

21001841

BIOLOGY
PAPER 1
(THEORY)

Maximum Marks: 70

Time Allotted: Three Hours

Reading Time: Additional Fifteen Minutes

Instructions to Candidates

1. You are allowed an **additional fifteen minutes** for **only** reading the question paper.
2. You must **NOT** start writing during reading time.
3. This question paper has **11 printed pages and one blank page**.
4. It has **eighteen questions** in all. Answer **all** questions.
5. There are **four** sections in the paper: **A, B, C and D**. **Internal choices** have been provided in **one question** each in **Sections B, C and D**.
6. **Section A** consists of **one question**. Each subpart carries **one mark**.
7. While answering **Multiple Choice Questions** in **Section A**, you are required to **write only one option** as the answer.
8. **Section B** consists of **seven questions** each carrying **two marks**.
9. **Section C** consists of **seven questions** each carrying **three marks**.
10. **Section D** consists of **three questions** each carrying **five marks**.
11. **Diagrams should be drawn** wherever necessary using a **pencil** only.
12. The intended marks for questions are given in brackets [].

SEAL

Instruction to Supervising Examiner

1. Kindly read **aloud** the Instructions given on page 1 to all the candidates present in the examination hall.
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SECTION A – 20 MARKS

Question 1

- (i) The roots of black walnut plant secrete a chemical called Juglone which harms the apple tree growing near it. [1]

Identify the type of ecological interaction between these two plants.

- (ii) Name the most important component of the biogas. [1]

- (iii) A population of 100 individuals is in Hardy Weinberg equilibrium for a gene with only two alleles, G and g. [1]

If the gene frequency of the allele G is 0.2, what will be the number of heterozygous individuals in the population?

- (iv) Observe the relation between the first two terms and complete the analogy. [1]

Progesterone : Corpus Luteum :: hCG : _____

- (v) Construct a pyramid of biomass for an ecosystem from the data provided below. [1]

Trophic Levels	Biomass (g/m ²)
Herbivores	500
Carnivores	50
Producers	1000

- (vi) Name the protein secreted by virus-infected cells which protects non-infected cells from further viral infection. [1]

- (vii) Calculate the number of base pairs in a DNA molecule of a length of 1700 angstrom. [1]

- (viii) At which stage does the second meiotic division of secondary oocyte remain arrested until fertilisation? [1]

- (ix) Among the five major classes of antibodies present in adults, which of the following types of antibodies is found at the highest level in the blood of a newborn baby? [1]

- (a) IgE
(b) IgA
(c) IgG
(d) IgM

- (x) Choose the correct patterns of inheritance of genes involved in ABO blood grouping. [1]

- (P) Co-dominance
- (Q) Multiple allelism
- (R) Polygenic inheritance
- (S) Only complete dominance

- (a) Only (P) and (Q)
- (b) Only (P) and (R)
- (c) Only (Q) and (R)
- (d) Only (Q) and (S)

- (xi) Given below are two statements marked Assertion and Reason. Read the two statements carefully and choose the correct option. [1]

Assertion: The process of origin of life is still going on.

Reason: The presence of oxygen makes the conditions favourable for the origin of life.

- (a) Both Assertion and Reason are true and Reason is the correct explanation for Assertion.
- (b) Both Assertion and Reason are true but Reason is not the correct explanation for Assertion.
- (c) Assertion is true and Reason is false.
- (d) Both Assertion and Reason are false.

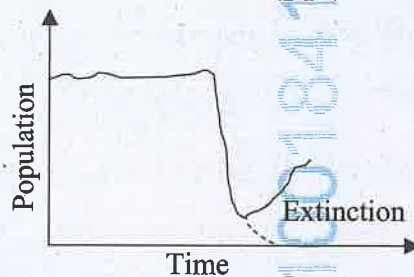
- (xii) Given below are two statements marked Assertion and Reason. Read the two statements carefully and choose the correct option. [1]

Assertion: Pollen Mother Cell (PMC) is the last cell of the male sporophytic generation.

Reason: Each PMC divides to produce two pollen grains.

- (a) Both Assertion and Reason are true and Reason is the correct explanation for Assertion.
- (b) Both Assertion and Reason are true but Reason is not the correct explanation for Assertion.
- (c) Assertion is true and Reason is false.
- (d) Both Assertion and Reason are false.

- (xiii) What type of genetic drift is indicated in the graph below of a country that is in a state of war? [1]



- (xiv) Swiss cheese is widely used in food industry and is characterised by the presence of large holes in it. How are these large holes formed in Swiss cheese? [1]
- (xv) Answer the following:
- (a) Double fertilisation is a unique property of angiosperms. [1]
Name the scientist who discovered this phenomenon.
- (b) Expand the abbreviation IARI. [1]
- (xvi) A male mouse produces 480 sperms. Assuming normal meiosis, how many meiotic divisions would have occurred in its testes? [1]
- (xvii) Name the part of anatropous ovule of an angiosperm that develops into seed coats. [1]
- (xviii) Give a reason for each of the following:
- (a) Pollen grains of hydrophilous plants are covered with mucilage. [1]
- (b) A patient suffering from malaria, if not treated immediately, may suffer from anaemia after some days. [1]

SECTION B - 14 MARKS

Question 2 [2]

Ramesh suddenly experienced severe chest pain and was rushed to the hospital. Angiography revealed a blood clot blocking a coronary artery. The doctor administered an enzyme derived from a microorganism, which helped dissolve the clot and restore normal blood flow.

Write the biological name of the microorganism and the enzyme produced from it.

Question 3 [2]

Mohit's father is colourblind and his mother is a carrier of the same genetic disorder. Draw a Punnett square to calculate the probability of his sister, Mahima being colourblind.

Question 4**[2]**

Observe the diagram of an embryo sac given below and answer the questions that follow.

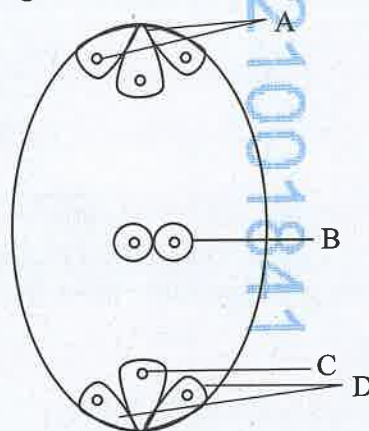
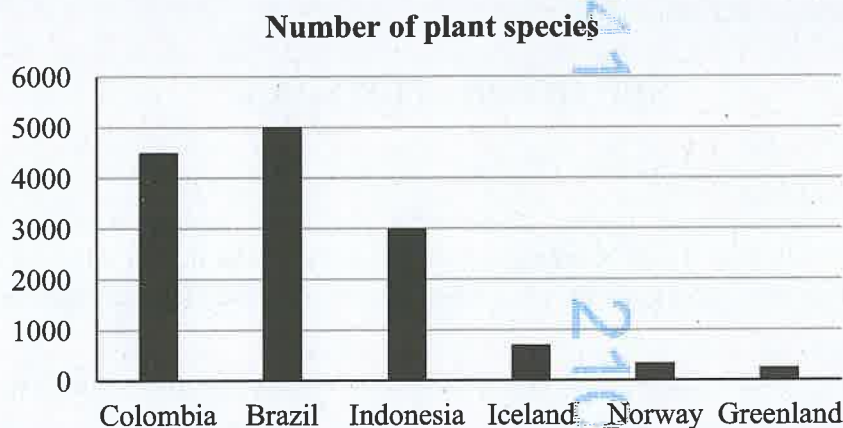


Figure 1

- (i) Identify the part marked 'C'.
- (ii) If the leaf cells of the plant had 24 chromosomes, calculate the number of chromosomes in part 'B' after fertilisation.

Question 5**[2]**

During a world tour, Aakash explored the number of plant species in different countries and prepared a graph based on the data he had compiled. Observe the graph given below carefully and answer the questions that follow.



- (i) Account for the variations in biodiversity in the regions specified above.
- (ii) What are *Ramsar sites*?

Question 6**[2]**

In a panel discussion on reproduction in angiosperms, Varun, a panelist, argued that a parthenocarpic fruit could also show polyembryony. The other panelist, Merlin disagreed. Who was correct? Give a reason to support your answer.

Question 7**[2]**

(i) Draw a well labelled diagram of mammalian blastocyst.

OR

(ii) Draw a well labelled diagram of Graafian follicle.

Question 8**[2]**

During an experiment on recombinant DNA technology, Shivam isolated a gene from a plant. He cut the plant DNA and the plasmid vector with different restriction enzymes.

Would it be possible for him to ligate the fragments and create a recombinant DNA? Justify.

SECTION C – 21 MARKS**Question 9****[3]**

Study the diagram of protein synthesis shown below and answer the questions that follow.

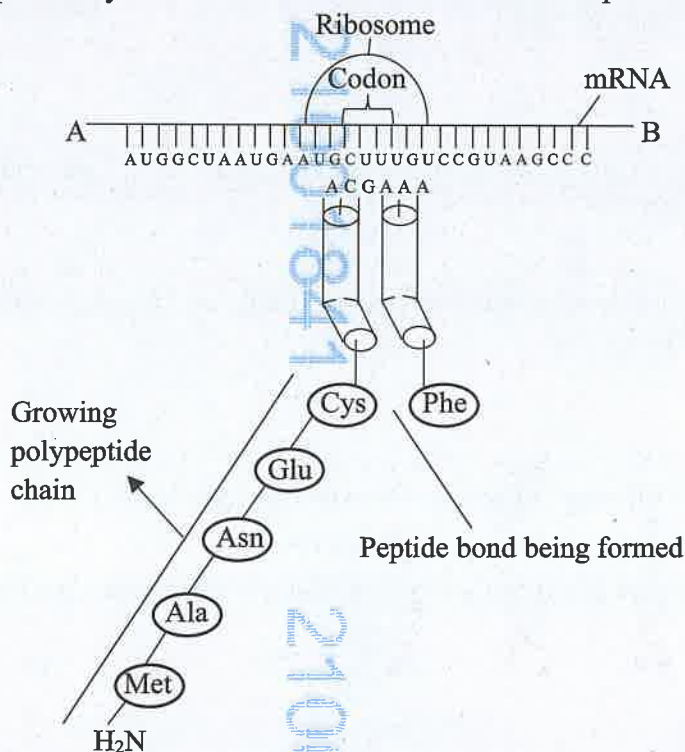


Figure 2

- What is the polarity of the strand from 'A' to 'B'?
- Write the corresponding anticodon for the amino acid Alanine.
- Name the enzyme that catalyses the formation of a peptide bond during translation.

Question 10**[3]**

Two countries, A and B, conducted a population census. The table given shows the percentage of human population in three different age groups in the two countries.

Age Group (Years)	Country A (%)	Country B (%)
0-14	80	20
15-59	40	60
60 and above	10	90

- (i) Draw an age pyramid for each country.
- (ii) Comment on the specific patterns of population growth in countries A and B respectively.

Question 11**[3]**

Explain the implication of the word 'Integrated' in the term Integrated Pest Management (IPM). Give *two* examples of IPM.

Question 12**[3]**

- (i) Explain *any three* causes of disappearance of Steller's Sea Cow and thylacine from the surface of earth.

OR

- (ii) Differentiate between Grazing Food Chain (GFC) and Detritus Food Chain (DFC) on *any three* parameters.

Question 13**[3]**

Renu observed that the flowers in her garden were always closed.

- (i) What is the term used to denote such flowers?
- (ii) List *any two* disadvantages of the pollination that takes place in flowers referred to above.

Question 14**[3]**

Explain *any three* methods to treat cancer.

Question 15**[3]**

Figure 3 below shows the steps involved in the Polymerase Chain Reaction (PCR). Study it carefully and answer the questions that follow.

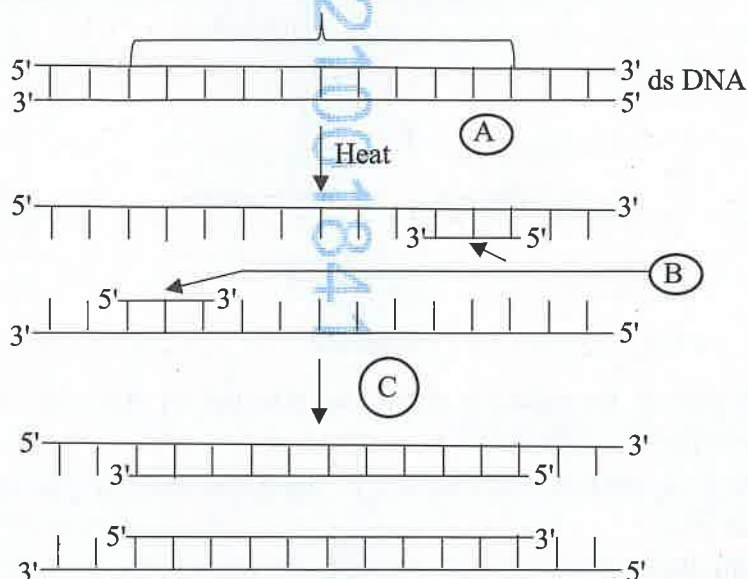


Figure 3

- Identify step 'B'.
- What is the role of the enzyme in step 'C' of PCR?
- What is the range of the temperature used in step 'A'?

SECTION D – 15 MARKS**Question 16****[5]**

- A biotech firm conducted preliminary rounds to select a suitable candidate for the position of scientist. Sandeep, Rachel and Rizwan applied for the same position. Each of them was given specimens of plant, fungus and animal tissues and asked to isolate the genetic material.
 - Sandeep selected enzymes like chitinase, protease and ribonuclease.
 - Rachel used the same enzymes as Sandeep. Additionally, she used phenol and chloroform.
 - Rizwan used the same set of enzymes as Sandeep and Rachel along with chilled ethanol and cellulase.

Rizwan was selected for the job.

- What was the outcome of the processes followed by Sandeep and Rachel? Substantiate your answer with a reason.
- What was the chilled ethanol used by Rizwan in this experiment?
- What is the purpose of using enzymes chitinase and protease in isolation of genetic material?

OR

- (ii) Sam, a researcher, wanted to develop varieties of pest resistant tobacco plants. The diagram given below shows some of the steps of the process he followed.

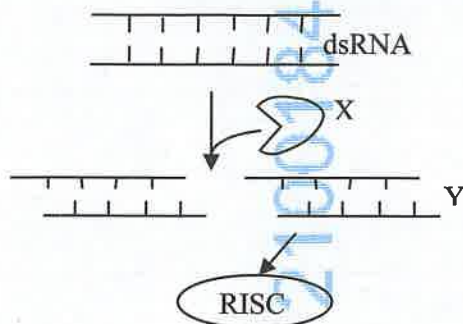


Figure 4

- Which part of the tobacco plant was affected by the pest? What is the biological name of this pest?
- Sam took a dsRNA and cleaved it using the enzyme 'X'. Identify the enzyme 'X'.
- On using the enzyme 'X', he obtained 'Y'. Identify the product 'Y'.
- How would this process help Sam in developing pest resistant tobacco plants?

Question 17

[5]

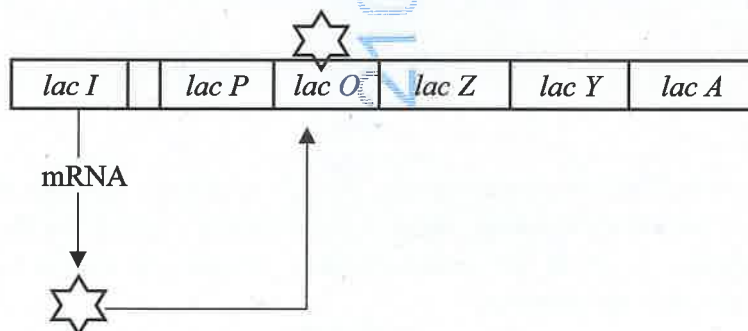


Figure A

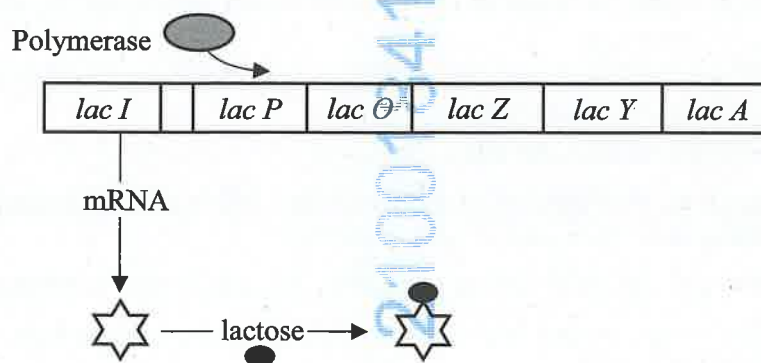


Figure B

- (i) Which figure represents the “ON” state of the operon? What causes the operon to switch “ON”?
- (ii) Name the enzyme coded by lac ‘Y’ gene. State its role.

Question 18

[5]

- (i) Explain *three* main types of biodiversity with an example of each type.
- (ii) Define *cryopreservation*. Explain how cryopreservation helps in conservation of biodiversity.

