To,

The Secretary,
Goa Board of Secondary and Higher Secondary Education,
Alto Betim, Goa
16/ 06/2025

Subject: New assessment scheme 2025-26 in biology for standard XII (Subject Code H- 4704)

Respected Sir,

I hereby submit following documents pertaining to assessment scheme 2025-26 in Biology for standard XII.

The documents submitted are as follows :

1. Syllabus of Biology (Theory & practical)
2. Portion for Final Exam
3. Design of question paper for Final Exam.
4. Portion for First Mid-Term Exam
5. Portion for First Term Exam
6. Design of question paper for First Mid- Term / First Term Exam
7. Model paper with Blue Print for final exam.

Thanking You,

Yours faithfully

Mrs.Meeta Bandekar
(convenor)

CLASS---- XII (SYLLABUS)

SUBJECT----- BIOLOGY

SUBJECT CODE----- 4704

THEORY

UNIT VI

REPRODUCTION

Chapter-2: Sexual Reproduction in Flowering Plants

Flower- A Fascinating Organ of Angiosperms ,Pre-Fertilization : structure and Events ,Double Fertilization , Post- Fertilization events : structure and Events ,
Apomixis and Polyembryony;

Chapter-3: Human Reproduction

The male reptiductive system, The female reproductive system, Gametogenesis, Menstrual cycle, Fertilisation and Implantation, Pregnancy and Embryonic development, Parturition and Lactation.

Chapter-4: Reproductive Health

Reoroductive Health- Problems and Strategies, Population explosion and Birth control, Medical termination Of Pregnancy(MTP), Sexually Transmitted Diseases(STDs), Infertility.

Unit-VII

GENETICS

Chapter-5: Principles of Inheritance and Variation

Mendel's Laws of Inheritance, Inheritance of One Gene, Inheritance of Two Genes, Polygenic Inheritance, Pleiotrophy
Sex Determination , Mutation , Genetic Disorders.

Chapter-6: Molecular Basis of Inheritance

The DNA, The Search for Genetic Material, RNA World, Replication, Transcription, Genetic Code, Translation, Regulation of Gene Expression, Human Genome Project, DNA Fingerprinting

Unit-VIII

BIOLOGY IN HUMAN WELFARE

Chapter-8: Human Health and Diseases

Common Diseases in Humans, Immunity, AIDS, Cancer, Drugs and Alcohol Abuse,

Chapter-10: Microbes in Human Welfare

Microbes in Household Products, Microbes in Industrial Products, Microbes in Sewage Treatment, Microbes in Production of Biogas, Microbes as Biocontrol Agents, Microbes as biofertilisers

Unit-IX

BIOTECHNOLOGY

Chapter-11: Biotechnology - Principles and Processes

Principles of biotechnology, Tools of Recombinant DNA Technology, Processes of Recombinant DNA Technology.

Chapter-12: Biotechnology and its Applications

Biotechnological Applications in Agriculture, Biotechnological Applications in Medicine, Transgenic Animals, Ethical Issues

Unit-X

ECOLOGY

Chapter-13: Organisms and Populations

Organism and its Environment, Populations

Chapter-14: Ecosystem

Ecosystem – Structure and Function, Productivity, Decomposition, Energy Flow, Ecological Pyramids, Ecological Succession, Nutrient Cycling, Ecosystem services.

Chapter-15: Biodiversity and its Conservation

Biodiversity, Biodiversity conservation

Note:

1. Refer to the latest edition of NCERT Biology text book.
2. There is no deletion of any subtopic under the main topics mentioned in each chapter.

Mrs. Meeta Bandekar

(Convenor)

Syllabus of Biology Practical – ClassXII

List of Experiments :

Section A – Physiology Experiment

1. To determine the pH and water holding capacity of garden or paddy field soil.

2. To detect presence of phosphate, nitrate and sulphate salts in paddy field soil.

3. To study B.O.D. of the given sample of pond water.

4. To study the effect of different temperature on the action of salivary amylase on starch.

5. To study the effect of different pH on the action of salivary amylase on starch.

Section B – Preparation of temporary stained slide

1. Onion root tip for mitosis

2. Onion/Rheo anther for meiosis.

Section C – Identification/Spotting

1. Adaptations in insect pollinated flower (Ocimum/Leucas/Salvia)
2. Adaptations in wind pollinated flower (Maize/Grass)
3. Study of T.S. of Testis (Any vertebrate)
4. Study of T.S. of Ovary (Any vertebrate)
5. Study of V.S. of Blastula (Any vertebrate)
6. Prepared pedigree chart of inability to roll the tongue.
7. Prepared pedigree chart of Widow's peak.
8. Identification of organisms and symptoms of disease caused.

- Ascaris
- Entamoeba
- Plasmodium

9. Adaptation of plant to dry condition (Suitable specimen to be given)
10. Adaptation of plant to aquatic condition (Suitable specimen to be given)
11. Adaptation of animal to dry condition (Suitable specimen/chart/model to be given)
12. Adaptation of animal to aquatic condition (Suitable specimen to be given)

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(Convenor)

GOA BOARD OF SECONDARY AND HIGHER SECONDARY EDUCATION

ALTO – BETIM 403521

TERMWISE PORTION IN BIOLOGY

ASSESSMENT SCHEME FOR THE ACADEMIC YEAR 2024l5-26.

STD: XII

PORTION FOR FINAL EXAM

Sr No.	Units	Marks
1.	**REPRODUCTION**	**19**
	Chapter 2: Sexual Reproduction in Flowering plants	7
	Chapter 3: Human Reproduction	8
	Chapter 4: Reproductive Health	4
2.	**GENETICS**	**14**
	Chapter 5: Principles of Inheritance and Variations	6
	Chapter 6: Molecular Basis of Inheritance	8
3.	**BIOLOGY IN HUMAN WELFARE**	**12**
	Chapter 8: Human Health and Diseases	8
	Chapter 10: Microbes in Human Welfare	4
4.	**BIOTECHNOLOGY**	**11**
	Chapter 11: Biotechnology: Principles and Processes	7
	Chapter 12: Biotechnology and its Applications	4
5.	**ECOLOGY**	**14**
	Chapter 13: Organisms and populations	6
	Chapter 14 : Ecosystem	4
	Chapter 15: Biodiversity and Conservation	4
	TOTAL	**70**

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DESIGN OF THE QUESTION PAPER FOR FINAL EXAM (2025-26)

CLASS: XII

TIME: 3 Hours **SUBJECT: BIOLOGY** **Max. Marks: 70**

The weightage of the distribution of marks over different dimensions of the question paper shall be as follows:

1. **Weightage to learning outcomes:**

Sr No.	Learning Outcomes	Marks	Percentage of Marks
1.	Knowledge	28	40 %
2.	Understanding	21	30 %
3.	Application	14	20 %
4.	Skill	07	10%
	TOTAL	**70**	**100%**

2, Weightage to Content / Subject units

Sr No.	Unit	Marks
1.	Reproduction	19
2.	Genetics	14
3.	Biology in Human Welfare	12
4.	Biotechnology and its applications	11
5.	Ecology	14
	TOTAL	**70**

3. **Weightage to forms of questions:**

Sr No.	Form of Questions	Marks for each Questions	No. of Questions	Total Marks
1.	Long Answer types (LA)	05	03	15
2.	Short Answer Type (SA – I)	03	06	18
3.	Short Answer Type (SA – II)	02	12	24
4.	Very Short Answer Type (VSA/ MCQ)	01	13 (08MCQ+5VSA)	13
	TOTAL		**34**	**70**

4. **Expected Time for different types of question would be as follows**

Sr No.	Forms of Questions	Approx. Time for each Question in mins (t)	No. of Questions (n)	Approx. Time for each form of Questions in mins (n x t)
1.	Long Answer types (LA)	14 min	03	03 x 14 min =42
2.	Short Answer Type (SA – I)	07min	06	06 x 07 min = 42
3.	Short Answer Type (SA – II)	05 min	12	12 x 5 min = 60
4.	Very Short Answer Type (VSA)	02 min	13	13 x 2min = 26
	TOTAL		**34**	**170min**

As the total time calculated on the basis of number of questions required to be answered and the length of their anticipated answers, it would therefore, be advisable for the candidates to budget their

time properly by cutting out the superfluous words and be within the expected time limits.

5. Weightage to difficulty level of Questions

Sr No.	Estimated Difficulty Level of Questions	Marks	Percentage
1.	Easy	21	30 %
2.	Average	35	50 %
3.	Difficulty	14	20 %
	Total	**70**	**100 %**

The question may vary in difficulty level from individual to individual. As such, the assessment in respect of each question will be made by paper setter, on the basis of general anticipation from the group as a whole , taking the examination. This provision is only to make the paper balanced in weightage , rather than to determine the pattern of marking at any stage.

- The theory paper will be of 70 marks and 3 hours duration.
- The questions shall be from all the units.
- The question paper shall have four(4) Sections A,B,C and D

 Section A has 13 questions of 01 mark each.

 Section B has 12 questions of 02 marks each.

 Section C has 06 questions of 03 marks each.

 Section D has 03 questions of 05 marks each.

- The total number of questions will be 34.
- All questions will be compulsory.
- There is no overall choice, however an internal choice is provided in two questions of Section B , one question of Section C and two questions of Section D.

Meeta Bandekar

(Convenor)

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PORTION IN BIOLOGY ASSESSMENT SCHEME

FOR THE ACADEMIC YEAR 2025-26

STD: XII

PORTION FOR FIRST MID TERM EXAMINATION

Sr No.	Units	Marks
1.	**Reproduction**	
	Chapter 2 :Sexual Reproduction in Flowering Plants	5
	Chapter 3 : Human Reproduction	5
	Chapter 4 :Reproductive Health	4
2.	**Genetics**	
	Chapter 5 : Principles of Inheritance and variation	6
	TOTAL	**20**

PORTION FOR FIRST TERM EXAMINATION

Sr No.	Units	Marks
1.	**Reproduction**	
	Chapter 2 :Sexual Reproduction in Flowering Plants	09
	Chapter 3 : Human Reproduction	09
	Chapter 4 :Reproductive Health	07
2.	**Genetics**	
	Chapter 5 : Principles of Inheritance and variation	10
	Chapter 6 : Molecular Basis of Inheritance	10
3.	**Biology In Human Welfare**	
	Chapter 10 : Microbes in Human Welfare	07
4.	**Ecology**	
	Chapter 14 : Ecosystem	08
	TOTAL	60

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DESIGN OF THE QUESTION PAPER

FIRST MID TERM EXAMINATION (2025-26)

STD: XII

TIME: 1 hr **SUBJECT: BIOLOGY** **MAX. MARKS: 20**

The weightage of the distribution of marks over different dimensions of the question paper shall be as follows:

1. **Weightage to learning outcomes**

Sr No.	Learning Outcomes	Marks	Percentage of Marks
1.	Knowledge	07	35 %
2.	Understanding	06	30 %
3.	Application	05	25 %
4.	Skill	02	10 %
	TOTAL	**20**	**100 %**

2. **Weightage to content/ subject units (First Mid Term Examination)**

Sr No.	Units	Marks
1.	**Reproduction**	
	Sexual Reproduction in Flowering Plants	5
	Human Reproduction	5
	Reproductive Health	4
2.	**Genetics and Evolution**	
	Principles of Inheritance and variation	6
	TOTAL	**20**

3. **Weightage to forms of questions:**

Sr No.	Form of Questions	Marks for each Questions	No. of Questions	Total Marks
1.	Long Answer types (LA)	---	---	---
2.	Short Answer Type (SA – I)	03	02	06
3.	Short Answer Type (SA – II)	02	05	10
4.	Very Short Answer Type (VSA)	01	04	04
	TOTAL		**11**	**20**

4. **Expected Time for different types of question would be as follows :**

Sr No.	Forms of Questions	Approx. Time for each Question in mins (t)	No. of Questions (n)	Approx. Time for each form of Questions in mins (n x t)
1.	Long Answer types (LA)	---	---	---
2.	Short Answer Type (SA – I)	10 min	02	2 x 10 min = 20
3.	Short Answer Type (SA – II)	05 min	05	5 x 5 min = 25
4.	Very Short Answer Type (VSA)	02 min	04	4 x 2min = 8
	TOTAL			**53 min**

As the total time is calculated on the basis of the number of questions required to be answered and the length of their anticipated answers. It would, therefore be advisable for the candidates to budget their time properly by cutting out the superfluous words and be within the expected time limits.

Scheme of options

(There will be no overall choice. However, there is an internal choice in 01 sub questions of 02 marks category and 01 sub-questions of 03 marks category)

5. **Weightage to difficulty level of Questions :**

Sr No.	Estimated Difficulty Level of Questions	Percentage
1.	Easy	30 %
2.	Average	50 %
3.	Difficulty	20 %
	TOTAL	**100 %**

- Question paper will have three sections A, B, C.
- Section A will have 04 questions of 01 mark.
- Section B will have 05 questions of 02 marks.
- Section C will have 02 questions of 03 marks.
- Question shall be from all the chapters specified above.
- Total number of questions will be 11.

Meeta Bandekar

(Convenor)

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DESIGN OF THE QUESTION PAPER

FIRST TERM EXAMINATION (2025-26)

STD: XII

TIME: 2hrs 30 mins **SUBJECT: BIOLOGY** **MAX. MARKS: 60**

The weightage of the distribution of marks over different dimensions of the question paper shall be as follows:

1. **Weightage to learning outcomes**

Sr No.	Learning Outcomes	Marks	Percentage of Marks
1.	Knowledge	18	30%
2.	Understanding	21	35%
3.	Application	15	25 %
4.	Skill	06	10 %
	Total	**60**	**100 %**

2. **Weightage to forms of questions:**

Sr No.	Form of Questions	Marks for each Questions	No. of Questions	Total Marks
1.	Long Answer types (LA)	05	02	10
2.	Short Answer Type (SA– I)	03	05	15
3.	Short Answer Type (SA– II)	02	11	22
4.	Very Short Answer Type (VSA)	01	13	13
	TOTAL		**31**	**60**

3. **Expected Time for different types of questions should be as follows**

Sr No.	Forms of Questions	Approx. Time for each Question in mins (t)	No. of Questions (n)	Approx. Time for each form of Questions in mins (n x t)
1.	Long Answer types (LA)	14min	02	2 x14min= 28
2.	Short Answer Type (SA – I)	07 min	05	5 x 07min = 35
3.	Short Answer Type (SA – II)	05 min	11	11 x 05min = 55
4.	Very Short Answer Type (VSA)	02 min	13	13 x 02min = 26
	TOTAL		**31**	**144 mins**

As the total time is calculated on the basis of the number of questions required to be answered and the length of their anticipated answers. It would, therefore be advisable for the candidates to budget their time properly by cutting out the superfluous words and be within the expected time limits.

Scheme of options

(There will be no overall choice. However, there is an internal choice in 01 sub question of 05 marks, 03 marks & 02 marks category)

4. **Weightage to difficulty level of Questions**

Sr No.	Estimated Difficulty Level of Questions	Percentage
1.	Easy	30 %
2.	Average	50 %
3.	Difficulty	20 %
	Total	**100%**

Question paper will have three sections A, B, C, D.

a. Section A will have 13 questions of 01 mark. (**7** MCQ questions**)**
b. Section B will have 11 questions of 02 marks. (1 internal choice)
c. Section C will have 05 questions of 03 marks. (1 internal choice)
d. Section D will have 02 questions of 05 marks. (1 internal choice)
e. Question shall be from all the chapters specified above.
f. Total number of questions will be 31.

Ms. Meeta Bandekar
(Convenor)

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DESIGN OF THE QUESTION PAPER

FIRST TERM EXAMINATION (2025-26)

STD: XII

TIME: 2hrs **SUBJECT: BIOLOGY PRACTICAL** **MAX. MARKS: 20**

Q1. Physiology Experiment --------- 6mks

Q.2 Temporary mounting---------- 4mks

Q.3 Identification ---------- 6mks

Q.4 Journal / Viva ----------4mks

(Only those experiments may be included for the practical exam whichever are completed during the first term)

Blue print of biology model paper 2025-2026																
Objectives	**Knowledge (40%)**				**Understanding (30%)**				**Application (20%)**				**Skill (10%)**				**Total**
Content area /Marks	V.S.A 1	S.A I 2	S.A II 3	L.A 5	V.S.A 1	S.A I 2	S.A II 3	L.A 5	V.S.A 1	S.A I 2	S.A II 3	L.A5	V.S.A 1	S.A I 2	S.AII 3	L.A 5	
Sexual reproduction in flowering plants				**1(5) ***										**1(2)**			**07**
2)Human reproduction	**1(1)**						**1(3)**		**1(1)**						**1(3)**		**08**
3)Reproductive health	**2(1)**									**1(2)**							**04**
4) Principles of inheritance and variation			**1(3)**						**1(1)**	**1(2)***							**06**
5)Molecular basis of inheritance		**1(2)***					**1(3)**		**1(1)**					**1(2)**			**08**
6)Human health and disease				**1(5) ***		**1(2)**			**1(1)**								**08**
7)Microbes in human welfare	**1(1)**	**1(2)**			**1(1)**												**04**
8)Biotechnology principles and processes								**1(5)**		**1(2)**							**07**
9)Biotechnology and its application		**1(2)**				**1(2)**											**04**
10)Organisms and population	**1(1)**						**1(3)**			**1(2)**							**06**
11)Ecosystem			**1(3)**						**1(1)**								**04**
12)Biodiversity and conservation.	**1(1)**					**1(2)**			**1(1)**								**04**
total	**28**				**21**				**14**				**07**				**70**

Blue print of the Model question paper
Std: XII
Sub: Biology
2025-26

Choice (*)

NOTE: Figures within the bracket indicate number of questions and figures outside the bracket indicate marks.

Biology Model Paper-2025-26

Std : XII **Time : 3 Hours** **Maximum marks : 70**

Instructions:

(i) All questions are compulsory.
(ii) Draw diagrams in lead pencil only.
(iii) The question paper consists of four (4) Sections A, B, C and D.

- **Section A has 13 questions of 01 mark each.**
- **Section B has 12 questions of 02 marks each.**
- **Section C has 06 questions of 03 marks each.**
- **Section D has 03 questions of 05 marks each.**

(iv) The total number of questions is 34.
(v) There is no overall choice, however an internal choice is provided in two questions of Section B, one question of Section C and two questions of Section D.
(vi) Multiple choice questions should be attempted only once, if attempted more than once it will not be evaluated. Choose the correct option and rewrite on the

Biology Model Paper 2025-26

Std: XII **Time: 3 Hours** **Max marks: 70**

INSTRUCTIONS

i) **All questions are compulsory.**

ii) **Draw diagrams in lead pencil only.**

iii) **The question paper consists of four (4) sections A, B, C and D.**

- **Section A has 13 questions of 01 mark each.**
- **Section B has 12 questions of 02 marks each.**
- **Section C has 06 questions of 03 marks each.**
- **Section D has 03 questions of 05 marks each.**

iv) **The total number of questions is 34.**

v) **There is no overall choice, however an internal choice is provided in two questions of Section B, one question of Section C and two questions of Section D.**

vi) **Multiple choice questions should be attempted only once, if attempted more than once it will not be evaluated. Choose the correct option and rewrite on the answer sheet**

Section A (01 mark each)

1. Nirankarachi Rai in Sattari taluka of Goa is an area which is last refuge to ecologically sensitive *Myristica* swamp forests. This area is venerated and protected by local people for hundreds of years. Such protected areas are called as _____.

   - National Parks
   - Biodiversity Parks
   - Sacred Groves

- Botanical Gardens

2. Recombination frequency between genes a and b is 1.5; a and c is 0.2; a and d is 0.1. The sequence of these linked genes on a chromosome is therefore _____.

   - a, b, c, d
   - a, c, b, d
   - a, d, b, c
   - a, d, c, b

3. In the 28 day human ovarian cycle, ovulation occurs on _____.

   - Day 01
   - Day 06
   - Day 14
   - Day 28

4. The large holes formed in 'Swiss cheese' is due to the action of _____.

   - *Propionibacterium sharmanii*
   - *Saccharomyces cerevisiae*
   - *Clostridium butylicum*
   - *Aspergillus niger*

5. Mrs. X, a pregnant woman had prolonged labour pain, in order to hasten the child birth, the doctor administered a hormone that can _____.

   - Increase the smooth muscles contractions
   - Increase the metabolic rate
   - Release glucose in the blood
   - Stimulate the ovary

6. Barrier method of contraception includes all except _____.

   - Condom
   - Lippes loop
   - Cervical Cap
   - Diaphragm

7. Which of the following is a curable sexually transmitted disease?

   - Gonorrhoea
   - Hepatitis-B
   - Genital herpes
   - HIV infection

8. E coli completes process of replication in 18 min. Due to a mutation the process of replication was completed in 36 min. What will be the rate of polymerization?

   - 1000
   - 2000
   - 1800
   - 3600

9. Give **two** reasons why 10kg of coconut fibre will decompose slower than 20kg of coconut kernel if placed in a similar environmental condition.

10. What are biodiversity hotspots?

11. Name the type of association where, one species benefits and the other is unaffected.

12. After selecting an organ donor, Mohan had a kidney transplant, but his body showed signs of rejection. Name the type of immune response that is triggered.

13. Define- Biochemical oxygen demand (BOD).

Section B (02 marks each)

14. Draw a neat diagram showing Watson and Crick model for semiconservative DNA replication.

15. Suman observed two remarkable features while studying honey bee chromosomes.

    1. All bees did not show same number of chromosomes.
    2. Females could produce offspring without males.

    What could be the reason for each of these two observations?

    OR

    In a cross between two birds, amongst the progenies produced, some were with long feathers, some with medium size feathers and a few with short feathers.

    1. What type of feathers did the parent birds have?
    2. Give reason for obtaining three different phenotypes in the progeny.

16. How ex-situ conservation today is advanced beyond keeping threatened species in closed enclosures?

17. Describe the structure of a Nucleosome.

    OR

    Describe the role of repressor and inducer in lac operon.

18. The cysts of the brine shrimp *Artemia* were allowed to hatch into adult stage by maintaining the optimum temperature in the hatching tanks. After hatching, 200 adult *Artemia* were observed in the tank. Within a few hours 25 out of the 200 shrimps died due to fluctuating temperature. Calculate the death rate of the *Artemia* population.

19. Mention the advantages of using *Rhizobium* and Mycorrhiza in agriculture.

20. Draw a neat diagram of sectional view of human ovary.

21. State any four uses of genetically modified plants.

22. Draw a neat diagrammatic representation of the mature embryo sac.

23. How was human insulin produced by the Eli Lilly company?

24. The contraceptive methods of using CuT and LNG-20 can be only for females. Give reasons and

Justify.

25. The DNA cannot pass on its own through host cell membrane, unless forced into it. Explain one

method each used to make an animal cell and plant cell competent to take up DNA.

Section C (03 marks each)

26. Distinguish between Transcription in Prokaryotes and in Eukaryotes. (3 points of difference)

27. How are Xerophytes adapted to the environment?

28. Explain the events occurring in the body leading to the immunodeficiency syndrome in human beings.

29. Write in detail the types, cause and inheritance of thalassemia in humans.

30. Name three types of ecological pyramids. What are the three limitations of these ecological pyramids of any ecosystem?

OR

Name the three reservoirs of carbon in nature. What are the three different ways in which carbon is released in the atmosphere during carbon cycling?

31. Explain the development of spermatozoa from spermatogonia till its release from human testis.

Section D (05 marks each)

32. State the primary and secondary lymphoid organs and tissues in the human body and give their role in the immune system.

OR

State the various causes of cancer and the treatment.

33. Describe in detail the structure of a pollen grain. Write a short note megasporogenesis.

OR

Describe in detail the structure of an ovule. Write a short note on microsporogenesis.

34. Explain the convention of naming, the kinds and the functioning of restriction enzymes.[9]

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Biology Model Paper 2025-26

Answer Key

Std: XII **Time: 3 Hours** **Max marks: 70**

Section A (01 mark each)

1. Sacred groves
2. a,d,c,b
3. Day 14
4. *Propionibacterium sharmanii*
5. Increase the smooth muscles contractions
6. Lippes loop
7. Gonorrhoea
8. 1000
9. 1. Coconut fibre is rich in lignin, a complex and resistant compound that slows down microbial activity.
   2.Coconut kernel contains more nitrogen and water-soluble substances like sugars, which enhance microbial growth and speed up decomposition.
10. Biodiversity hotspots are regions with high levels of species richness and high degree of endemism.
11. Commensalism.
12. Cell-mediated immune response.
13. The amount of the oxygen that would be consumed if all the organic matter in one litre of water were oxidised by bacteria.

Section B (02 marks each)

14. Fig 6.6 Biology NCERT XII textbook.

15. Following are the reasons for the two observations in honey bees.
    1. All bees did not show same number of chromosomes because there are diploid females with 32 chromosomes and haploid males with 16 chromosomes. -1m
    2. Females could produce offsprings without males by the process of parthenogenesis where the unfertilised eggs developed into sons/male

    OR

1. The parent birds have medium sized feathers. 1mk
2. The reason for obtaining three phenotypes in progeny is due to incomplete dominance where one allele was not completely dominant over the other.
   -1mk

16. 1. Gametes of threatened species can be preserved in viable and fertile conditions for a long period using cryopreservation. 2. Plants can be propagated using tissue culture. 3. Seeds of commercially important plants can be kept in seed banks. 4. Eggs can be fertilized by in vitro fertilization.
    4 points – 2mks

17. In eukaryotes histones are organized to form a unit of 8 molecules called histone octamer. The negatively charged DNA of 200 base pairs is wrapped around positively charged histone octamer to form a Nucleosome.
    2 points - 1mk
    OR
    Role of repressor- Repressor of Lac operon is synthesized from i-gene it binds to the operator region of operon and prevents RNA polymerase from transcribing the lac operon.- 1mk
    Role of inducer- inducer of lac operon such as lactose or allolactose interacts with the repressor resulting in inactivation of the repressor this results in transcription of the lac operon.- 1mk

18. Total number of Artemia = 200 . Number of Artemia died = 25
    Death rate = No. of Dead Artemia/Total No. X 100. Death rate = 25/200 X 100 =12.5% .

19. Role of Rhizobium: These arebacteriathat fix atmospheric nitrogen into organic forms, which is used by the plant as
    a nutrient.
- 1mk.
- Role of mycorrhiza: They absorb phosphorus from the soil and passes it to the plant. They create resistance against root borne pathogens, tolerance to salinity and drought.
- Any1 point 1mk

20. Fig 3.7, Biology NCERT XII textbook

21. 1. Genetically modified plants can be bred for resistance to fungal, bacterial, or viral diseases, reducing the need for fungicides and improving crop yield. 2.Genetically

modified plants can be biofortified to increase vitamin, protein, and mineral content, helping combat malnutrition .
3.Genetically modified plants can resist insect pests, reducing crop loss and minimizing the use of harmful chemical pesticides.
4.Genetically modified plants are often engineered to tolerate environmental stresses like drought, salinity, and extreme temperatures, leading to increased agricultural productivity.
- 4 points 2mks

22. Fig 2.8 (c), Biology NCERT XII text book - 2mks

23. Eli Lilly synthesized DNA sequences for the A and B chains of human insulin and inserted them into plasmids of E. coli bacteria using recombinant DNA technology. -1mk
The A and B chains were produced separately in different bacterial cultures, extracted, and then chemically combined by forming disulfide bonds to create functional, mature human insulin. 1mk

24. CuT and LNG-20 are Intra Uterine Devices (IUDs). The uterus is a female reproductive organ. 1 mk
CuT releases Cu ions that suppress sperm motility and the fertilizing capacity of the sperms. ½ mk
LNG-20 releases hormones that make uterus unsuitable for implantation and the cervix hostile to the sperms. ½ mk

25. Animal cell – Microinjection - recombinant DNA is directly injected into the nucleus of the animal cell. - 1mk
Plant cell - biolistics or gene gun – cells are bombarded with high-velocity micro-particles of gold or tungsten coated with DNA. - 1mk

Section C (03 marks each)

26. 3 Points 1mk each

In prokaryotes	In Eukaryotes
1.Transcription and translation are (coupled) occur simultaneously in the cytosol as nuclear membrane is absent.	1. Transcription occurs in the nucleus after which RNA is transported to the ribosome where translation takes place.
2. A single RNA polymerase transcribes t-RNA, m-RNA and r-RNA.	2. RNA polymerase I transcribes r-RNA, RNA Polymerase II transcribes m-RNA and RNA polymerase III transcribes t- RNA.

3. mRNA has no introns and exons differentiated. 4.No capping and tailing involved.	3. m-RNA (hnRNA has which introns are removed and exons are joined. 4. Capping and tailing required.

27. The Xerophytes have leaves with a thick cuticle.
The leaves are reduced to Spines to reduce transpiration
They have sunken stomata.
CAM pathway for photosynthesis
The stem is green in colour and performs the function of Photosynthesis.
Any 3 points 1 mk each.

28. 1. When the virus enters into the macrophage, the RNA genome of the virus replicates to form viral DNA with the help of the enzyme Reverse transcriptase.
2. The viral DNA gets incorporated into the host cell's DNA and directs the infected cells to produce virus particles.
3.They act like a HIV factory
4.The HIV enters into the helper T-Lymphocytes and produce progeny viruses.
5.These in turn attack the helper T-Lymphocytes, this leads to a progressive decrease of T lymphocytes and the person starts suffering from infections that could have been otherwise overcome.
6.The person becomes immuno-deficient that he is unable to protect himself against these infections.

Each point ½ mk each – 3mks

29. Types of Thalassemia: It can be of types a^ Thalassemia and a' Thalassemia/ alpha and beta thalassemia. - ½ mk
Inheritance: It is transmitted from parents to the child when both the partners are unaffected carriers for the gene i.e. heterozygous condition. - ½ mk
Cause: Production of a' chain is controlled by two closely linked genes HBA1 & HBA2 on chromosome 16 of each parent and it is observed due to mutation or deletion of one or more of these genes & due to this there is less production of a' chain. - 1 mk
While a^ Thalassemia is controlled by a single gene HBB on chromosome 11 of each parent and occurs due to mutation of one or both the genes resulting into less production of a^ chain. 1 mk

30. Three types of ecological pyramids are; Pyramid of number - ½ mk
Pyramid of biomass - ½ mk
Pyramid of energy - ½ mk
Limitations of these ecological pyramids are as follows:It does not take into account the same species belonging to two or more trophic levels ½ mk
It assumes a simple food chain something that almost never exists in nature. It doesn't accommodate a food web ½ mk

Saprophytes are not given any place even though they play a vital role in the ecosystem. ½ mark.
Each point ½ mk – 3mk
OR

The three reservoirs of carbon are –
Dry weight of organism ½ mk
Carbon dissolved in oceans ½ mk
Fossil fuels ½ mk
Carbon is released during carbon cycling in the following ways
A considerable amount of carbon returns to the atmosphere as CO2 through respiratory activities of the producers and consumers.
Decomposers contribute substantially to CO2 pool by their processing of waste materisls and dead organic matter of land or oceans.
Burning of wood, forest fire and combustion of organic matter, fossil fuel are additional sources for releasing CO2 in the atmosphere.
Volcanic activity also releases CO2 in the atmosphere.
Any 3 points ½ mk each.

31. The spermatogonia present on the inside wall of seminiferous tubules multiply by mitotic division and increase in numbers.
Some of the spermatogonia (46 chromosomes) called primary spermatocyte periodically undergo meiosis.
A primary spermatocyte completes the first meiotic division leading to formation of two equal haploid cells, secondary spermatocytes (23 chromosomes)
The secondary spermatocytes undergo the second meiotic division to produce four equal haploid spermatids.
The spermatids are transformed in to spermatozoa (spermiogenesis)
After spermiogenesis, sperm heads become embedded in the sertoli cells and are finally released from the seminiferous tubules (spermiation).
Each point ½ mk each – 3mks

Section D (5 marks each)

32. Lymphoid organs are the sites where the origin, maturation and proliferation of lymphocytes occur.
The primary lymphoid organs are bone marrow and thymus, where immature lymphocytes differentiate into antigen sensitive lymphocyte. - 1 mk

After they mature, they migrate to secondary lymphoid organs eg the spleen, lymph nodes, tonsils, Peyer's patches in the small intestines and the appendix.
The secondary lymphoid organs provide the sites for interaction of lymphocytes with the antigen which then proliferate to become effector cells. - 1mk

The bone marrow is the main lymphoid organ where all blood cells including lymphocytes are produced.
Thymus is a lobed organ located close to the heart and beneath the Breastbone. The organ is large at birth but starts reducing in size with age and by the time the individual attains puberty it reduces in size. Both the Bone marrow and the thymus provide micro -environments for the development and maturation of T- lymphocytes. - 1mk

The spleen is a large bean shaped organ. It contains lymphocytes and phagocytes, it is a filter of the blood, it traps blood borne microorganisms, it is a large reservoir of erythrocytes.
Lymph nodes present in the human body, they are small solid structures located at various points in the lymphatic system, they also serve to trap the microorganisms or other antigens which get into the lymph and tissue fluid. The Antigens trapped in the lymph nodes are responsible for the activation of lymphocytes to destroy the pathogens, thus triggering the immune response.
- 1mk

The lymphoid tissues located in the Respiratory, Digestive and the urinogenital tracts called the Mucosal-associated lymphoid tissue MALT, constitutes 50% of the lymphoid tissue in the human body. - 1mk
Total 5mks

OR

Causes of cancer –.Transformation of normal cells into cancerous neoclassical cells may be induced by Physical, Chemical or Biological agents, called Carcinogens.
1.Ionizing radiations like X-rays and gamma rays and non -ionizing radiations like the UV cause DNA damage leading to neoplastic transformation.- ½ mk
2.The chemical Carcinogens present in tobacco smoke have been identified as a major cause of lung cancer.-½ mk
3.Cancer causing viruses have genes called cellular oncogenes(c-onc) or proto oncogenes have been identified in normal cells which, when activated under certain conditions, could lead to oncogenic transformation of cells. -½ mk
Treatment –
1.Surgery- ½ mk
2.Radiation therapy. Radiation therapy involves removal of the tumor cells by irradiating them lethally, to protect normal tissues surrounding the tumor mass.-1 mk
3 Immunotherapy :Cancer is also treated with alfa interferon, which activates their immune system and helps destroying the tumor lethally.-- 1 mk
4.Chemotherapeutic drugs are used to kill cancerous cells- ½ mk.
5. Most cancers are treated by the combination of surgery, radiotherapy and chemotherapy. -½ mk
Total – 5 mks

33. Structure of pollen grain
Pollen grains are generally spherical or oval. They measure about 25–50 micrometers in diameter.
Pollen wall has 2 layers a) Exine (Outer Wall)- Made of a tough substance called sporopollenin, which is one of the most resistant organic materials known. Exine exhibits a fascinating array of patterns and designs. Contains germ pores that are thin areas where sporopollenin is absent.
b) Intine (inner wall)- thin and continuous layer made of cellulose and pectin. Lies beneath the exine and surrounds the cytoplasm.
c)The cytoplasm is enclosed by a plasma membrane. A mature pollen grain contains two cells, Vegetative cell: Large, with abundant food reserve and a large irregular nucleus. It forms the pollen tube.

Generative cell: Small, spindle-shaped, and floats in the cytoplasm of the vegetative cell. It later divides mitotically to form two male gametes.

Megasporogenesis

-Megasporogenesis is the process of formation of megaspores from the megaspore mother cell (MMC) inside the ovule of a flowering plant.
-A single MMC develops in the micropylar region of the nucellus.
-The MMC undergoes meiotic division to produce four megaspores, out of these four, usually only one megaspore remains functional, while the other three degenerate.
-The functional megaspore gives rise to the female gametophyte (embryo sac) by mitotic divisions.
½ mk for each point - 5mks

OR

Structure of Ovule
-The ovule is a small structure attached to the placenta by means of stalk called funicle.
-The body of the ovule fuses with funicle in the region called hilum. Hilum acts as the junction between ovule and funicle.
-Each ovule has one or two protective envelopes called integuments which encircle the nucellus except at the tip where a small opening called the micropyle is organised.
-Opposite the micropylar end, is the chalaza, representing the basal part of the ovule.
-Enclosed within the integuments is a mass of cells called the nucellus. Cells of the nucellus have abundant reserve food materials. Located in the nucellus is the embryo sac or female gametophyte.
-An ovule generally has a single embryo sac formed from a megaspore.

Microsporogenesis

-Microsporogenesis is the process of formation of microspores from pollen mother cells through meiosis.
-Sporogenous tissue is located at the center of each microsporangium in a young anther.
-Each cell of this tissue functions as a Pollen Mother Cell (PMC) or microspore mother cell. As the anther develops the PMC undergoes meiotic division, resulting in the formation of a microspore tetrad..
-These microspores are initially attached together but later separate as the anther matures and dehydrates. Each haploid microspore develops into a pollen grain, which is the male gametophyte.
-½ mk for each point – 5mks

34. Convention of naming is the first letter of the name comes from the genus and the second two letter come from the species of the prokaryotic cell from which they are isolated.
Roman numbers following the names indicate the order in which the enzymes were isolated from that strain of bacteria. Eg. EcoRI 1mk

Restriction enzymes belong to a larger class of enzymes called nucleases and are of two kinds; exonucleases and endonucleases. Exonucleases remove nucleotide from the ends of the DNA and endonucleases make cuts at specific positions within the DNA. 1mk

Each restriction enzyme functions by inspecting the length of a DNA sequence.
Once it finds its specific recognition sequence, it will bind to the DNA and cut each of the two strands of the double helix at specific points in the sugar – phosphate backbones.

Each restriction endonuclease recognizes a specific palindromic nucleotide sequence in DNA. 1½ mks

Restriction enzymes cut the strand of DNA a little away from the centre of the palindrome sites, but between the same two bases on the opposite strands.This leaves single stranded portions at the ends, overhanging stretches called sticky ends. The sticky ends facilitate the action of the enzyme DNA ligase 1½ mks

1+1+1½+1½ = 5mks
