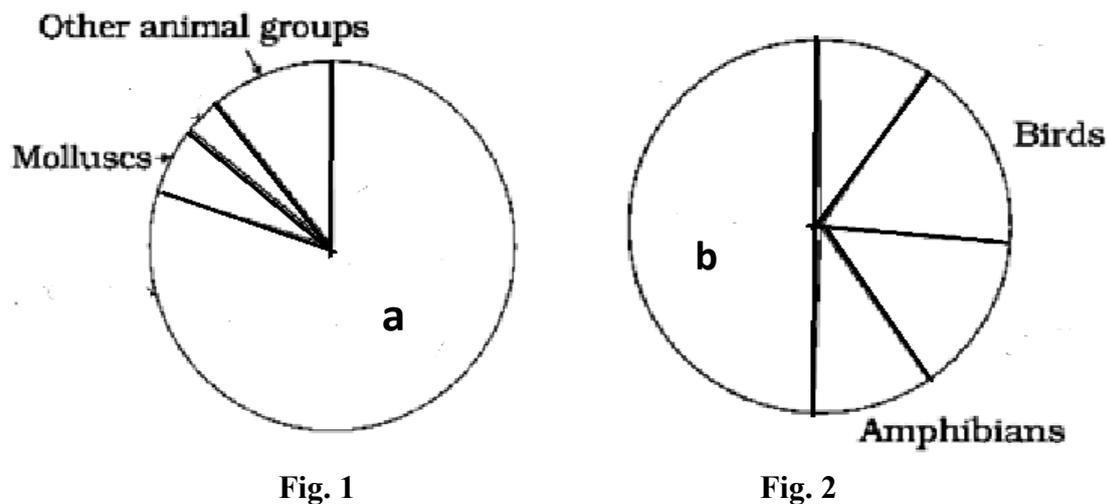
- B. (i) What is the difference between recombinant DNA and recombinant protein?
 (ii) After downstream processing, the product of the biosynthetic stage cannot be marketed directly. Give two reasons to support your answer.

21

Attempt either option A or B

2

A. Observe the Fig.1 and Fig. 2 illustrating the proportionate number of species of major taxa of invertebrates and vertebrates, respectively, according to the currently available species inventories.



- (i) Identify 'a' and 'b' taxa which represent proportionately higher number of species of invertebrates and vertebrates in Fig. 1 and Fig. 2, respectively.
 (ii) Draw the diagram to illustrate the proportionate number of species of some major taxa of plants.

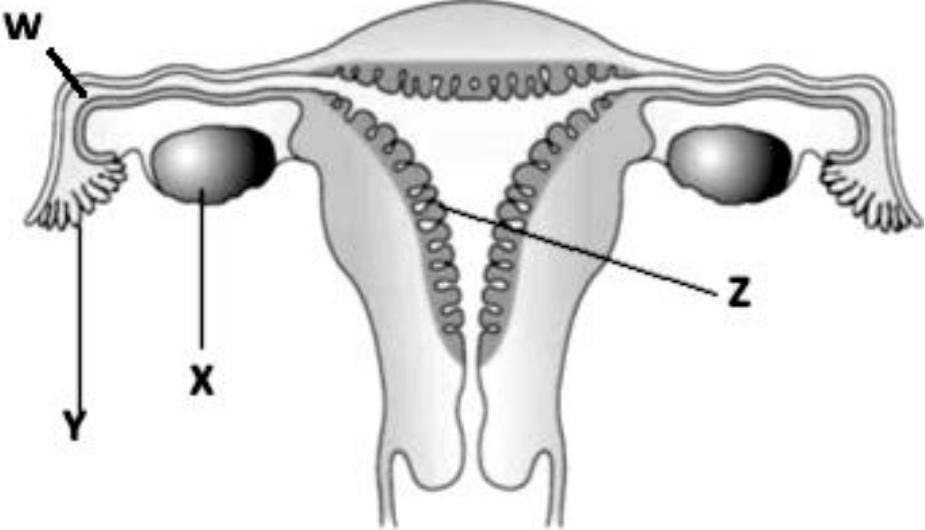
For visually impaired students

- A. (i) Stability of a community depends on its species richness. How was it experimentally shown by David Tilman.
 (ii) Biodiversity hotspots cover less than 2% of Earth's land area. Strict protection of these areas can reduce the rate of ongoing extinctions. Name any two hotspots in India.

OR

- B. (i) The Tundra desert's gross primary productivity (GPP) is 800 kilo calories/m² and respiration losses are about 200 kilo calories. Calculate the net primary productivity of the desert.
 (ii) Why do deserts have the least NPP across most ecosystems?

SECTION C

22	<p>Give scientific explanations for the following:</p> <p>A. Why is tobacco smoking associated with rise in blood pressure and emphysema (oxygen deficiency in the body)?</p> <p>B. Why does a doctor administer tetanus antitoxin and not a tetanus vaccine to a child injured in roadside accident with a bleeding wound?</p> <p>C. The anamnestic response is faster and more intense than primary response.</p>	3
23	<p>The diagrammatic sectional view of the female reproductive system is illustrated below. Answer the questions that follow:</p> <div style="text-align: center;">  </div> <p>A. Successful fertilization will take place only when 'Y' part in the above diagram functions properly. Justify.</p> <p>B. Surgical intervention takes place in 'W' part of the above diagram. How does this procedure justify its efficacy? What is a major disadvantage of this procedure?</p> <p>C. Corpus luteum formed in 'X' is responsible to maintain 'Z' for successful pregnancy. Explain.</p> <p style="text-align: center;">-----</p> <p><u>For visually impaired students.</u></p> <p>A. Mention the stage at which the process of oogenesis temporarily gets arrested and name the cells thus formed in the ovary of a baby girl at the time of her birth.</p> <p>B. Placenta acts as a temporary endocrine tissue and forms a functional junction between the mother and foetus. Explain.</p>	3
24	<p>A. In the context of primary productivity, which ecosystem would be more productive? A natural old forest, a young forest, alpine meadow, a shallow polluted lake. Give reason.</p> <p>B. The rate of decomposition is controlled by chemical composition of detritus and climatic factors. Discuss.</p>	3
25	<p>The graphs below show three types of natural selection. The shaded areas marked with arrows show the individuals in the population which are not selected. The dotted vertical lines show the statistical means.</p>	3

- A. How many DNA molecules will be formed after three cycles of PCR?
 B. Cite specific reasons for the requirement of high temperature in step 1, primers specifically joining the 3' end of the desired gene to be amplified in step 2 and use of *Taq* polymerase instead of normal DNA polymerase in step 3.

For visually impaired students

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SECTION D

29 Study the following table which differentiates between two types of pollen transfers, and answer the questions that follow with justification for each answer: 4

Code	Characteristic	Type A	Type B
P	Transfer of pollen	From anther to stigma of the same flower	From anther to the stigma of a different plant
Q	Genetic variation	Progeny is genetically pure	Progeny shows genetic variation
R	Presence of a pollinating agent	Not required, but synchronous pollen release and stigma receptivity is needed	Required for pollen transfer

- A. Name any one outbreeding device that helps prevent Type A type of pollen transfer in flowering plants.
 B. Which type of pollination is genetically similar to Type A but functionally similar to Type B?

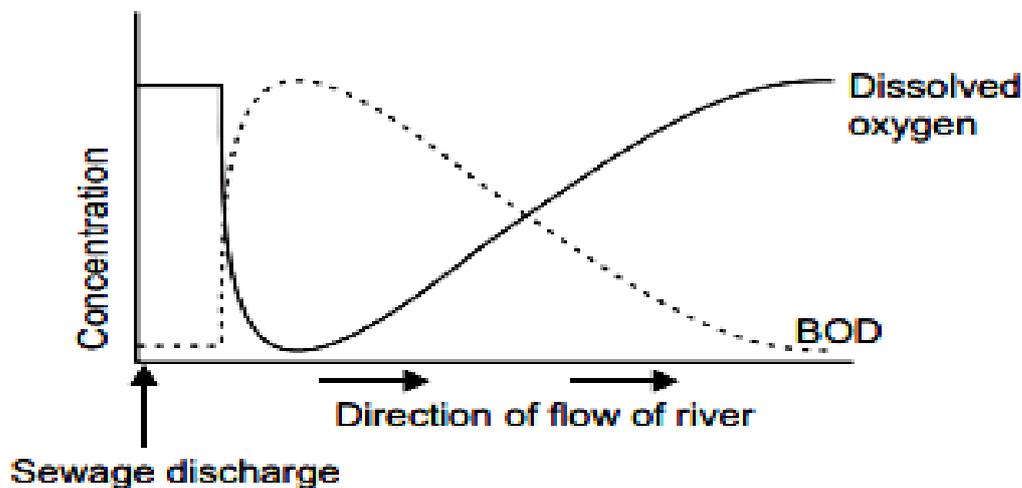
Attempt either subpart C or D.

C. Why should Type A flowers be emasculated and bagged prior to artificial pollination?

OR

D. Name the type of pollen transfers that may lead to inbreeding depression. Explain briefly.

30 Study the graph given below and answer the questions that follow: 4



- A. Expand BOD.
- B. Three water samples (X, Y, and Z) have BOD values of 20 mg/L, 8 mg/L and 400 mg/L, respectively. These samples are known to be river water, untreated sewage water, and secondary effluent from a sewage treatment plant. Which sample is the most polluted, and how would you label each sample?

Attempt either subpart C or D.

- C. Why does the level of BOD suddenly increase immediately after the sewage discharge?

OR

- D. What impact would the increase in DO (dissolved oxygen) level and decrease in BOD level have on fish and other aquatic life further downstream the flowing river?

For visually impaired students

Changes in BOD and dissolved oxygen (DO) levels in a flowing river body were observed. At the point of sewage discharge, DO suddenly decreases and BOD increases and further downstream along the direction of flow of river, their levels just got reversed.

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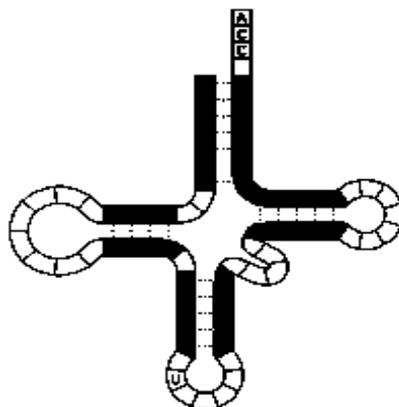
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SECTION E

- | | | |
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| 31 | <p>A. Below is an illustration of the secondary structure of tRNA. Also given are the following components: two amino acids Serine (Ser) and tyrosine (Tyr), four triplet ribonucleotide sequences AUG, AGU, UCA and UAC. Construct any single complete schematic assembly using given components to show that tRNA serves as an adapter molecule as postulated by Francis Crick.</p> | 5 |
|----|---|---|



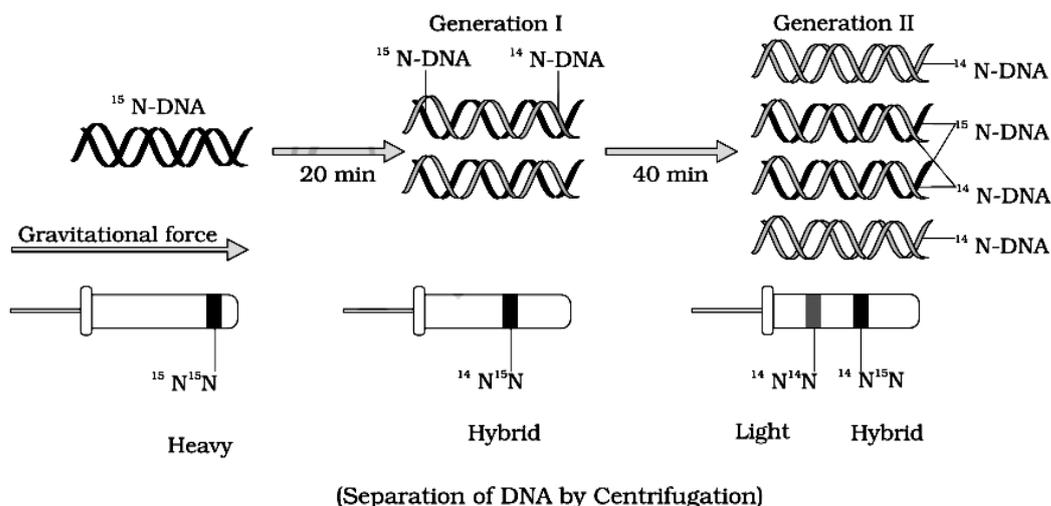
- B. What is the substrate for the synthesis of enzyme beta-galactosidase? Explain how *lac* operon is regulated for enzyme synthesis by its substrate.

For visually impaired students

- A. What are untranslated regions (UTR) in a mRNA transcript? State their significance.
- B. What is the substrate for the synthesis of enzyme beta-galactosidase? Explain how *lac* operon is regulated for enzyme synthesis by its substrate.

OR

- A. What does scheme of semiconservative model of DNA replication suggest?
- B. Replication of DNA begins at *ori*, to form a replication fork. Explain the process.
- C. The diagram below shows experimental evidence for semiconservative nature of DNA replication. If the experiment was continued for a third generation (60 minutes), what would be the ratio of hybrid DNA to light DNA?



For visually impaired students

- C. Experiment involving use of radioactive thymidine was performed and it also proved that the DNA in chromosomes replicate semi-conservatively. Name the scientists who made these similar observations in plants and name their plant.

32	<p>A. List the three molecular diagnostic techniques that help detect pathogens from suspected patients. Mention one advantage of these techniques over conventional methods.</p> <p>B. Plasmid is a boon to biotechnology. Justify this statement quoting the production of human insulin as an example.</p> <p style="text-align: center;">OR</p> <p>A. List the optimal growth conditions provided in a bioreactor for achieving the desired product.</p> <p>B. Draw a neat and well labelled diagram of a simple stirred-tank bioreactor used as a continuous culture system for producing a larger biomass leading to higher yields of desired protein.</p> <p>C. Construct a flow chart showing different steps of downstream processing.</p>	5
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A population of 100 spotted deer was living without any carnivores in an enclosure of a few hectares of rich tropical forest land. Deer census was taken at time zero and after a few years.

- A. Draw the growth curve that represents the deer population at time zero.
- B. Is it a realistic one? Justify?
- C. Draw another growth curve to show the impact on deer population if some tigers are introduced after five years? Give reason to support your answer.
- D. 'r' is an important parameter assessing impacts of any biotic or abiotic factor on population growth. What does 'r' stand for in a population growth equation?
- E. How does the increase and decrease in the value of 'r' affect the population size?

OR

The table given below represents inter-specific interaction between two species of *Paramecia* competing for the same resource in a culture medium. *Paramecium caudatum* and *Paramecium aurelia* were grown in separate cultures as well as in mixed cultures. It was found that each species grew in numbers according to the logistic equation.

Culture conditions	Names of <i>Paramecium</i> sps.	No. of <i>Paramecium</i> sps. at different time intervals of culture initiation	
		After 8 days	After 16 days
Separate	<i>Paramecium caudatum</i>	60	60
Separate	<i>Paramecium aurelia</i>	100	100
Mixed	<i>Paramecium caudatum</i>	20	05
Mixed	<i>Paramecium aurelia</i>	80	95

- A. Which species is competitively superior?
- B. State the underlying principle for the above result and name the scientist associated with this principle.
- C. Explain the mechanism in which two or more species competing with each other can co - exist.
