

# 2022-2023

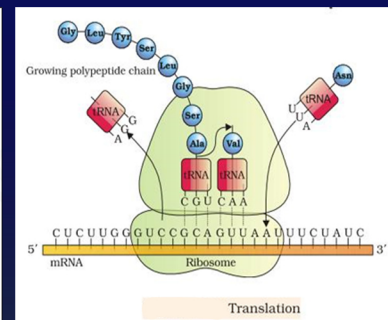
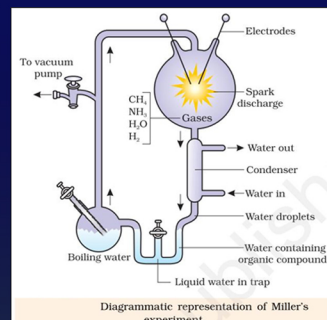
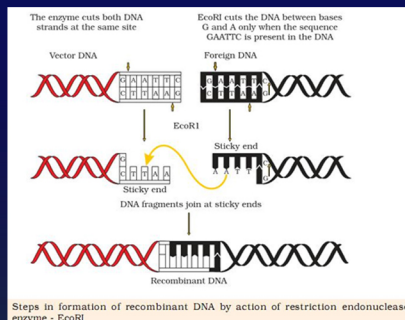
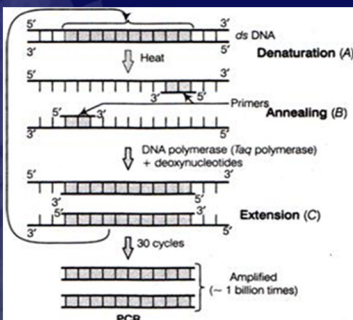
## 2ND YEAR PUC KARNATAKA

# BIOLOGY

## SUPER 5 MODEL

## QUESTION PAPERS WITH

## ANSWERS



Best Wishes

# DPUE DIKSHA TEAM



NOT FOR SALE

ಪ್ರಿಯ ವಿದ್ಯಾರ್ಥಿಗಳೇ,

ಕರ್ನಾಟಕದಲ್ಲಿ ದ್ವಿತೀಯ ಪಿಯುಸಿ ವ್ಯಾಸಂಗ ಮಾಡುತ್ತಿರುವ ಜೀವಶಾಸ್ತ್ರದ  
ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ೨೦೨೩ರ ವಾರ್ಷಿಕ ಪರೀಕ್ಷೆಗೆ ಅನುಕೂಲವಾಗಲೆಂದು **ಐದು  
ಮಾದರಿ ಪ್ರಶ್ನೆಪತ್ರಿಕೆಗಳನ್ನು ಉತ್ತರಗಳ ಜೊತೆಗೆ ಉಚಿತವಾಗಿ ಪ್ರಕಟಿಸಲು**  
ಹೆಮ್ಮೆ ಎನಿಸುತ್ತಿದೆ.  
ನಿಮಗೆ ಶುಭವಾಗಲಿ.

ಸದಸ್ಯರು,  
ದೀಕ್ಷಾ ಜೀವಶಾಸ್ತ್ರ

Cover page courtesy: Sri Bhuvana Mitra

**DEPARTMENT OF PRE UNIVERSITY EDUCATION**  
**MODEL QUESTION PAPER**  
**BIOLOGY (36)**  
**II PUC**

<b>2022-23</b>
----------------

**DISTRIBUTION OF MARKS-CHAPTER-WISE**

Unit No	Unit Wise Hours	Unit Wise Marks	Chapter No	Chapters	Chapter Wise Hours	Chapter Wise Marks
VI	29	28	1	Reproduction in organisms	5	5
			2	Sexual reproduction in flowering plants	10	9
			3	Human reproduction	9	9
			4	Reproductive health	5	5
VII	30	28	5	Principles of inheritance and variation	12	11
			6	Molecular basis of inheritance	12	11
			7	Evolution	6	6
VIII	25	24	8	Human health and disease	10	9
			9	Strategies for enhancement in food production	9	9
			10	Microbes in human welfare	6	6
IX	12	12	11	Biotechnology-principles and processes	7	7
			12	Biotechnology and its applications	5	5
X	24	23	13	Organisms and populations	7	7
			14	Ecosystem	6½	6
			15	Biodiversity and conservation	3½	3
			16	Environmental issues	7	7
	<b>120</b>	<b>115</b>			<b>120</b>	<b>115</b>
Knowledge = 40% (46 marks)				Easy = 40%	1 mark = 20 questions	
Understanding = 30% (35 marks)				Average = 40%	2 marks = 08 questions	
Application = 15% (17 marks)				Difficult = 20%	3 marks = 08 questions	
Skill = 15% (17 marks)				<b>Total questions = 47</b>	5 marks = 11 questions	

**BLUE PRINT  
MODEL QUESTION PAPER  
II PUC- BIOLOGY (36)**

**2022-23**

**UNIT-WISE WEIGHTAGE**

UNIT NO	UNITS	TEACHING HOURS	KNOWLEDGE				UNDERSTANDING				APPLICATION / APPRECIATION				EXPRESSION/ SKILL				TOTAL QUESTIONS				MARKS WEIGHTAGE
			1M	2M	3M	5M	1M	2M	3M	5M	1M	2M	3M	5M	1M	2M	3M	5M	1M	2M	3M	5M	
VI	REPRODUCTION	29	6	2	1			1	1	1							1	6	3	2	2	28	
VII	GENETICS AND EVOLUTION	30	4	2	1			1		1				1		1	1	4	4	2	2	28	
VIII	BIOLOGY IN HUMAN WELFARE	25	1			2	1			1	1		2					3		2	3	24	
IX	BIOTECHNOLOGY	12	1							1				1	1			2			2	12	
X	ECOLOGY	24	2		1	1	2			1					1	1	1	5	1	2	2	23	
		120	<b>40% (46 MARKS)</b>				<b>30% (35 MARKS)</b>				<b>15% (17 MARKS)</b>				<b>15% (17 MARKS)</b>				20	8	8	11	115

**NOTE:**

1. The question paper must be prepared based on the individual blueprint on the basis of weightage of marks fixed for each chapter.
2. A variation of 1% per objective weightage is allowed.
3. A variation of 1 mark per unit/chapter is allowed. However, the total marks should not exceed 115 marks.
4. At least one question each carrying 1 mark, 2 marks, 3 marks, and 5 marks have to be derived from each unit.
5. When a question carrying 5 marks is divided into sub-questions (3+2/2+2+1/1+1+1+1+1), the sub-questions have to be derived from the same chapter. One of the 5 marks questions should be subdivided into 5 questions carrying 1 mark each.
6. When a question carrying 5 marks is divided into sub-questions, the sub-questions have to be derived from different topics of the same chapter.
7. Skill-based questions should not expect descriptive answers.
8. MCQs and fill-in-the-blank type of questions should be simple and straightforward.

**BLUE PRINT  
MODEL QUESTION PAPER  
II PUC- BIOLOGY (36)**

**2022-23**

**CHAPTER-WISE WEIGHTAGE**

Unit No	Total hours	Chapter No	CHAPTERS	Hours	KNOWLEDGE				UNDERSTANDING				APPLICATION				SKILL				Total Questions				Chapter wise marks	Unit wise marks			
					1 M	2 M	3 M	5 M	1 M	2 M	3 M	5 M	1 M	2 M	3 M	5 M	1 M	2 M	3 M	5 M	1 M	2 M	3 M	5 M					
VI	29																												
		1	Reproduction in organisms	5	1	1				1														1	2			5	28
		2	Sexual reproduction in flowering plants	10	2	1					1													2	1		1	9	
		3	Human reproduction	9	1		1													1				1		1	1	9	
4	Reproductive health	5	2							1												2		1		5			
VII	30	5	Principles of inheritance and variation	12	2				1					1			1					2	2		1	11	28		
		6	Molecular basis of inheritance	12	1	1	1				1												1	1	1	1		11	
		7	Evolution	6	1	1												1					1	1	1			6	
VIII	25	8	Human health and disease	10	1			1						1								1		1	1	9	24		
		9	Strategies for enhancement in food production	9							1	1		1									1		1	1		9	
		10	Microbes in human welfare	6			1	1															1			1		6	
IX	12	11	Biotechnology : Principles and processes	7	1						1					1						2			1	7	12		
		12	Biotechnology and its applications	5										1												1		5	
X	24	13	Organisms and populations	7				1			1					1						2			1	7	23		
		14	Ecosystem	6½	2				1										1			3			1			6	
		15	Biodiversity and conservation	3½			1																		1			3	
		16	Environmental issues	7				1										1						1		1		7	
	<b>120</b>		<b>Total Questions</b>	<b>120</b>	<b>1</b> <b>4</b>	<b>4</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>5</b>	<b>1</b>		<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>2</b> <b>0</b>	<b>8</b>	<b>8</b>	<b>1</b> <b>1</b>	<b>115</b>	<b>115</b>		
			<b>OBJECTIVE WEIGHTAGE</b>			<b>40% (46 MARKS)</b>				<b>30% (35 MARKS)</b>				<b>15% (17 MARKS)</b>				<b>15% (17 MARKS)</b>											

DEPARTMENT OF PRE UNIVERSITY EDUCATION

MODEL QUESTION PAPER - 2022-23

II PUC

SUB: BIOLOGY (36)

MQP-1

TIME: 3 HOURS 15 MINUTES

MAX. MARKS: 70

**General instructions:**

1. The question paper consists of four parts A, B, C, and D.
2. PART-A consists of I & II and Part-D consists of V & VI.
3. All the parts are compulsory.
4. Draw diagrams wherever necessary, unlabelled diagrams or illustrations do not attract any marks.

**PART- A**

**I. Select the correct alternative from the choices given below:**

**1 x 15 = 15**

1. Which of the following organism exhibits oestrous cycle?  
a) Monkey b) Human c) Rat d) Apes
2. Triploid condition is observed in  
a) Egg cell b) Synergid c) Antipodals d) Primary endosperm nucleus
3. The first movements of the foetus are observed during which month of the pregnancy?  
a) First month b) Second month c) Fifth month d) Sixth month
4. An example for non-medicated IUD is  
a) Cu-T b) Lippes loop c) LNG-20 d) Multiload 375
5. Appearance of autosomal recessive trait results in a condition called  
a) Phenylketonuria b) Turners' syndrome c) Haemophila d) Colour blindness
6. Biopsy is useful in the detection of  
a) Typhoid b) Cancer c) AIDS d) Allergy
7. Biofortified bitter gourd is enriched with  
a) Vitamin A b) Protein c) Vitamin C d) Iron
8. A typical example for mycorrhiza forming fungus is  
a) *Penicillium* b) *Aspergillus* c) *Trichoderma* d) *Glomus*
9. Select the correct sequence of steps in polymerase chain reaction:  
a) Annealing → Denaturation → Extension  
b) Denaturation → Annealing → Extension  
c) Annealing → Extension → Denaturation  
d) Denaturation → Extension → Annealing
10. In the equation  $GPP-R = NPP$ , the letter 'R' denotes  
a) Respiratory quotient b) Respiration loss  
c) Intrinsic rate of natural increase d) Regression coefficient
11. Medical termination of pregnancies are considered relatively safe during  
a) First trimester of pregnancy b) Second trimester of pregnancy  
c) Third trimester of pregnancy d) Eighth month of pregnancy
12. A disorder characterized by trisomy of 21 is  
a) Down's syndrome b) Haemophila c) Thalassemia d) Cystic fibrosis
13. The process of degradation of detritus into simpler inorganic substances by bacterial and fungal enzymes is  
a) Fragmentation b) Leaching c) Catabolism d) Humification

14. Desert lizards bask in the sun when their body temperature drops below the comfort zone and move into shade when ambient temperature starts increasing. This is an example for  
a) Morphological adaptation    b) Behavioural adaptation  
c) Physiological adaptation    d) Biochemical adaptation

15. Each tropic level has certain mass of living material at a particular time called as  
a) Standing state    b) Standing crop    c) Biomass    d) Productivity

**II. Fill in the blanks by choosing the appropriate word/words from those given below:**

(Saltation, Pioneer species, Tapetum,  $\beta$ -galactosidase, Retrovirus) **1 x 5 = 5**

16. The commonly used vector for cloning genes in animals is .....
17. The species that invade bare areas are called.....
18. The tissue that nourishes the developing pollen grains is.....
19. In *lac* operon, the 'z' gene codes for.....
20. A single-step large mutation that causes speciation is.....

**PART-B**

**III. Answer any FIVE of the following questions in 3-5 sentences each, wherever applicable:**

**2 x 5 = 10**

21. What is parthenogenesis? Give an example.
22. Define    a) Emasculation    b) Bagging
23. List the criteria for a molecule that can act as genetic material.
24. What are homologous organs? Give an example.
25. Differentiate between seasonal breeders and continuous breeders.
26. Distinguish between linkage and recombination.
27. Draw the pedigree symbols for:    a) Affected male individual    b) Mating between relatives.
28. Sketch and label a scrubber used in controlling air pollution.

**PART - C**

**IV. Answer any FIVE of the following questions in about 40-80 words each, wherever applicable:**

**3 x 5 = 15**

29. What is placenta? Name the hormones secreted by it.
30. Explain natural methods for birth control.
31. Mention the different steps involved in DNA fingerprinting.
32. Draw a labelled diagram of Stanley Miller's apparatus.
33. Describe any three barriers of innate immunity with examples.
34. a) Why meristem is preferred in tissue culture as explant? (1)  
b) Mention the objectives of plant breeding. (2)
35. a) Define endemism. (1)  
b) "Over-exploitation of natural resources by humans resulted in the extinction of many species in the last 500 years". List any two examples for this. (2)
36. Schematically represent phosphorous cycling in a terrestrial ecosystem.

**PART- D**

**V. Answer any THREE of the following questions in about 200-250 words each, wherever applicable:**

**5 x 3 = 15**

37. Describe the structure of a mature female gametophyte in angiosperms.
38. Explain any five features of genetic code.
39. Explain the different steps involved in the development of a new genetic variety of crop plant.
40. Mention the roles played by microbes in household products.

41. Explain the process of separation and isolation of DNA fragments using gel-electrophoresis.
42. Define the following:  
a) Biochemical oxygen demand    b) Eutrophication    c) Biomagnification  
d) Algal bloom    e) Ecological sanitation

**VI. Answer any TWO of the following questions in about 200-250 words each, wherever applicable: 5 x 2 = 10**

43. Draw a sectional view of the human male reproductive system.
44. Explain the benefits of transgenic animals for humans.
45. In Mendel's experiment, when two pairs of traits are combined in a hybrid, segregation of one pair of characters is independent of other pair of characters. Justify this by representing schematically the two gene inheritance.
46. a) Differentiate between euryhaline animals and stenohaline animals. (2)  
b) Describe sexual deceit in *Ophrys*. (3)
47. List out the measures used for prevention and control of alcohol and drugs abuse among adolescents.



DEPARTMENTAL MODEL QUESTION PAPER-2022-23


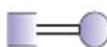
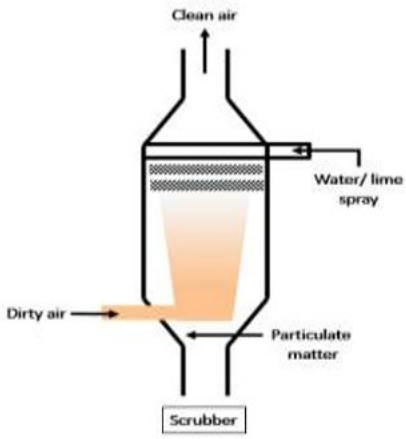
MQP-1

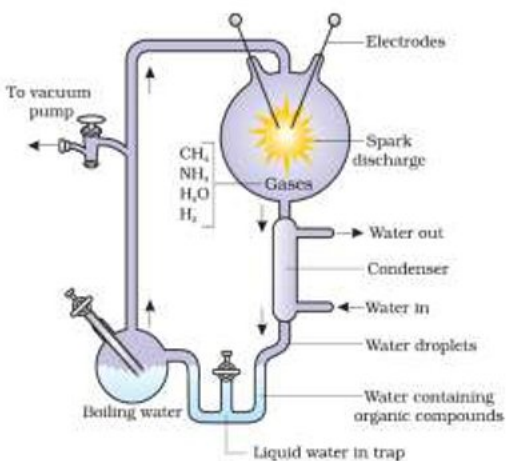
SCHEME OF EVALUATION

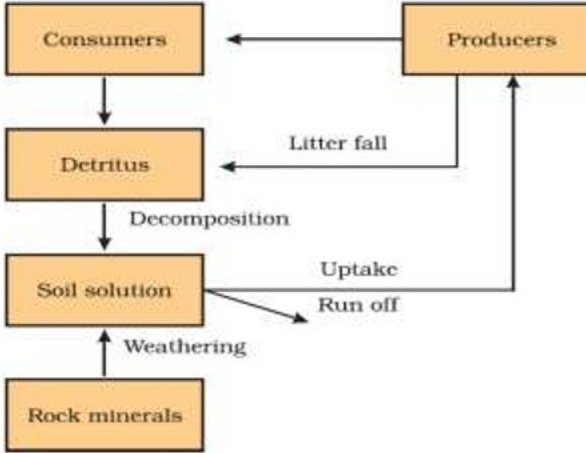
II PUC

BIOLOGY (36)

Q.NO	VALUE POINTS / KEY POINTS	MARKS	ANSWER REFERENCE PAGE NO
	<b>PART- A</b>		
<b>I</b>	<b>Select the correct alternative from the choices given below:</b>	<b>1x15=15</b>	
1	c) Rat	1	9
2	d) Primary endosperm nucleus	1	34
3	c) Fifth month	1	54
4	d) Multiload 375	1	60
5	a) Phenylketonuria	1	90
6	b) Cancer	1	157
7	c) Vitamin C	1	176
8	d) <i>Glomus</i>	1	188
9	b) Denaturation → Annealing → Extension	1	202
10	b) Respiration loss	1	243
11	a) First trimester of pregnancy	1	62
12	a) Down's syndrome	1	91
13	c) Catabolism	1	243
14	b) Behavioural adaptation	1	226
15	b) Standing crop	1	247
<b>II</b>	<b>Fill in the blanks by choosing the appropriate word/words from those given below:</b>	<b>1x5=5</b>	
16	Retrovirus	1	200
17	Pioneer species	1	251
18	Tapetum	1	21
19	β-galactosidase	1	116
20	Saltation	1	135
	<b>PART- B</b>		
<b>III</b>	<b>Answer any FIVE of the following questions in 3-5 sentences each, wherever applicable:</b>	<b>2x5=10</b>	
<b>21</b>	<b>What is parthenogenesis? Give an example.</b> The phenomenon of development of female gamete into an organism without fertilisation. <b>Example:</b> Rotifers / Honey bees / some lizards / Turkey birds <i>Any one example</i>	1     1	     14
<b>22</b>	<b>Define a) Emasculation b) Bagging</b> a) The removal of anthers from flower bud before anther dehiscence using a pair of forceps. b) The covering of emasculated flower with a bag of suitable size.	1  1	  33
<b>23</b>	<b>List the criteria for a molecule that can act as genetic material.</b> 1. It should be able to generate its replica (Replication). 2. It should be stable chemically and structurally.	  4x½=2	  103

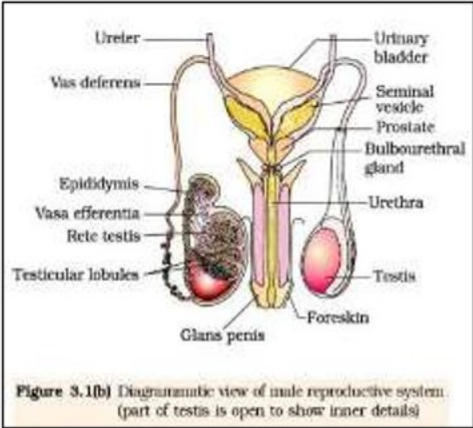
	3. It should provide the scope for slow changes (mutation) that are required for evolution. 4. It should be able to express itself in the form of 'Mendelian Characters'.		
24	<b>What are homologous organs? Give an example.</b> The organs that are similar in anatomical structure and origin but perform different functions. <b>Examples:</b> Bones in forelimbs of bats, cheetah and mammals / Thorns in <i>Bougainvillea</i> and tendrils in cucurbita <i>Any one example</i>	1  1	131
25	<b>Differentiate between seasonal breeders and continuous breeders.</b>		
	<b>Seasonal breeders</b> These animals are reproductively active only during favourable season during their reproductive phase. <b>Example:</b> Animals in natural and wild conditions	<b>Continuous breeders</b> These animals are reproductively active throughout their reproductive phase. <b>Example:</b> Mammals <i>One example on either side</i>	1  1
26	<b>Distinguish between linkage and recombination.</b>		
	<b>Linkage</b> It is the physical association of genes on a chromosome	<b>Recombination</b> It is the generation of non-parental gene combination	2  83
27	<b>Draw the pedigree symbols for:</b> a) Affected male individual  b)  mating between relatives (consanguineous mating)	1  1	88
28	<b>Sketch and label a scrubber used in controlling air pollution.</b>  <i>Diagram with any 4 labelling</i>		271
IV	<b>PART-C</b> <b>Answer any FIVE of the following questions in about 40-80 words each, wherever applicable:</b>	$4 \times \frac{1}{2} = 2$ $3 \times 5 = 15$	
29	<b>What is placenta? Name the hormones secreted by it.</b> Placenta is the structural and functional unit between foetus and maternal body. Hormones secreted by placenta are:	1	53

	<ol style="list-style-type: none"> <li>1) human chorionic gonadotropin (hCG)</li> <li>2) human placental lactogen (hPL)</li> <li>3) Estrogens</li> <li>4) Progesterones (any two)</li> </ol>	<p>1</p> <p>1</p>	
<b>30</b>	<p><b>Explain natural methods for birth control.</b>  Natural methods work on the principle of avoiding chances of ovum and sperms meeting. Different types of natural methods are</p> <ol style="list-style-type: none"> <li>1. <b>Periodic abstinence</b> is one such method in which the couples avoid or abstain from coitus from day 10 to 17 of the menstrual cycle when ovulation could be expected.</li> <li>2. <b>Withdrawal or coitus interrupts</b> is another method in which the male partner withdraws his penis from the vagina just before ejaculation so as to avoid insemination.</li> <li>3. <b>Lactational amenorrhea</b> (absence of menstruation) method is based on the fact that ovulation and therefore the cycle do not occur during the period of intense lactation following parturition. Therefore, as long as the mother breast-feeds the child fully, chances of conception are almost nil.</li> </ol>	<p>1</p> <p>1</p> <p>1</p>	59-60
<b>31</b>	<p><b>Mention the different steps involved in DNA fingerprinting.</b>  <b>Steps involved in DNA fingerprinting are:</b></p> <ol style="list-style-type: none"> <li>1. DNA is isolated from samples (skin, hair, bone, saliva, blood, etc).</li> <li>2. The DNA is digested using restriction endonucleases to produce small fragments.</li> <li>3. The DNA fragments are separated according to their size by electrophoresis.</li> <li>4. The separated DNA fragments are transferred to nitrocellulose or nylon membrane by Southern blotting.</li> <li>5. The DNA fragments on the membrane are hybridized with labeled VNTR probe.</li> <li>6. Hybridized DNA fragments are detected by autoradiography.</li> </ol>	<p>6x½=3</p>	122
<b>32</b>	<p><b>Draw a labelled diagram of Stanley Miller's apparatus.</b></p>  <p style="text-align: right;"><i>Diagram with any 6 labelling</i></p>	<p>6x½=3</p>	128

33	<p><b>Describe any three barriers of innate immunity with examples.</b>  <b>Innate immunity barriers are</b></p> <ol style="list-style-type: none"> <li>Physical barriers: Example: Skin / Mucus</li> <li>Physiological barriers: Example: Acid in the stomach / saliva in the mouth / tears from eyes</li> <li>Cellular barriers: Example: Polymorpho-nuclear leukocytes (PMNL-neutrophils) / monocytes / natural killer cells / macrophages</li> <li>Cytokine barriers: Example: Interferons</li> </ol>	Any three 3x1=3	150-151
34 (a)  (b)	<p><b>Why meristem is preferred in tissue culture as explant?</b>  To get a virus-free plant.</p> <p><b>Mention the objectives of plant breeding.</b>  <b>Objective of plant breeding are:</b></p> <ol style="list-style-type: none"> <li>To create a plant types that are better suited for cultivation</li> <li>To get better yields</li> <li>To get disease resistant varieties</li> </ol>	1  Any two 2x1=2	170
35 (a)  (b)	<p><b>Define endemism.</b>  It is the phenomenon of a species being confined to a particular area and not found anywhere else.</p> <p><b>“Over-exploitation of natural resources by humans resulted in the extinction of many species in the last 500 years”. List any two examples for this.</b></p> <ol style="list-style-type: none"> <li>Steller’s sea cow</li> <li>Passenger pigeon</li> </ol>	1  1 1	265
36	<p><b>Schematically represent phosphorous cycling in a terrestrial ecosystem.</b></p>  <p style="text-align: center;"><i>Diagram with any 6 labelling</i></p>	6x½=3	255
V	<p style="text-align: center;"><b>PART-D</b></p> <p><b>Answer any <u>THREE</u> of the following questions in about 200-250 words each, wherever applicable:</b></p>	5X4=20	
37	<p><b>Describe the structure of a mature female gametophyte in angiosperms.</b>  <b>Female gametophyte is known as the embryo sac.</b></p> <ol style="list-style-type: none"> <li>Development of embryo sac from a single megaspore is called as monosporic type of embryo sac.</li> </ol>		

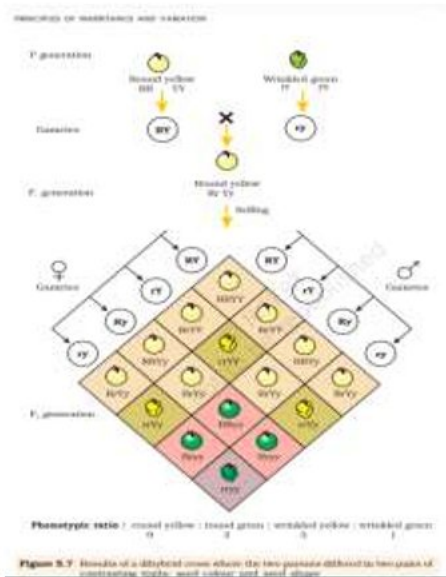
	<ol style="list-style-type: none"> <li>2. The nucleus of the functional megaspore divided by mitotic division to form two nuclei which move to the opposite pole, 2-nucleated embryo sac.</li> <li>3. Two successive mitotic division leads to formation of 4-nucleate and later 8-nucleate stages of the embryo sac.</li> <li>4. All mitotic divisions are free nuclear type; karyokinesis is not followed by cytokinesis.</li> <li>5. Six of the eight nuclei are surrounded by cell walls and organized into cells.</li> <li>6. Three cells are grouped together at the micropylar end, constitute the egg apparatus.</li> <li>7. The egg apparatus, in turn consists of two synergids and one egg cell.</li> <li>8. Synergids have special filiform apparatus, which play an important role in guiding the entry of pollen tube into the synergids.</li> <li>9. Three cells arranged towards chalazal end are called antipodal cells.</li> <li>10. The large central cell has two polar nuclei. typical angiosperm embryo sac at maturity is 8- nucleated and 7-celled.</li> </ol>	5	26-27
38	<p><b>Explain any five features of genetic code.</b></p> <ol style="list-style-type: none"> <li>1. The codon is triplet. That means three nitrogen base sequences constitute one codon. There are 64 codons, of these 61 codes for amino acids and 3 codons are stop codons or terminator codons.</li> <li>2. One codon code for only one amino acid, hence genetic code is called unambiguous.</li> <li>3. Degeneracy: some amino acids are coded by more than one codon.</li> <li>4. Genetic code is Comma less: the codon is read in mRNA in a continuous fashion. There is no punctuation.</li> <li>5. Genetic code is Universal: A codon codes for same amino acid in all organisms. From bacteria to human UUU codes for phenyl alanine.</li> <li>6. Genetic code has Initiation codon: AUG is the first codon of all mRNA. And also, it codes for methionine (met), hence has dual function.</li> </ol> <p style="text-align: center;">(any five)</p>	5	112
39	<p><b>Explain the different steps involved in the development of a new genetic variety of crop plant.</b></p> <p>The main steps in breeding with a new genetic variety of a crop are,</p> <p><b>1. Collection of variability:</b></p> <ul style="list-style-type: none"> <li>• In many crops pre-existing variability is available from wild relatives of crops.</li> <li>• Collection and preservation of all the different wild varieties, species and relatives of cultivated crop species.</li> <li>• The entire collection (of plants/seeds) with all diverse alleles for all genes in a given crop is called germplasm collection.</li> </ul> <p><b>2. Evaluation and selection of parents:</b></p> <ul style="list-style-type: none"> <li>• The germplasm is evaluated so as to identify plants with desirable combination of characters. The selected plants are multiplied and used in the process of hybridization. Pure line plants (homozygous) are created by self-pollination for 6-8 generations.</li> </ul> <p><b>3. Cross- hybridization among the selected parents:</b></p>	5x1=5	171-172

	<ul style="list-style-type: none"> <li>Hybridization is the crossing of two plants differing from each other genotypically in one or more characters to produce a hybrid. Ex: - High protein quality of one parent may need to be combined with disease resistance from another parent. So, hybrid formed has both the characters. But it is a very time consuming and tedious process.</li> </ul> <p><b>4. Selection and testing of superior recombinants:</b></p> <ul style="list-style-type: none"> <li>It involves the selection of plants among the progeny of the hybrid with desired combination of characters.</li> <li>These plants are then self-pollinated for 6-8 generations, till they reach the state of homozygosity.</li> </ul> <p><b>5. Testing, release and commercialization of new cultivars:</b></p> <ul style="list-style-type: none"> <li>The newly selected lines are evaluated for their and other traits of quality, disease resistance etc., by growing them in the research fields.</li> <li>After evaluation, the hybrid line is tested in farmer's fields.</li> <li>The crop is grown at different localities in the country with different agro climatic zones for at least 3 growing seasons.</li> <li>The material tested is then selected to certify and released in bulk as a variety.</li> </ul>		
40	<p><b>Mention the roles played by microbes in household products.</b></p> <ol style="list-style-type: none"> <li>Lactic acid Bacteria (LAB) grow in milk and convert it to curd.</li> <li>LAB produces acids that coagulate and partially digest milk proteins.</li> <li>A small amount of curd added to fresh milk as inoculums or starter.</li> <li>LAB improves nutritional quality of milk by increasing vitamin B<sub>12</sub></li> <li>LAB plays very important role in checking disease causing microbes.</li> <li>Dough, used to make dosa and idli is also fermented by bacteria.</li> <li>The puffed-up appearance of dough is due to the production of CO<sub>2</sub>.</li> <li>Baker's yeast (<i>Saccharomyces cerevisiae</i>) is used to making bread.</li> <li>'Toddy' a traditional drink is made by fermentation of sap from palms.</li> <li>Large holes in 'Swiss cheese' are due to production of large amount of CO<sub>2</sub> by a bacterium named <i>Propionibacterium sharmanii</i>.</li> <li>The 'Roquefort cheese' is ripened by specific fungi, which gives specific flavor.</li> </ol>	5x1=5	181
41	<p><b>Explain the process of separation and isolation of DNA fragments using gel-electrophoresis.</b></p> <p>Separation and isolation of DNA fragments:</p> <ol style="list-style-type: none"> <li>The cutting of DNA by restriction endonucleases results in the fragments of DNA.</li> <li>These fragments are separated by a technique called gel electrophoresis.</li> </ol>		

	<p>3. Since the DNA fragments are negatively charged, they can be separated by forcing them to move towards anode under an electric field through a medium/matrix.</p> <p>4. Most commonly used matrix is agarose, a natural polymer extracted from sea weed.</p> <p>5. DNA fragments separate according to their size through sieving effect provided by the agarose gel. Hence the smaller the fragment size, farther it moves.</p> <p>6. The separated fragments are visualized by staining them with Ethidium bromide followed by exposure to UV radiation.</p> <p>7. The separated bands of DNA are cut out from the agarose gel and extracted from the gel piece. This step is called elution.</p>	5	198
42	<p>48. Define the following:</p> <p>a) Biochemical oxygen demand b) Eutrophication c) Biomagnification d) Algal bloom e) Ecological sanitation</p> <p><b>a) Biochemical oxygen demand:</b> The amount of Oxygen that would be consumed if all the organic matter present in one litre of water were oxidized by bacteria is called BOD.</p> <p><b>b) Eutrophication:</b> The process of natural aging of a lake by nutrient enrichment of its water.</p> <p><b>c) Biomagnification:</b> Increase in concentration of the toxicant at successive trophic level is called biological magnification or biomagnification.</p> <p><b>d) Algal bloom:</b> Presence of large amount of nutrients in water also causes excessive growth of Planktonic (free floating) algae, called algal bloom.</p> <p><b>e) Ecological sanitation:</b> Ecological sanitation is a sustainable system for handling human excreta, using dry composting toilets.</p>	1 1 1 1 1	275-276
VI	<p>Answer any <b>TWO</b> of the following questions in about 200-250 words each, wherever applicable:</p>	5X2=10	
43	<p><b>Draw a sectional view of the human male reproductive system.</b></p>  <p style="text-align: center;"><b>Diagram with any 10 labelling</b></p>	10x½=5	43

44	<p><b>Explain the benefits of transgenic animals for humans.</b>  Animals that have an <b>alien DNA</b> which able to express in it is called <b>transgenic animals</b>.  <b>Reasons for creation of transgenic animals:</b></p> <ol style="list-style-type: none"> <li><b>Normal physiology and development:</b> <ul style="list-style-type: none"> <li>Transgenic animals are specifically designed to allow study of: <ul style="list-style-type: none"> <li>How the genes are regulated.</li> <li>How the gene affects normal functioning of body</li> <li>How it affects growth and development. E.g. insulin like growth factor.</li> <li>The animals made transgenic to know the biological effect and result.</li> </ul> </li> </ul> </li> <li><b>Study of disease:</b> <ul style="list-style-type: none"> <li>Transgenic animals are designed to understand how genes contribute to the development of disease like cancers, cystic fibrosis, rheumatoid arthritis and Alzheimer's.</li> </ul> </li> <li><b>Biological products:</b> <ul style="list-style-type: none"> <li>Transgenic animals are used to produce biological product of human interest: <ul style="list-style-type: none"> <li><b><math>\alpha</math>-1-antitrypsin</b> used to treat emphysema.</li> <li>Proteins for treatment for PKU and cystic fibrosis.</li> <li>Transgenic cow Rosie, produce human protein enriched milk (2.4 gm/lit. <b>human <math>\alpha</math>-lactalbumin</b>)</li> </ul> </li> </ul> </li> <li><b>Vaccine safety:</b> <ul style="list-style-type: none"> <li>Transgenic mice are being developed and use in testing the safety of vaccines before they are used for humans.</li> <li>Polio vaccine is tested in mice.</li> </ul> </li> <li><b>Chemical safety testing:</b> <ul style="list-style-type: none"> <li>This is also known as toxicity/safety testing.</li> <li>Transgenic animals are made to know the effect of toxic chemicals.</li> </ul> </li> </ol>	5x1=5	212-213
45	<p><b>In Mendel's experiment, when two pairs of traits are combined in a hybrid, segregation of one pair of characters is independent of other pair of characters. Justify this by representing schematically the two gene inheritance.</b></p>	5	79





46 (a)	<b>Differentiate between euryhaline animals and stenohaline animals</b>			
	<b>Euryhaline organisms</b>	<b>Stenohaline organisms</b>	2	222
	The organisms which can tolerate wide range of salinity	The organisms which can tolerate narrow range of salinity		
b)	<b>Describe sexual deceit in <i>Ophrys</i>.</b>			
	<p><b>Sexual deceit:</b>          Many orchids have modified their flowers to attract the right pollinator insect and ensure guaranteed pollination by it.</p> <ul style="list-style-type: none"> <li>• Mediterranean orchid <i>Ophrys</i> employs 'sexual deceit'.</li> <li>• One petal of the flower resembles the female bee in colour and markings.</li> </ul> <p>The male bee is attracted thinking that it is a female, and 'pseudocopulates' with the flower. As a result, the pollination occurs. But bee does not get any benefits. This is a good example for co-evolution.</p>		3	238
47	<p><b>List out the measures used for prevention and control of alcohol and drugs abuse among adolescents.</b></p> <p><b>Prevention and control of drug / alcohol abuse:</b></p> <ol style="list-style-type: none"> <li>1. Avoid undue peer pressure.</li> <li>2. Education and counselling.</li> <li>3. Seeking help from parents and peers.</li> <li>4. Looking for danger signs.</li> <li>5. Seeking professional and medical help.</li> </ol>		5x1=5	162-163

TIME: 3 HOUR 15 MINUTES

MAX. MARKS: 70

**General instructions:**

1. The question paper contains four parts A, B, C and D. Part-A consists of I & II and Part-D consists of V&VI.
2. All the parts are compulsory.
3. Draw diagrams wherever necessary, unlabelled diagrams or illustrations do not attract any marks.

**PART – A****I. Select the correct alternative from the choices given:****15 x 1 = 15**

1. The plant which flowers only once in its life time is  
a) Date palm      b) Sea-grass      c) Bamboo      d) Papaya
  2. If the chromosome number in the gametes of potato plant is 24, then what is the chromosome number in the meiocytes?  
a) 12      b) 48      c) 72      d) 96
  3. Transfer of pollen grains from the anther to stigma of another flower of the same plant is known as  
a) Autogamy      b) Xenogamy      c) Cleistogamy      d) Geitonogamy
  4. Hormone secreted by ovary in the later phase of pregnancy is  
a) Relaxin      b) Progesterone      c) Oxytocin      d) Oestrogen
  5. Infertility due to very low sperm counts in the ejaculates can be corrected by  
a) *In Vitro* fertilisation      b) Artificial insemination      c) GIFT      d) ZIFT
  6. An example for sex linked recessive disease is  
a) Haemophilia      b) Sickle-cell anaemia      c) Phenylketonuria      d) Thalassemia
  7. The initiator codon during protein synthesis is  
a) UUU      b) UAA      c) AUG      d) UAG
  8. According to Hugo deVries single step large mutation is called  
a) Genetic drift      b) Gene flow      c) Founder effect      d) Saltation
  9. A widely used diagnostic test for AIDS is  
a) Widal test      b) ELISA      c) Biopsy      d) MRI
  10. Cowpea variety bred for resistance to bacterial blight disease through hybridisation and selection named as  
a) Pusa Swarnim      b) Pusa Sadabahar      c) Pusa Komal      d) Pusa Shubhra
  11. An animal produced through interspecific hybridisation is  
a) Hisardale      b) Mule      c) Rosie      d) Leghorn
  12. Streptokinase is produced by  
a) *Staphylococcus*      b) *Streptococcus*      c) *Streptomyces*      d) *Aspergillus*
  13. In the exponential growth equation  $N_t = N_0 e^{rt}$ , 'e' denotes  
a) Intrinsic rate of natural increase      b) Extrinsic rate of natural increase  
c) Carrying capacity      d) The base of natural logarithms
  14. Water-soluble inorganic nutrients go down into the soil horizon and get precipitated as unavailable salt in decomposition process is known as  
a) Fragmentation      b) Mineralisation      c) Metabolism      d) Leaching
  15. According to Euro II norms, the sulphur content in the petrol should be  
a) 150 ppm      b) 350 ppm      c) 450 ppm      d) 100 ppm
- II. Fill in the blanks by choosing the appropriate word/words from those given in the bracket. 5 x 1 =5**  
(Biofortification, Diapause, Reforestation, Acrosome, LNG-20)
16. The anterior portion of the sperm head is covered by a cap like structure called -----.
  17. An example for hormone releasing IUD is -----.
  18. Breeding crops with higher levels of vitamins and minerals or higher proteins and healthier fats is known as-----.

19. Under unfavourable conditions many zooplankton species in lakes and ponds are known to enter a stage of suspended development called -----.
20. The process of restoring a forest that once existed but removed at some point of time in the past is called-----.

**PART – B**

**III. Answer any FIVE of the following questions in 3-5 sentences each, wherever applicable: 5 x 2 = 10**

21. Mention the events of menstrual cycle.
22. List the features of Down's syndrome affected individuals.
23. Write the applications of DNA finger printing.
24. Define the following: i) Totipotency (1M) ii) Micro-propagation (1M)
25. Mention the two main steps of downstream processing.
26. List the uses of genetically modified plants.
27. Differentiate between hydrarch succession and xerarch succession.
28. Mention 'The Evil Quartet' of biodiversity loss.

**PART – C**

**IV. Answer any FIVE of the following questions in 40-80 words each, wherever applicable: 5 x 3 =15**

29. Distinguish between external fertilisation and internal fertilisation.
30. Draw a neat labelled diagram of a typical anatropous ovule.
31. i) List the features of ideal contraceptives. (2M) ii) Define amniocentesis. (1M)
32. Schematically represent one gene inheritance in pea plant.
33. DNA is more stable compared to RNA. Justify.
34. Schematically represent the stages in the life cycle of *Plasmodium*.
35. Describe the steps involved in human insulin production using genetic engineering.
36. Sketch the pyramid of numbers in a grassland ecosystem.

**PART – D**

**V. Answer any FOUR of the following questions in 200-250 words each, wherever applicable: 3x 5 =15**

37. i) Briefly describe the double fertilisation in angiosperms. (3M)  
ii) How do you distinguish albuminous seeds from non-albuminous seeds? (2M)
38. Draw a neat labelled diagram of sectional view of mammary gland.
39. i) Explain haplodiploid method of sex determination in honey bee. (3M)  
ii) Differentiate between pleiotropy and polygenic inheritance. (2M)
40. List the salient features of the double helix structure of DNA.
41. i) What are analogous organs? Give two examples. (3M)  
ii) Mention the two key concepts of Darwinian Theory of evolution. (2M)
42. i) What is an allergy? Name the two chemicals released by mast cells in the body during allergy. (3M)  
ii) What are auto-immune diseases? Give an example. (2M)

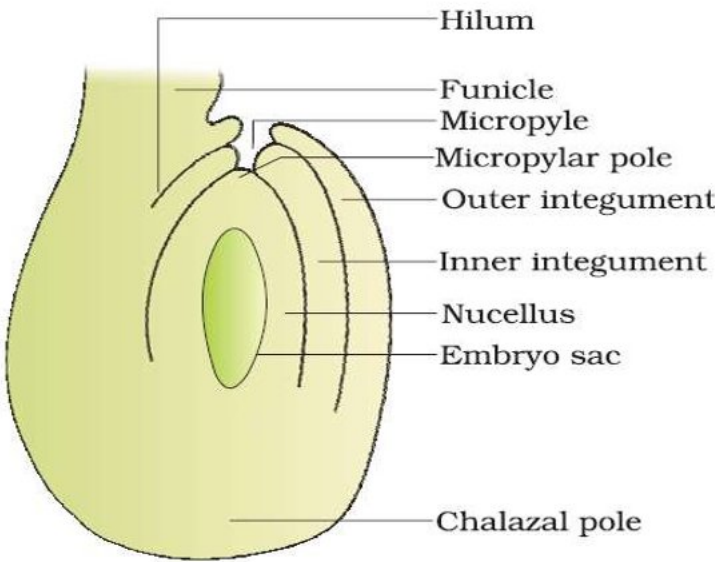
**VI. Answer any TWO of the following questions in 200-250 words each, wherever applicable: 2x 5= 10**

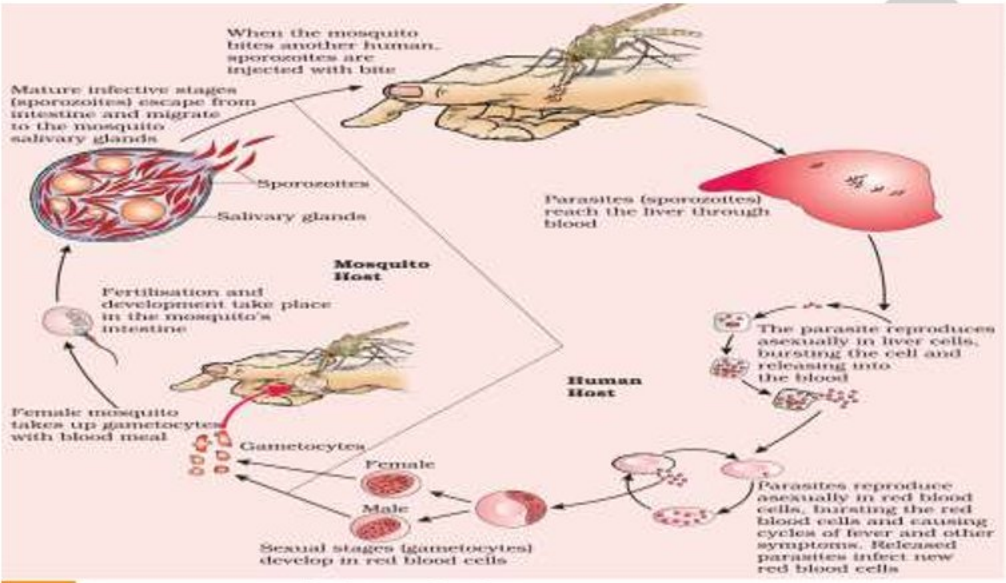
43. Explain the measures required for successful Bee-keeping.
44. "In agriculture, there is method of controlling pests that relies on natural predation rather than introduced chemicals". Substantiate the statement with examples.
45. i) "There are several ways to introduce alien DNA into host cells". Substantiate it by giving any three methods of introducing recombinant DNA into host cells. (3M)  
ii) Origin of replication and selectable markers are key features of cloning vectors. Give reasons. (2M)
46. Write the name of interspecific interactions for the following examples.
- i) Tiger and deer
  - ii) Abingdon tortoise and goats
  - iii) Ticks on dogs
  - iv) Cattle egret and grazing cattle
  - v) Fig and wasp species
47. Define eutrophication. Describe the process of natural eutrophication.

QUE NO.	ANSWERS/ VALUE POINTS	MA RKS	ANSWER REFERENCE PAGE NO
<b>PART – A</b>			
<b>I. Select the correct alternative from the choices given:</b>		<b>15 x 1 = 15</b>	
1	<b>The plant which flowers only once in its life time is</b> a) Date palm      b) Sea-grass      c) Bamboo      d) Papaya <b>Ans: c) Bamboo</b>	1	9
2	<b>If the chromosome number in the gametes of potato plant is 24, then what is the chromosome number in the meiocytes?</b> a) 12      b) 48      c) 72      d) 96 <b>Ans: b) 48</b>	1	13
3	<b>Transfer of pollen grains from the anther to stigma of another flower of the same plant is known as</b> a) Autogamy      b) Xenogamy      c) Cleistogamy      d) Geitonogamy <b>Ans: d) Geitonogamy</b>	1	28
4	<b>Hormone secreted by ovary in the later phase of pregnancy is</b> a) Relaxin      b) Progesterone      c) Oxytocin      d) Estrogen <b>Ans: a) Relaxin</b>	1	53
5	<b>Infertility due to very low sperm counts in the ejaculates can be corrected by</b> a) <i>In Vitro</i> fertilisation      b) Artificial insemination      c) GIFT      d) ZIFT <b>Ans: b) Artificial insemination</b>	1	64
6	<b>An example for sex linked recessive disease is</b> a) Haemophilia      b) Sickle-cell anaemia      c) Phenylketonuria      d) Thalassemia <b>Ans: a) Haemophilia</b>	1	89
7	<b>The initiator codon during protein synthesis is</b> a) UUU      b) UAA      c) AUG      d) UAG <b>Ans: c) AUG</b>	1	112
8	<b>According to Hugo deVries single step large mutation is called</b> a) Genetic drift      b) Gene flow      c) Founder effect      d) Saltation <b>Ans: d) Saltation</b>	1	135
9	<b>A widely used diagnostic test for AIDS is</b> a) Widal test      b) ELISA      c) Biopsy      d) MRI <b>Ans: b) ELISA</b>	1	156
10	<b>Cowpea variety bred for resistance to bacterial blight disease through hybridisation and selection named as</b> a) Pusa Swarnim      b) Pusa Sadabahar      c) Pusa Komal      d) Pusa Shubhra <b>Ans: c) Pusa Komal</b>	1	174
11	<b>An animal produced through interspecific hybridisation is</b> a) Hisardale      b) Mule      c) Rosie      d) Leghorn <b>Ans: b) Mule</b>	1	168
12	<b>Streptokinase is produced by</b> a) <i>Staphylococcus</i> b) <i>Streptococcus</i> c) <i>Streptomyces</i> d) <i>Aspergillus</i> <b>Ans: b) Streptococcus</b>	1	183
13	<b>In the exponential growth equation <math>N_t = N_0 e^{rt}</math>, 'e' denotes</b> a) Intrinsic rate of natural increase      b) Extrinsic rate of natural increase	1	230

	c) Carrying capacity d) The base of natural logarithms <b>Ans: d) The base of natural logarithms</b>		
14	<b>Water-soluble inorganic nutrients go down into the soil horizon and get precipitated as unavailable salt in decomposition process is known as</b> a) Fragmentation b) Mineralisation c) Metabolism d) Leaching <b>Ans: d) Leaching</b>	1	243
15	<b>According to Euro II norms, the sulphur content in the petrol should be</b> a) 150 ppm b) 350 ppm c) 450 ppm d) 100 ppm <b>Ans: a) 150 ppm</b>	1	273
<b>II. Fill in the blanks by choosing the appropriate word/words from those given in the bracket. 5 x 1 = 5</b> (Biofortification, Diapause, Reforestation, Acrosome, LNG-20)			
16	<b>The anterior portion of the sperm head is covered by a cap like structure called</b> -----. <b>Ans: Acrosome</b>	1	48
17	<b>An example for hormone releasing IUD is</b> -----. <b>Ans: LNG-20</b>	1	60
18	<b>Breeding crops with higher levels of vitamins and minerals or higher proteins and healthier fats is known as</b> -----. <b>Ans: Biofortification</b>	1	176
19	<b>Under unfavourable conditions many zooplankton species in lakes and ponds are known to enter a stage of suspended development called</b> -----. <b>Ans: Diapause</b>	1	225
20	<b>The process of restoring a forest that once existed but removed at some point of time in the past is called</b> -----. <b>Ans: Reforestation</b>	1	284
<b>PART – B</b>			
<b>III. Answer any FIVE of the following questions in 3-5 sentences each, wherever applicable: 5 x 2 = 10</b>			
21	<b>Mention the events of menstrual cycle.</b> <b>Ans: Events of menstrual cycle are</b> 1. Menstrual phase 2. Follicular phase 3. Ovulatory phase 4. Luteal phase (4 x ½M)	2	50-51
22	<b>List the features of Down's syndrome affected individuals.</b> <b>Ans: Features of Down's syndrome affected individuals are</b> 1. Short statured with small round head 2. Furrowed tongue and partially open mouth 3. Palm is broad with characteristic palm crease 4. Physical, psychomotor and mental development is retarded (4 x ½M)	2	91
23	<b>Write the applications of DNA finger printing.</b> <b>Ans:</b> 1. DNA finger printing is used to identify the criminals connected with murder and rape (Forensic investigation). 2. It is used to solve the cases of disputed parentage and relationship. i.e. maternity and paternity testing. 3. It helps in determining population and genetic diversity. 4. It solves disputes arising from baby switch over in hospitals. (Any two)	2	122-123

24	<p><b>Define the following:</b></p> <p><b>i) Totipotency</b> Ans: Capacity to generate a whole plant from any cell or explant is called totipotency.</p> <p><b>ii) Micro-propagation</b> Ans: Method of producing thousands of plants through tissue culture is called micro-propagation.</p>	1  1	177				
25	<p><b>Mention the two main steps of downstream processing.</b> Two main steps of downstream processing are separation and purification.</p>	2	205				
26	<p><b>List the uses of genetically modified plants.</b> Ans: Genetic modification has (i) made crops more tolerant to abiotic stresses (cold, drought, salt, heat). (ii) reduced reliance on chemical pesticides (pest-resistant crops). (iii) helped to reduce post-harvest losses. (iv) increased efficiency of mineral usage by plants (this prevents early exhaustion of fertility of soil). (v) enhanced nutritional value of food, e.g., Vitamin 'A' enriched rice. (Any four uses) (4 x ½M)</p>	2	208				
27	<table border="1"> <thead> <tr> <th>Hydrarch succession</th> <th>Xerarch succession</th> </tr> </thead> <tbody> <tr> <td>Takes place in wetter areas and successional series progress from hydric to mesic conditions.</td> <td>Takes place in dry areas and successional series progress from xeric to mesic conditions.</td> </tr> </tbody> </table>	Hydrarch succession	Xerarch succession	Takes place in wetter areas and successional series progress from hydric to mesic conditions.	Takes place in dry areas and successional series progress from xeric to mesic conditions.	2	251
Hydrarch succession	Xerarch succession						
Takes place in wetter areas and successional series progress from hydric to mesic conditions.	Takes place in dry areas and successional series progress from xeric to mesic conditions.						
28	<p><b>Mention 'The Evil Quartet' of biodiversity loss.</b> Ans: 'The Evil Quartet' of biodiversity loss are 1. Habitat loss and fragmentation 2. Over-exploitation 3. Alien species invasions 4. Co-extinctions (4 x ½M)</p>	2	264-265				
<b>PART – C</b>							
<b>IV. Answer any THREE of the following questions in 40-80 words each, wherever applicable: 3 x 3 =15</b>							
29	<p><b>Distinguish between external fertilisation and internal fertilisation.</b></p> <table border="1"> <thead> <tr> <th>External fertilisation</th> <th>Internal fertilisation</th> </tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> <li>Fusion of male and female gametes take place outside the female body i.e in water medium.</li> <li>Chance of fertilization is less.</li> <li>Both organisms produce more number of gametes.</li> <li>Offsprings are more vulnerable to the predators.</li> <li>Ex: Bony fishes and amphibians</li> </ul> </td> <td> <ul style="list-style-type: none"> <li>Fusion of male and female gametes take place inside the female body.</li> <li>Chance of fertilization is More.</li> <li>Male individuals produce more number of sperms, female produces one or few eggs / ovum.</li> <li>Offsprings are highly protected.</li> <li>Ex: Higher animals like reptiles birds and mammals.</li> </ul> </td> </tr> </tbody> </table> <p style="text-align: center;">(Any three differences)</p>	External fertilisation	Internal fertilisation	<ul style="list-style-type: none"> <li>Fusion of male and female gametes take place outside the female body i.e in water medium.</li> <li>Chance of fertilization is less.</li> <li>Both organisms produce more number of gametes.</li> <li>Offsprings are more vulnerable to the predators.</li> <li>Ex: Bony fishes and amphibians</li> </ul>	<ul style="list-style-type: none"> <li>Fusion of male and female gametes take place inside the female body.</li> <li>Chance of fertilization is More.</li> <li>Male individuals produce more number of sperms, female produces one or few eggs / ovum.</li> <li>Offsprings are highly protected.</li> <li>Ex: Higher animals like reptiles birds and mammals.</li> </ul>	3	9
External fertilisation	Internal fertilisation						
<ul style="list-style-type: none"> <li>Fusion of male and female gametes take place outside the female body i.e in water medium.</li> <li>Chance of fertilization is less.</li> <li>Both organisms produce more number of gametes.</li> <li>Offsprings are more vulnerable to the predators.</li> <li>Ex: Bony fishes and amphibians</li> </ul>	<ul style="list-style-type: none"> <li>Fusion of male and female gametes take place inside the female body.</li> <li>Chance of fertilization is More.</li> <li>Male individuals produce more number of sperms, female produces one or few eggs / ovum.</li> <li>Offsprings are highly protected.</li> <li>Ex: Higher animals like reptiles birds and mammals.</li> </ul>						

<p>30</p>	<p><b>Draw a neat labelled diagram of a typical anatropous ovule.</b>          Ans:</p>  <p>(Any six labelling) (6 x ½M)</p>	<p>3</p>	<p>25</p>									
<p>31</p>	<p><b>i) List the features of ideal contraceptives.</b>          Ans:</p> <ul style="list-style-type: none"> <li>• User-friendly</li> <li>• Easily available</li> <li>• Effective and reversible with no or least side-effects</li> <li>• It also should in no way interfere with the sexual drive, desire and/or the sexual act of the user (1/2 Marks each)</li> </ul> <p><b>ii) Define amniocentesis.</b>          Ans:          Fetal sex determination test based on the chromosomal pattern in the amniotic fluid surrounding the developing embryo is called amniocentesis.</p>	<p>2</p> <p>1</p>	<p>58-59</p>									
<p>32</p>	<p><b>Schematically represent one gene inheritance in pea plant.</b>          Ans:</p> <p>Parents:          Phenotype: Female Tall TT Male Dwarf tt          Genotype:</p> <p>Gametes: T t</p> <p>F<sub>1</sub> hybrid:          Phenotype: Female Tall Tt Male Tall Tt          Genotype:</p> <p>Gametes: T t T t</p> <table border="1" data-bbox="470 1780 1125 1982"> <tr> <td>♀ \ ♂</td> <td>T</td> <td>t</td> </tr> <tr> <td>T</td> <td>TT Tall</td> <td>Tt Tall</td> </tr> <tr> <td>t</td> <td>Tt Tall</td> <td>tt Dwarf</td> </tr> </table> <p>Phenotypic ratio= Tall : Dwarf = 3 : 1          Genotypic ratio= TT : Tt : tt = 1 : 2 : 1</p>	♀ \ ♂	T	t	T	TT Tall	Tt Tall	t	Tt Tall	tt Dwarf	<p>1</p> <p>1</p> <p>1</p>	<p>73</p>
♀ \ ♂	T	t										
T	TT Tall	Tt Tall										
t	Tt Tall	tt Dwarf										

33	<p><b>DNA is more stable compared to RNA. Justify.</b></p> <p>Ans:</p> <ul style="list-style-type: none"> <li>• DNA is more stable because even if the two complementary strands are separated by factors like heat, they can come together again. But RNA is more labile and easily degradable because of an additional –OH, group in the 2' position of ribose in every nucleotide.</li> <li>• DNA does not act as enzyme. But some RNA molecule acts as enzyme and therefore, is more reactive.</li> <li>• DNA has Thymine which gives additional stability. RNA molecule does not have Thymine.</li> <li>• Both DNA and RNA can mutate. But RNA mutates at a faster rate as it is less stable.</li> </ul> <p>(Any three)</p>	3	103
34	<p><b>Schematically represent the stages in the life cycle of <i>Plasmodium</i>.</b></p> <p>Ans:</p> 	3	148
35	<p><b>Describe the steps involved in human insulin production using genetic engineering.</b></p> <p>Ans:</p> <ul style="list-style-type: none"> <li>• In mammals, including humans, insulin is synthesized as a prohormone (like a pro-enzyme, the pro-hormone also needs to be processed before it becomes a fully mature and functional hormone) which contains an extra stretch called the <b>C peptide</b>. This C peptide is not present in the mature insulin and is removed during maturation into insulin.</li> <li>• In 1983, Eli Lilly an American company prepared two DNA sequences corresponding to A and B, chains of human insulin and introduced them in plasmids of <i>E. coli</i> to produce insulin chains.</li> <li>• Chains A and B were produced separately, extracted and combined by creating disulfide bonds to form human insulin.</li> </ul>	3	211



36	<p><b>Sketch the pyramid of numbers in a grassland ecosystem.</b></p> <p>Ans:</p> <table border="1"> <thead> <tr> <th>Trophic level</th> <th>Number of individuals</th> </tr> </thead> <tbody> <tr> <td>TC (Tertiary consumer)</td> <td>3</td> </tr> <tr> <td>SC (Secondary consumer)</td> <td>3,54,000</td> </tr> <tr> <td>PC (Primary consumer)</td> <td>708, 000</td> </tr> <tr> <td>PP (Primary producer)</td> <td>5,842,000</td> </tr> </tbody> </table>	Trophic level	Number of individuals	TC (Tertiary consumer)	3	SC (Secondary consumer)	3,54,000	PC (Primary consumer)	708, 000	PP (Primary producer)	5,842,000	3	248
Trophic level	Number of individuals												
TC (Tertiary consumer)	3												
SC (Secondary consumer)	3,54,000												
PC (Primary consumer)	708, 000												
PP (Primary producer)	5,842,000												

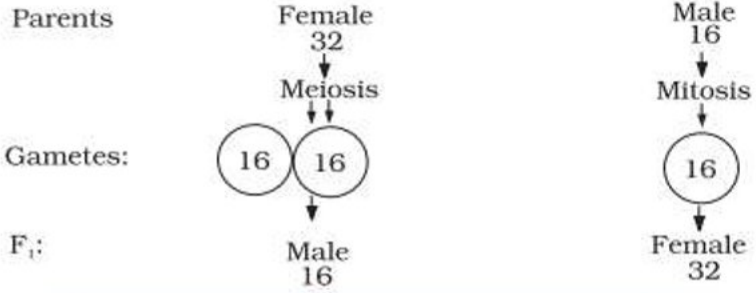
**PART- D**

**V. Answer any THREE of the following questions in 200-250 words each, wherever applicable: 3x5= 15**

37	<p><b>i) Briefly describe the double fertilisation in angiosperms.</b></p> <p>Ans:</p> <p>Two types of fusions, syngamy and triple fusion take place in an embryo sac the phenomenon is termed double fertilization. It is a unique event occurring in flowering plants.</p> <p><b>Syngamy:</b> Fusion of one of the male gametes released from the pollen tube with the egg cell that result in the formation of a diploid zygote.</p> <p><b>Triple fusion:</b> Fusion of another male gamete with the two polar nuclei located in the central cell to produce a triploid <b>primary endosperm nucleus (PEN)</b>. As this involves the fusion of three haploid nuclei it is termed <b>triple fusion</b>.</p> <p><b>ii) How do you distinguish albuminous seeds from non-albuminous seeds?</b></p> <p>Ans:</p> <table border="1"> <thead> <tr> <th>Albuminous seeds</th> <th>Non-albuminous seeds</th> </tr> </thead> <tbody> <tr> <td>They retain part of the endosperm as it is not completely used up during embryo development. Eg. Wheat, Maize, Castor</td> <td>They have no residual endosperm as it is completely consumed during embryo development. Eg. Pea, groundnut</td> </tr> </tbody> </table>	Albuminous seeds	Non-albuminous seeds	They retain part of the endosperm as it is not completely used up during embryo development. Eg. Wheat, Maize, Castor	They have no residual endosperm as it is completely consumed during embryo development. Eg. Pea, groundnut	1 1 1	34
Albuminous seeds	Non-albuminous seeds						
They retain part of the endosperm as it is not completely used up during embryo development. Eg. Wheat, Maize, Castor	They have no residual endosperm as it is completely consumed during embryo development. Eg. Pea, groundnut						
		2	36				

38	<p><b>Draw a neat labelled diagram of sectional view of mammary gland.</b></p> <p>Ans:</p> <p align="right">( ½ mark for each labelling) (10 x ½ M)</p>	5	46
----	---	---	----

39	<p><b>i) Explain haplodiploid method of sex determination in honey bee.</b></p> <p>Ans:</p> <ul style="list-style-type: none"> <li>Sex determination in Honey bee is depends on number of sets of chromosome, this method is called Haplodiploid method of sex determination.</li> </ul>		
----	--	--	--

	<ul style="list-style-type: none"> <li>Chromosome number in Diploid Honey bee is <math>2n=32</math>.</li> <li>Offsprings formed by the union of sperm (<math>n=16</math>) and egg (<math>n=16</math>) develops into female [Queen/Worker]. Later queen lays haploid eggs by meiosis.</li> <li>Unfertile eggs develop into male honey bee by parthenogenesis.</li> </ul>  <p><b>Figure 5.13 Sex determination in honey bee</b></p> <p>ii) <b>Differentiate between pleiotropy and polygenic inheritance</b>  Ans:  <b>Pleiotropy:</b> The phenomena of single gene exhibiting multiple phenotypic expression is called <b>pleiotropy</b>.  <b>Polygenic Inheritance:</b> The inheritance of a trait controlled by three or more genes is called <b>polygenic inheritance</b>.</p>	1 1 1 2	87 83
40	<p><b>List the salient features of the double helix structure of DNA.</b>  Ans:  Salient features of double helix model of DNA:</p> <ol style="list-style-type: none"> <li>The double helical structure of DNA was proposed by the J. D. Watson and F. Crick.</li> <li>DNA molecule consists of two polynucleotide chains helically coiled around each other to form double helix structure.</li> <li>Backbone of the DNA is made up of repeating units of deoxyribose and phosphate.</li> <li>At the center base pairs are present, Adenine is always bound to Thymine by two hydrogen bonds (<math>A=T</math>) while guanine is always bound to Cytosine by three hydrogen bonds (<math>G=C</math>).</li> <li>Thus both strands are said to be complementary. Base pairing is always complementary, (<math>A=T</math>, <math>G=C</math>). Because of this is the sequence of bases on one strand is known, the sequence of bases on the other strand can be predicted.</li> <li>There are 10 base pairs in one helix, arranged at a distance of 0.34 nm or 3.4 <math>\text{A}^\circ</math>, length of one helix is 3.4 nm or 34 <math>\text{A}^\circ</math>. Thus, one full turn of the helix is of 360<math>^\circ</math> has 10 base pairs.</li> <li>Both the strands are arranged in are anti-parallel to each other. It means one chain is in 3' <math>\rightarrow</math>5' direction and another one in 5' <math>\rightarrow</math>3' direction.</li> </ol> <p>(Any five features)</p>	5	97
41	<p>i) <b>What are analogous organs? Give two examples.</b>  Ans: These are the organs which are anatomically not similar but which perform similar functions.  Examples: 1. Eyes of octopus and mammals  2. Flippers of penguins and dolphins  3. Root of sweet potato and stem of potato  4. Wings of butterflies and birds</p> <p>(Any two examples)</p>	1 2	130-131

	<p><b>ii) Mention the two key concepts of Darwinian Theory of evolution.</b>          Ans: Branching descent and natural selection are the two key concepts of Darwinian Theory of Evolution.</p>	2	134
42	<p><b>i) What is an allergy? Name the two chemicals released by mast cells in the body during allergy.</b>          Ans:          The exaggerated response of the immune system to certain antigens present in the environment is called allergy.</p> <p>Chemicals like histamine and serotonin are released from the mast cells during allergy.</p> <p><b>ii) What are auto-immune diseases? Give an example.</b>          Ans:          Sometimes, due to genetic and other unknown reasons, the body attacks self-cells and this results in damage to body are called auto-immune diseases.          Ex: Rheumatoid arthritis.</p>	1  2  1  1	152
<b>VI. Answer any TWO of the following questions in 200-250 words each, wherever applicable: 2 x 5= 10</b>			
43	<p><b>Explain the measures required for successful Bee-keeping.</b>          Ans:          The following points are important for successful bee-keeping:</p> <ol style="list-style-type: none"> <li>1. Knowledge of the nature and habits of bees</li> <li>2. Selection of suitable location for keeping the beehives</li> <li>3. Catching and hiving of swarms (group of bees)</li> <li>4. Management of beehives during different seasons, and</li> <li>5. Handling and collection of honey and of beeswax.</li> </ol>	1 1 1 1 1	169
44	<p><b>“In agriculture, there is method of controlling pests that relies on natural predation rather than introduced chemicals”. Substantiate the statement with examples.</b>          Ans:          Biocontrol or biological control refers to the use of biological methods for controlling plant diseases and pests. This method relies on natural predation rather than introduced chemicals.          Examples are:</p> <ol style="list-style-type: none"> <li>1. The Ladybird beetle is used to control aphids.</li> <li>2. Dragonflies are used to control mosquitoes.</li> <li>3. Dried spores of <i>Bacillus thuringiensis</i> are used to kill Butterfly caterpillars.</li> <li>4. <i>Trichoderma</i> species, a free living fungus in the roots of many plants is used to control several plant pathogens.</li> <li>5. Baculoviruses belongs to the genus <i>Nucleopolyhedrovirus</i> are species specific and are used as biocontrol agents against insects and other arthropods.</li> </ol> <p style="text-align: right;">(Any four examples)</p>	1       4	186-187

45	<p>i) <b>“There are several ways to introduce alien DNA into host cells”. Substantiate it by giving any three methods of introducing recombinant DNA into host cells.</b></p> <p>Ans: Different methods of introducing alien DNA into host cells are:</p> <ol style="list-style-type: none"> <li>1. Recombinant DNA and the bacterial cells are incubated in ice, followed by placing them briefly at 42°C (heat shock) and then putting them back in ice.</li> <li>2. By <b>microinjection</b> the recombinant DNA directly injected into the nucleus of the animal cell.</li> <li>3. Plant cells are bombarded with high velocity micro-particles of gold or tungsten coated with DNA in a method known as <b>biolistics</b> or <b>gene gun</b>.</li> <li>4. <b>Disarmed pathogen vectors</b>, which when allowed infecting the cell, transfer the recombinant DNA into the host. (Any three methods)</li> </ol> <p>ii) <b>Origin of replication and selectable markers are key features of cloning vectors. Give reasons.</b></p> <p>Ans: Origin of replication (<i>Ori</i>) is a sequence from where replication starts and any piece of DNA when linked to this sequence can be made to replicate within host cells. Selectable marker helps in identifying and eliminating non-transformants and selectively permitting the growth of the transformants.</p>	3	201           2 199
46	<p><b>Write the name of interspecific interactions for the following examples.</b></p> <ol style="list-style-type: none"> <li>i) Tiger and deer Ans: Predation</li> <li>ii) Abingdon tortoise and goats Ans: Competition</li> <li>iii) Ticks on dogs Ans: Parasitism</li> <li>iv) Cattle egret and grazing cattle Ans: Commensalism</li> <li>v) Fig and wasp species Ans: Mutualism</li> </ol>	1  1  1  1  1	233-237
47	<p><b>Define eutrophication. Describe the process of natural eutrophication.</b></p> <p>Eutrophication is the natural aging of a lake by biological enrichment of its water. The process of natural eutrophication includes following steps:</p> <ol style="list-style-type: none"> <li>1. In a young lake the water is cold and clear, supporting little life. With time, streams draining into the lake introduce nutrients such as nitrogen and phosphorus, which encourage the growth of aquatic organisms.</li> <li>2. As the lake’s fertility increases, plant and animal life burgeons, and organic remains begin to be deposited on the lake bottom.</li> <li>3. Over the centuries, as silt and organic debris pile up, the lake grows shallower and warmer, with warm-water organisms supplanting those that thrive in a cold environment.</li> <li>4. Marsh plants take root in the shallows and begin to fill in the original lake basin. Eventually, the lake gives way to large masses of floating plants (bog), finally converting into land.</li> </ol>	1  1  1  1  1	276

TIME: 3 HOUR 15 MINUTES

MAX. MARKS: 70

General instructions:

1. The question paper contains four parts A, B, C and D. Part-A consists of three sections I&II, and Part-D consists of two sections, Section-V & VI.
2. All the parts are compulsory.
3. Draw diagrams wherever necessary, unlabelled diagrams or illustrations do not attract any marks.

**PART – A****I. Select the correct alternative from the choices given:****15 x 1 = 5****1. The asexual reproductive structures of *Penicillium* are**

- a) Conidia
- b) Bud
- c) Gemmule
- d) Zoospores

**2. Which among the following has 23 chromosomes?**

- a) Spermatogonia
- b) Zygote
- c) Secondary oocyte
- d) Oogonia

**3. The most accepted line of descent in human evolution is**

- a) *Australopithecus* → *Ramapithecus* → *Homo sapiens* → *Homo habilis*
- b) *Homo erectus* → *Homo habilis* → *Homo sapiens*
- c) *Ramapithecus* → *Homo habilis* → *Homo erectus* → *Homo sapiens*
- d) *Australopithecus* → *Ramapithecus* → *Homo erectus* → *Homo habilis* → *Homo sapiens*

**4. The method of directly injecting sperm into ovum in assisted reproductive technologies is called**

- a) GIFT
- b) ZIFT
- c) ICSI
- d) ET

**5. Person having genotype  $I^A I^B$  would show the blood group as AB. This is because of**

- a) Pleiotropy
- b) Co-dominance
- c) Segregation
- d) Incomplete dominance

**6. The heterochromatin is,**

- a) More densely packed and darkly stained chromatin
- b) Loosely packed and lightly stained chromatin
- c) Loosely packed and darkly stained chromatin
- d) More densely packed and lightly stained chromatin

**7. Virus free plants in tissue culture can be obtained by,**

- a) Embryo culture
- b) Meristem culture
- c) Pollen culture
- d) Anther culture

**8. Leghorn is an improved breed of**

- a) Cattle
- b) Chicken
- c) Fish
- d) Bee

9. The large holes in "swiss cheese" due to the production of large amount of CO<sub>2</sub> from a bacterium called

- a) *Propionibacterium sharmanii*
- b) *Aspergillus niger*
- c) *Trichoderma polysporum*
- d) *Monascus purpureus*

10. The Cry gene that controls corn borer is

- a) Cry IAb
- b) Cry IAc
- c) Cry IIAb
- d) Cry IIAC

11. Rosie, the first transgenic cow produced which human protein in its milk?

- A) Alpha antitrypsin
- b) Insulin
- c) Alpha lactalbumin
- d) Interferon

12. The population interaction in which one species is harmed whereas the other unaffected is,

- a) Parasitism
- b) Commensalism
- c) Mutualism
- d) Amensalism

13. In bacteria, fungi and lower plants, various kinds of thick-walled spores are formed which help them to survive unfavourable conditions. This phenomenon is called

- a) Hibernation
- b) Suspend
- c) Aestivation
- d) Dormancy

14. World summit for sustainable development in 2002 was held at

- a) Montreal
- b) Rio de Janeiro
- c) Johannesburg
- d) Kyoto

15. The thickness of ozone is measured in terms of

- a) Decibels
- b) Dobson units
- c) Decilitre
- d) Decimetre

II. Fill in the blanks by choosing the appropriate word/words from those given in the bracket. 5 x 1 = 5

(Cirrhosis, Endometrium, Camouflage, Chlamydiosis, Syngamy)

16. In sexual reproduction, ..... results in the formation of diploid zygote.

17. The glandular layer of uterus that undergoes cyclic changes during menstrual cycle is .....

18. An example for sexually transmitted infection or venereal disease is.....

19. The damage caused to liver due to chronic use of drugs and alcohol is called.....

20. Some species of insects and frogs are cryptically coloured to avoid being detected easily by predators. This is called.....

#### PART – B

III. Answer any FIVE of the following questions in 3-5 sentences each, wherever applicable: 5 x 2 = 10

21. What are cleistogamous flowers? Name a plant showing this.

22. Why is apple called a false fruit? Which part(s) of the flower forms the fruit?

23. Write the function each for the following:

- i) Seminal vesicle
- ii) Acrosome of human sperm

24. Sketch and label a transcription unit.
25. How is outcrossing different from cross breeding?
26. Secondary treatment of the sewage is also called Biological treatment. Justify this statement.
27. Explain the role of the enzyme *EcoRI* in recombinant DNA technology.
28. Schematically represent an ideal pyramid of energy.

#### PART – C

#### IV. Answer any THREE of the following questions in 40-80 words each, wherever applicable: 5 x 3 =15

29. Define: i) Juvenile phase, ii) Reproductive phase iii) Senescence phase
30. A mother of one-year old daughter wanted to space her second child. Her doctor suggested CuT. Explain its contraceptive actions.
31. Answer the following:
  - i) List the two methodologies which were involved in human genome project.
  - ii) Expand 'SNP'.
32. List any two symptoms of ascariasis. How does a healthy person acquire this infection?
33. Sketch and label a typical biogas plant.
34. Write the functions of adenosine deaminase enzyme. State the cause of ADA deficiency in humans. Mention a possible permanent cure for ADA deficiency patient.
35. What is ecological succession? List the types based on nature and habitat.
36. What are biodiversity hotspots? Mention any two biodiversity hotspots of India.

#### PART- D

#### V. Answer any TWO of the following questions in 200-250 words each, wherever applicable: 2 x 5 = 20

37. i) Sketch and label human sperm. ii) Write the schematic representation of oogenesis.
38. Explain different outbreeding devices.
39. Schematically represent the steps involved in two gene inheritance.
40. Answer the following:
  - i) Explain the mechanism of sex determination in birds. (3)
  - ii) List the advantages of *Drosophila* in genetic experiments. (2)
41. Define translation. Explain the steps.
42. What is adaptive radiation? Describe two examples.

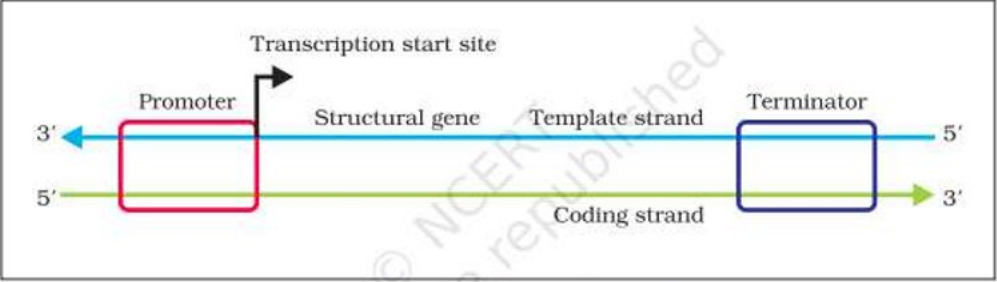
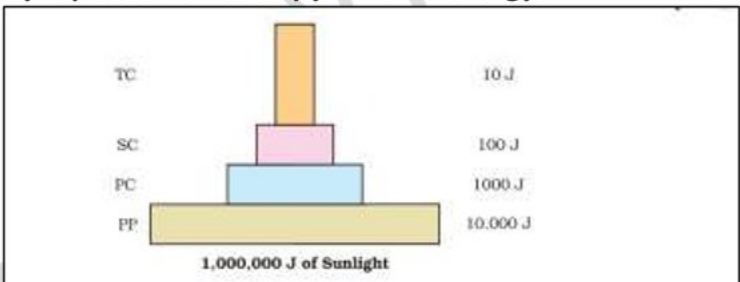
#### VI. Answer any TWO of the following questions in 200-250 words each, wherever applicable: 2 x 5= 10

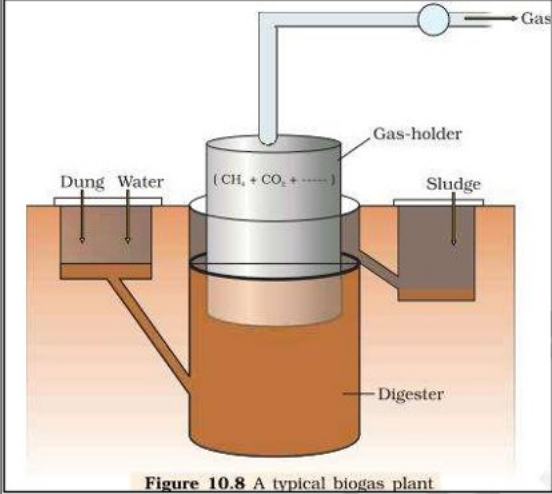
43. Name the following:
  - i) Secondary lymphoid organ in humans.
  - ii) The plant from which Coca alkaloid or cocaine is obtained.
  - iii) Protein secreted by virus infected cells.
  - iv) The infection caused due to Rhinovirus.
  - v) Toxin released from ruptured RBC's during malaria.
44. Expand MOET. Explain the procedure of this technology in cattle improvement.
45. Explain the process by which a bacterial cell can be made 'competent'. Why is it essential to make bacterial cells 'competent' in recombinant DNA technology?
46. Answer the following:
  - i) Apart from being part of the food chain, predators play other important roles. Mention any three such roles. (3)
  - ii) Differentiate between Hibernation and Aestivation (2)
47. Explain:
  - i) Advantages of using CNG over Diesel. (3)
  - ii) Effects of UV-B on humans. (2)

-----

QUE NO.	ANSWERS/ VALUE POINTS	MARKS	ANSWER REFERENCE PAGE NO
<b>PART – A</b>			
<b>I. Select the correct alternative from the choices given:</b>		<b>15 x 1 = 5</b>	
1	a) Conidia	1	7
2	c) Secondary oocyte	1	48
3	c) <i>Ramapithecus</i> → <i>Homo habilis</i> → <i>Homo erectus</i> → <i>Homo sapiens</i>	1	140-141
4	c) ICSI	1	64
5	b) Co-dominance	1	77
6	a) More densely packed and darkly stained chromatin	1	100
7	b) Meristem culture	1	177
8	b) Chicken	1	167
9	a) <i>Propionibacterium sharmanii</i>	1	181
10	a) <i>Cry IAb</i>	1	209
11	c) Alfa Lactalbumin	1	213
12	d) Amensalism	1	233
13	b) Suspend	1	225
14	c) Johannesburg	1	267
15	b) Dobson units	1	272
<b>II. Fill in the blanks by choosing the appropriate word/words from those given in the bracket. 5 x 1 = 5</b>			
16	Syngamy	1	14
17	Endometrium	1	50
18	Chlamydiosis	1	63
19	Cirrhosis	1	162
20	Camouflage	1	233
<b>PART – B</b>			
<b>III. Answer any FIVE of the following questions in 3-5 sentences each, wherever applicable: 5 x 2 = 10</b>			
21	<b>What are cleistogamous flowers? Name a plant showing this.</b> Cleistogamous flowers which do not open at all. <i>Viola</i> (common pansy), <i>Oxalis</i> and <i>Commelina</i> (ANY ONE)	1 1	28
22	<b>Why is apple called a false fruit? Which part(s) of the flower forms the fruit?</b> In apple, the parts other than ovary also contributes to the formation of fruits. Such fruits are called false fruits. Thalamus.	1 1	36
23	<b>Write the function each for the following:</b> <b>i) Seminal vesicle</b> <b>ii) Acrosome of human sperm</b> Seminal vesicle -Secretion helps in lubrication of the penis. Acrosome of human sperm -The acrosome is filled with enzymes that help fertilisation of the ovum.	1 1	44



24	<p><b>Sketch and label a transcription unit.</b></p>  <p><b>Figure 6.9</b> Schematic structure of a transcription unit</p>	2	108
25	<p><b>How is outcrossing different from cross breeding?</b>          Outcrossing is the practice of mating animals of the same breed that have no common ancestors on either side of their pedigree up to 4-6 generations whereas cross breeding is the cross of one with superior females of another breed.</p>	2	168
26	<p><b>Secondary treatment of the sewage is also called Biological treatment. Justify this statement.</b>          The secondary treatment allows vigorous growth of useful aerobic microbes into flocs.          The growth of microbes consumes the major part of the organic matter in the effluent.          The sludge is pumped into anaerobic sludge digester where other bacteria grow anaerobically, and digest the bacteria and fungi in the sludge. (Any two)</p>	2	184
27	<p><b>Explain the role of the enzyme <i>EcoRI</i> in recombinant DNA technology.</b>  <i>EcoRI</i> is a restriction endonuclease, inspects length of DNA and recognises specific palindromic nucleotide sequences. It then binds with DNA and cuts each of the two strands of double helix at specific points.</p>	2	196
28	<p><b>Schematically represent an ideal pyramid of energy.</b></p>  <p><b>Figure 14.4 (d)</b> An ideal pyramid of energy. Observe that primary producers convert only 1% of the energy in the sunlight available to them into NPP</p>	2	249
<b>PART – C</b>			
<b>IV. Answer any THREE of the following questions in 40-80 words each, wherever applicable: 5 x 3 =15</b>			
29	<p><b>Define (i) Juvenile phase, (ii) Reproductive phase (iii) Senescence phase</b>          i) Juvenile phase: It is the pre-reproductive phase in which all organisms require a certain growth and maturity in the life before reproducing sexually.          ii) Reproductive phase is the phase in the life cycle, where an organism possesses all the capacity and potential to reproduce sexually. It is the end of juvenile phase or vegetative phase.          iii) The end of reproductive phase where concomitant changes in the body like slowing of metabolism, etc., occurs and it is called senescence phase.</p>	3	9
30	<p><b>A mother of one-year old daughter wanted to space her second child. Her doctor suggested CuT. Explain its contraceptive actions.</b>          They are Copper releasing IUDs          •Increase phagocytosis of sperm within the uterus.</p>	3	60

	<ul style="list-style-type: none"> <li>•Cu ion released i) suppresses sperm motility and ii) fertilizing capacity of sperm.</li> </ul>		
31	<p><b>Answer the following:</b></p> <p><b>i) List the two methodologies which were involved in human genome project.</b></p> <p><b>ii) Expand 'SNP'.</b></p> <p>The two methodologies involved in human genome project are:</p> <p><b>1. Expressed Sequence Tags:</b> Identifying all the genes that are expressed as RNA</p> <p><b>2. Sequence Annotation:</b> Sequencing the whole set of genome coding or non-coding sequences and later assigning different region with functions.</p> <p><b>SNP=Single Polynucleotide Polymorphism</b></p>	2          1	119-120
32	<p><b>List any two symptoms of ascariasis. How does a healthy person acquire this infection?</b></p> <p>Symptoms of ascariasis: Internal bleeding, muscular pain, anaemia, blockage of intestinal passage.</p> <p>A healthy person can acquire this infection by intake of water, vegetables/fruits/foods contaminated with eggs of the parasite</p>	2    1	149
33	<p><b>Sketch and label a typical biogas plant.</b></p>  <p><b>Figure 10.8 A typical biogas plant</b></p>	3	186
34	<p><b>Write the functions of adenosine deaminase enzyme. State the cause of ADA deficiency in humans. Mention a possible permanent cure for ADA deficiency patient.</b></p> <p>Adenosine deaminase enzyme is responsible for the proper functioning of the immune system.</p> <p>ADA deficiency is caused by deletion of gene for adenosine deaminase.</p> <p>A possible permanent cure would be gene therapy, if it is detected at early embryonic stage</p>	3	211
35	<p><b>What is ecological succession? List the types based on nature and habitat.</b></p> <p>The sequential, gradual and predictable changes in the species composition in an area are called succession or ecological succession.</p> <p>Primary succession</p> <p>Secondary succession</p>	1  2	250
36	<p><b>What are biodiversity hotspots? Mention any two biodiversity hotspots of India.</b></p> <p>These are regions of high levels of species richness and high degree of endemism.</p> <p>In India, the three hotspots are Western Ghats and Sri Lanka, Indo–Burma and Himalaya.</p>	1   2	266

PART- D

V. Answer any TWO of the following questions in 200-250 words each, wherever applicable: 2 x 5 = 20

- i) Sketch and label human sperm. (3)  
 ii) Write the schematic representation of oogenesis. (2)

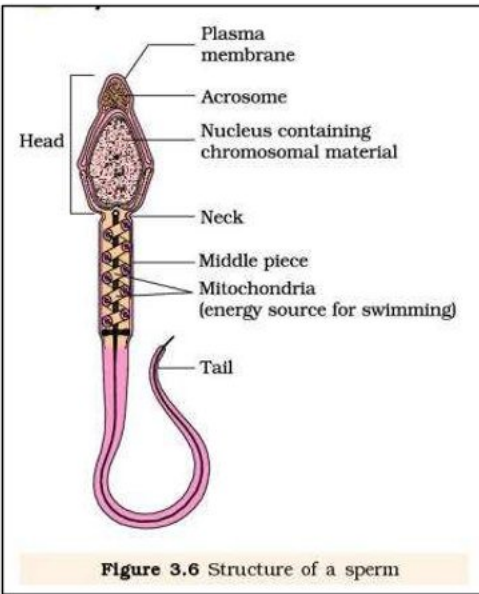
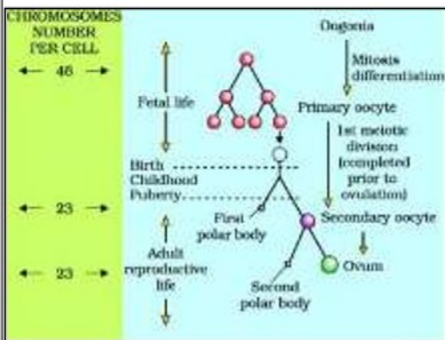


Figure 3.6 Structure of a sperm



3

48-49

2

**Explain different outbreeding devices.**

These are the devices or mechanisms that developed to discourage the self-pollination and to encourage the cross pollination.

- 1) In some plants pollen release and stigma receptivity is not synchronized. Either the pollen is release before the stigma becomes receptive or stigma becomes receptive much before the release of pollen grains.
- 2) In some plants, the anther and stigma are placed at different positions so that the pollen cannot come in contact with the stigma of the same flower.
- 3) Self-incompatibility: - This device is to prevent self-incompatibility. It is the genetic mechanism which prevents its own pollen grain from fertilizing the ovules by inhibiting pollen germination or pollen tube growth in the pistil.
- 4) Unisexuality: This device is to prevent unisexuality. If both male and female flowers are present on the same plant, self-pollination is prevented but cross pollination is not prevented.
- 5) In papaya, male and female flowers are present in different plants, where each plant is called male or female (dioecy). This condition prevents both autogamy and geitonogamy.

5

31

Schematically represent the steps involved in two gene inheritance.

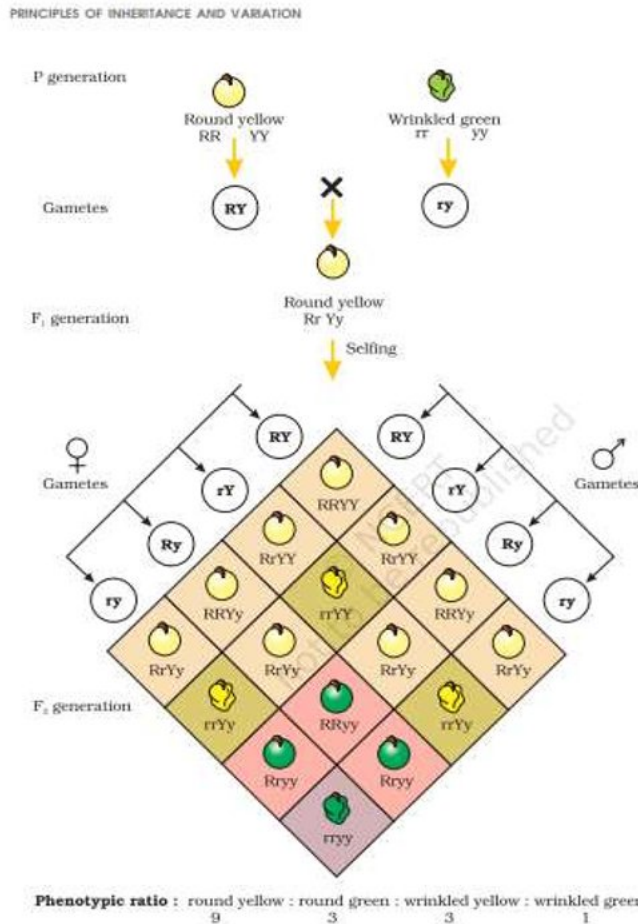


Figure 5.7 Results of a dihybrid cross where the two parents differed in two pairs of contrasting traits: seed colour and seed shape

39

5

79

Answer the following:

- i) Explain the mechanism of sex determination in birds. (3)
- ii) List the advantages of *Drosophila* in genetic experiments. (2)

i) Sex determination in birds:

1. Female birds have two different sex chromosomes designated as Z and W.
2. Male birds have two similar sex chromosomes and called ZZ.
3. Such type of sex determination is called female heterogamety and male homogamety.

ii) the advantages of *Drosophila* in genetic experiments: -

1. It can be grown on simple synthetic medium in the laboratory.
2. They complete their life cycle in about two weeks.
3. A single mating could produce a large number of progeny flies.
4. Clear differentiation of male and female flies
5. Have many types of hereditary variations that can be seen with low power microscopes.

40

5

85-87

Define translation. Explain the steps.

Translation is the process of synthesis of protein from amino acids, sequence and order of amino acids being defined by sequence of bases in mRNA. Amino acids are joined by peptide bonds.

(i) **Initiation:** In prokaryotes, initiation requires the large and small ribosome subunits, the mRNA, initiation tRNA and three initiation factors (IFs). Activation of amino acid: Amino acids become activated by binding with aminoacyl tRNA synthetase enzyme in the presence of ATP.

41

1

4

114-115

	<p><b>(ii) Transfer of amino acid to tRNA:</b> The AA–AMP–Enzyme complex formed reacts with specific tRNA to form aminoacyl-tRNA complex. AA–AMP–Enzyme complex <math>R + + t t N A A A - R N A A M P + E n z y m e</math>.</p> <p>The cap region of mRNA binds to the smaller subunit of ribosome. The ribosome has two sites, A-site and P-site. The smaller subunit first binds to the initiator mRNA and then binds to the larger subunit so that initiation codon (AUG) lies on the P-site. The initiation tRNA, i.e., methionyl tRNA then binds to the P-site.</p> <p><b>(ii) Elongation of polypeptide chain:</b> Another charged aminoacyl tRNA complex binds to the A-site of the ribosome at the second codon. A peptide bond is formed between carboxyl group (—COOH) of amino acid at P-site and amino group (—NH) of amino acid at A-site by the enzyme peptidyl transferase. The ribosome slides over mRNA from codon to codon in the 5'→3' direction i.e. called <b>translocation</b>.</p> <p><b>(iv) Termination of polypeptide:</b> When the A-site of ribosome reaches a termination codon, which does not code for any amino acid, no charged tRNA binds to the A-site. Dissociation of polypeptide from ribosome takes place, which is catalysed by a 'release factor'. There are three termination codons namely UGA, UAG and UAA</p>		
42	<p><b>What is adaptive radiation? Describe two examples.</b> It is the process of evolution of different species in a given geographical area starting from a common point and radiating to other geographical areas (habitats). Examples:</p> <p><b>(i) Darwin's finches:</b> - Darwin travelled to Galapagos Islands and observed many varieties of finches on the same island. All varieties had evolved from original seed-eating finches. With alteration in beaks some became insectivorous and some vegetarian.</p> <p><b>(ii) Placental animals in Australia:</b> - A variety of placental mammals have evolved which appear similar to a corresponding marsupial. eg. Placental wolf and Tasmanian wolf.</p>	1 4	132-133
<b>VI. Answer any TWO of the following questions in 200-250 words each, wherever applicable: 2 x 5= 10</b>			
43	<p><b>Name the following:</b></p> <p>i) Secondary lymphoid organ in humans. ii) The plant from which Coca alkaloid or cocaine is obtained. iii) Protein secreted by virus infected cells. iv) The infection caused due to Rhinovirus. v) Toxin released from ruptured RBC's during malaria.</p> <p>i) spleen, lymph nodes, tonsils, Peyer's patches of small intestine and appendix ii) <i>Erythroxylum coca</i> (coca plant). iii) Interferon iv) Common Cold v) Haemozoin</p>	5	154, 159, 151, 147, 148
44	<p><b>Expand MOET. Explain the procedure of this technology in cattle improvement.</b> <b>MOET</b> stands for Multiple Ovulation Embryo Transfer Technology. It is a programme for herd improvement in animals like cattle, sheep, rabbits, buffaloes, mares, etc. High milk-yielding breeds of female have been bred with high quality (lean meat with less lipid) meat-yielding bulls to increase herd size in lesser time.</p>	5	168-169

	<p><b>Procedure:</b></p> <p>(i) A cow is administered hormones with FSH-like activity to induce follicular maturation and super-ovulation.</p> <p>(ii) The cow produces 6–8 eggs instead of one egg produced normally.</p> <p>(iii) It is now, either mated with an elite bull or artificial insemination is carried out.</p> <p>(iv) When the fertilised eggs attain 8–32 cells stage, they are non-surgically removed and transferred to a surrogate mother. The genetic mother can now be again super-ovulated.</p>		
45	<p><b>Explain the process by which a bacterial cell can be made 'competent'. Why is it essential to make bacterial cells 'competent' in recombinant DNA technology?</b></p> <p>In order to force bacteria to take-up the plasmid, the bacterial cells must first be made 'competent' to take up DNA.</p> <p>The bacterial cell is treated with divalent cations such as calcium. This increases the efficiency of DNA up take by the bacteria.</p> <p>Recombinant DNA and the bacterial cells are incubated in ice, followed by placing them briefly at 42°C (heat shock) and then putting them back in ice. DNA is a hydrophilic molecule; it cannot pass through cell membranes. Therefore, the bacteria should be made competent to accept the DNA molecules.</p>	5	200-201
46	<p><b>Write a note on:</b></p> <p><b>i) Apart from being part of the food chain, predators play other important roles. Mention any three such roles. (3)</b></p> <p><b>ii) Hibernation and Aestivation (2)</b></p> <p>(i) They keep prey population under control.</p> <p>(ii) Predators also help in maintaining species diversity in a community by reducing the intensity of competition among competing prey species.</p> <p>(iii) Predator acts as a passage for transfer of energy across trophic level.</p> <p>The condition of passing the winter in a resting or dormant condition is called hibernation (Bears going into hibernation during winter). Aestivation is the state of inactivity during hot dry summer (Some snails and fish go into aestivation).</p>	3	233 225
47	<p><b>Explain:</b></p> <p><b>i) Advantages of using CNG over Diesel (3)</b></p> <p><b>ii) Effects of UV-B on humans. (2)</b></p> <p>Advantages of CNG over diesel/petrol:</p> <p>(a) CNG burns most efficiently without leaving any unburnt remnant behind.</p> <p>(b) CNG is cheaper than petrol or diesel.</p> <p>(c) CNG cannot be siphoned off by thieves and adulterated like petrol or diesel.</p> <p>UV-B is absorbed by human eye and at high dose, it causes inflammation of cornea. This is called snow-blindness cataract</p>	3	273 283

TIME: 3 HOUR 15 MINUTES

MAX. MARKS: 70

**General instructions:**

1. The question paper contains four parts A, B, C and D. Part-A consists of two sections I, &II, and Part-D consists of two sections, Section-V &VI.
2. All the parts are compulsory.
3. Draw diagrams wherever necessary, unlabeled diagrams or illustrations do not attract any marks.

**PART A****I. Select the correct alternative from the choices given below:****15 x 1 = 15**

1. Menstrual cycle is seen in.....  
a) Apes                      b) Cows                      c) Rats                      d) Deer
2. Pollination which brings genetically different types of pollen grains to the stigma is .....  
a) Geitonogamy              b) Xenogamy              c) Autogamy              d) Cleistogamy
3. The release of sperms from the seminiferous tubules is called .....  
a) Spermiation              b) Spermatogenesis  
c) Spermiogenesis              d) Spermioteliolysis
4. Sterilisation procedure in the human females is called .....  
a) Tubectomy              b) Vasectomy              c) Vaults                      d) Progestasert
5. Phenylketonuria is an example for .....  
a) Polygenic inheritance              b) Pleiotrophy  
c) Codominance              d) 21<sup>st</sup> trisomy
6. Distance between two consecutive base pairs in a DNA double helix is approximately ...  
a) 3.4nm                      b) 34nm                      c) 0.34nm                      d) 0.034nm
7. Fossils discovered in Java in 1891 revealed .....  
a) *Homo sapiens*              b) *Homo erectus*              c) *Homo habilis*              d) *Australopithecines*
8. Polymorpho nuclear leucocytes is an example for .....  
a) Physical barriers              b) Physiological barriers  
c) Cellular barriers              d) Cytokine barriers
9. *Hisardale* is an example for .....  
a) Cross breeding              b) Out breeding  
c) Out crossing              d) Interspecific hybridisation
10. An example for edible marine fish is .....  
a) *Catla*                      b) *Rohu*                      c) Carp                      d) *Hilsa*
11. *Monascus purpureus* is used to extract .....  
a) Streptokinase              b) Lipase                      c) Statins                      d) Cyclosporin A
12. The process where the organisms try to maintain the constancy of its internal environment is...  
a) Homeostasis              b) Conform                      c) Migrate                      d) Suspend
13. An animal example for recent extinction in Australia is .....  
a) Thylacine                      b) Stellar's sea cow              c) Dodo                      d) Quagga
14. Natural aging of a lake by nutrient enrichment of its water is....  
a) Stratification              b) Eutrophication              c) Biomagnification              d) Algal bloom
15. The entire sequence of communities that successively change in a given area is called ...  
a) Sere                      b) Climax community              c) Pioneer species              d) Standing state

**II. Fill in the blanks by choosing the appropriate word/words from those given below: 5 x 1 = 5**

(Pseudocopulation, MTP, Snow blindness, Stem, Zygote)

16. High dose of UV-B causes .....
17. The vital link that ensures continuity of species between organisms of one generation and the next is .....

18. The ..... cells of the inner cell mass of embryo have the potency to give rise to all the tissues and organs.
19. Intentional termination of pregnancy before full term is .....
20. Mediterranean orchid that exhibits sexual deceit undergoes .....

**PART B**

**III. Answer any FIVE of the following questions in 3-5 sentences each, wherever applicable:**  
**5 x 2 = 10**

21. Acrosome and middle piece of the sperm are very essential for fertilisation. Justify.
22. What is a test cross? Write its significance.
23. Codon AUG has dual function. Substantiate.
24. With reference to tissue culture, define (i) Somaclones (ii) Somatic hybrid
25. Mention two core techniques that enables the birth of modern biotechnology.
26. List any two modern methods of disease diagnosis.
27. Distinguish between standing crop and standing state.
28. Write a note on Co-extinction.

**PART C**

**IV. Answer any FIVE of the following questions in about 40-80 words each, wherever applicable:**  
**5 x 3 = 15**

29. a. Distinguish between monoecious and dioecious plants. 2  
 b. Why heterogametes are called so? 1
30. Draw a labelled diagram of T.S. of a young anther.
31. Schematically represent the incomplete dominance in *Antirrhinum*.
32. Mention the simple principles to be followed to be free of STD's.
33. RNA polymerases in eukaryotes show division of labour. Substantiate.
34. Write the schematic representation of replication of retrovirus.
35. Explain any three benefits of creating transgenic animals.
36. Schematically represent carbon cycle.

**PART D**

**V. Answer any THREE of the following questions in about 200-250 words each, wherever applicable:**  
**3 x 5 = 15**

37. Explain the pollen-pistil interaction.
38. a. Draw sectional view of seminiferous tubule. 3  
 b. Schematically represent spermatogenesis. 2
39. Explain Morgan's experiment on *Drosophila* to show relation between linkage and recombination.
40. Mention any five salient features of Human genome.
41. Give reasons:  
 i. *Sonalika* and *Kalyan Sona* varieties are superior to the traditional varieties of wheat. 2  
 ii. Biofortified maize and wheat are considered as nutritionally improved. 2  
 iii. *Methylophilus methylotrophus* is a preferred microorganism in the production of single cell proteins. 1
42. Explain the role of microbes as biofertilisers.

**VI. Answer any TWO of the following questions in about 200-250 words each, wherever applicable:**  
**2 x 5 = 10**

43. Define (i) Saltation (ii) Gene pool (iii) Founder effect (iv) Divergent evolution (v) Genetic drift
44. Explain prevention and control measures of alcohol and drug abuse.
45. Give reasons:  
 i. Alien DNA is linked with 'ori' site of a vector in gene cloning.  
 ii. Restriction enzymes are called 'molecular scissors'.  
 iii. DNA ligase are called "molecular glues".  
 iv. Gel electrophoresis is an important technique in recombinant DNA technology.



v. Bacterial cells are made 'competent' by treating them with specific concentration of a divalent cation like calcium.

46. i. Differentiate between Emigration and Immigration. 2

ii. Write a note on altitude sickness. 3

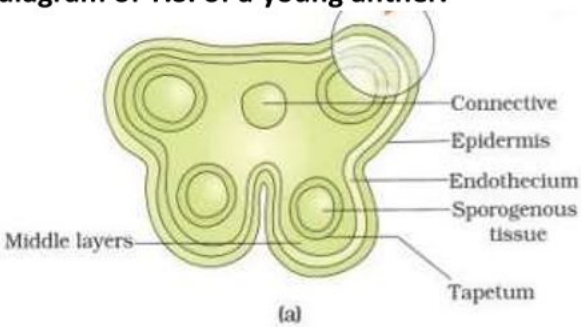
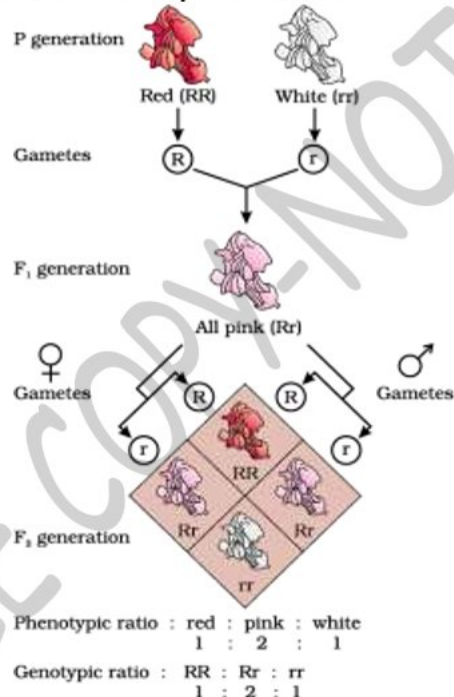
47. Explain organic farming technique practised by Ramesh Chandra Dagar. Mention its advantages.

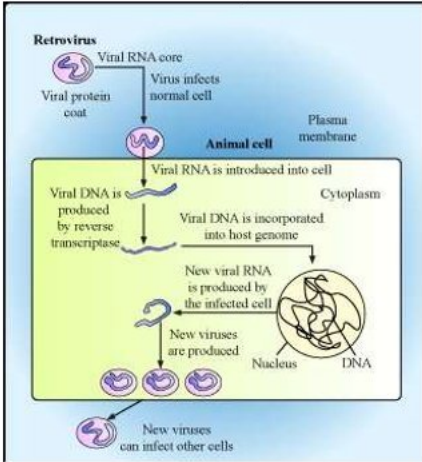
\*\*\*\*\*

SAMPLE COPY-NOT FOR SALE

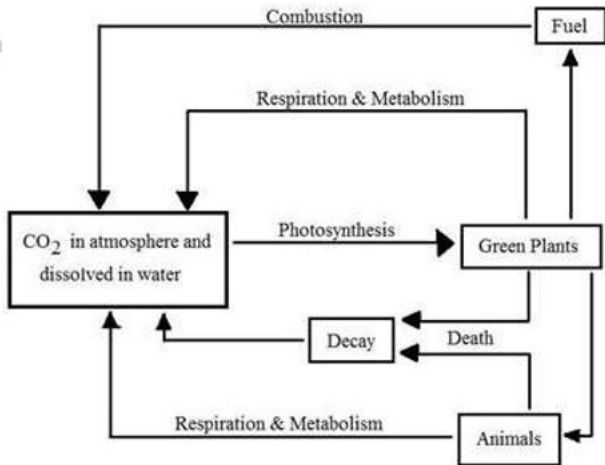
QUE NO.	ANSWERS/ VALUE POINTS	MARKS	ANSWER REFERENCE PAGE NO
<b>PART – A</b>			
<b>I. Select the correct alternative from the choices given:</b>		<b>15 x 1 = 5</b>	
1	<b>Menstrual cycle is seen in.....</b> a) Apes	1	09
2	<b>Pollination which brings genetically different types of pollen grains to the stigma is ....</b> b) Xenogamy	1	28
3	<b>The release of sperms from the seminiferous tubules is called .....</b> a) Spermiation	1	47
4	<b>Sterilisation procedure in the females is called .....</b> a) Tubectomy	1	62
5	<b>Phenylketonuria is an example for .....</b> b) Pleiotrophy	1	85/288
6	<b>Distance between two consecutive base pairs in a DNA double helix is approximately ....</b> c) 0.34nm	1	99
7	<b>Fossils discovered in Java in 1891 revealed .....</b> b) <i>Homo erectus</i>	1	140
8	<b>Polymorpho nuclear leucocytes is an example for .....</b> c) Cellular barriers	1	150
9	<b><i>Hisardale</i> is an example for .....</b> a) Cross breeding	1	168
10	<b>An example for edible marine fish is .....</b> d) <i>Hilsa</i>	1	169
11	<b><i>Monascus purpureus</i> is used to extract .....</b> c) Statins	1	183
12	<b>The process where the organisms try to maintain the constancy of its internal environment is .....</b> a) Homeostasis	1	223
13	<b>An animal example for recent extinction in Australia is .....</b> a) Thylacine	1	263
14	<b>Natural aging of a lake by nutrient enrichment of its water is....</b> b) Eutrophication	1	276
15	<b>The entire sequence of communities that successively change in a given area is called ...</b> a) Sere	1	250
<b>II. Fill in the blanks by choosing the appropriate word/words from those given in the bracket. 5 x 1 = 5</b>			
16	<b>High dose of UV-B causes .....</b> Snow blindness	1	283
17	<b>The vital link that ensures continuity of species between organisms of one generation and the next is .....</b> Zygote	1	15
18	<b>The ..... cells of the inner cell mass of embryo have the potency to give rise to all the tissues and organs.</b>	1	

	Stem		54
19	<b>Intentional termination of pregnancy before full term is .....</b> MTP	1	62
20	<b>Mediterranean orchid that exhibits sexual deceit undergoes .....</b> Pseudocopulation	1	238
<b>PART – B</b>			
<b>III. Answer any FIVE of the following questions in 3-5 sentences each, wherever applicable: 5 x 2 = 10</b>			
21	<b>Acrosome and middle piece of the sperm are very essential for fertilization. Justify.</b> Acrosome is filled with enzymes that help fertilization of the ovum. Middle piece possesses numerous mitochondria, which produce energy for the movement of tail that facilitate sperm motility essential for fertilization.	1 1	48
22	<b>What is a test cross? Write its significance.</b> A cross between a dominant phenotype and the recessive parent is called a test cross. To determine the genotype of the dominant phenotype.	1 1	74
23	<b>Codon AUG has dual function. Substantiate.</b> AUG codes for Methionine (met) and It also acts as initiator codon.	1 1	112
24	<b>With reference to tissue culture, define</b> <b>(i) Somaclones (ii) Somatic hybrid</b> Somaclones are plants grown by micropropagation which are genetically identical to the original plant from which they were grown. Isolated protoplasts from two different varieties of plants – each having a desirable character – can be fused to get hybrid protoplasts, which can be further grown to form a new plant. These hybrids are called somatic hybrids.	1 1	177
25	<b>Mention two core techniques that enables the birth of modern biotechnology.</b> (i) Genetic engineering (ii) Bioprocess engineering	1 1	193 194
26	<b>List any two modern methods of disease diagnosis.</b> Recombinant DNA technology, Polymerase Chain Reaction (PCR), Enzyme Linked Immuno-sorbent Assay (ELISA) (Any 2)	2	212
27	<b>Distinguish between standing crop and standing state.</b> Each trophic level has a certain mass of living material at a particular time called as the standing crop. The amount of nutrients, such as carbon, nitrogen, phosphorus, calcium, etc., present in the soil at any given time, is referred to as the standing state.	1 1	247 253
28	<b>Write a note on Co-extinction.</b> When a species becomes extinct, the plant and animal species associated with it in an obligatory way also become extinct. When a host fish species becomes extinct, its unique assemblage of parasites also meets the same fate. Or In the case of a coevolved plant-pollinator mutualism where extinction of one invariably leads to the extinction of the other.	1 1	265
<b>PART – C</b>			
<b>IV. Answer any THREE of the following questions in 40-80 words each, wherever applicable: 3 x 3 =15</b>			
29	<b>a. Distinguish between monoecious and dioecious plants.</b> <b>b. Why heterogametes are called so?</b>		

	<p>a. Plants having both male and female reproductive structures in the same plant (bisexual) are monoecious plants.</p> <p>Plants having male and female reproductive structures on different plants (unisexual) are dioecious plants.</p> <p>b. In a majority of sexually reproducing organisms the gametes produced are of two morphologically distinct types (heterogametes).</p>	1 1 1	11
30	<p><b>Draw a labelled diagram of T.S. of a young anther.</b></p>  <p>(½x6=3)</p>	3	22
31	<p><b>Schematically represent the incomplete dominance in <i>Antirrhinum</i>.</b></p>  <p>Phenotypic ratio : red : pink : white 1 : 2 : 1</p> <p>Genotypic ratio : RR : Rr : rr 1 : 2 : 1</p>	1  1  1	76
32	<p><b>Mention the simple principles to be followed to be free of STD's.</b></p> <p>(i) Avoid sex with unknown partners/multiple partners.</p> <p>(ii) Always try to use condoms during coitus.</p> <p>(iii) In case of doubt, one should go to a qualified doctor for early detection and get complete treatment if diagnosed with infection.</p>	1 1 1	63
33	<p><b>RNA polymerases in eukaryotes show division of labour. Substantiate.</b></p> <p>In eukaryotes,</p> <p>RNA polymerase I transcribes rRNAs (28S, 18S, and 5.8S).</p> <p>RNA polymerase III is responsible for transcription of tRNA, 5srRNA, and snRNAs (small nuclear RNAs).</p> <p>RNA polymerase II transcribes precursor of mRNA, the heterogeneous nuclear RNA (hnRNA).</p>	1 1 1	110-111

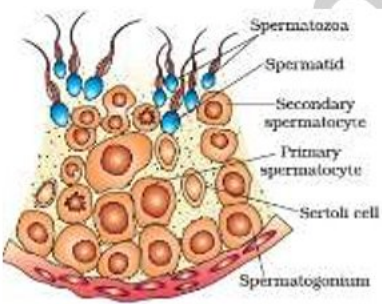
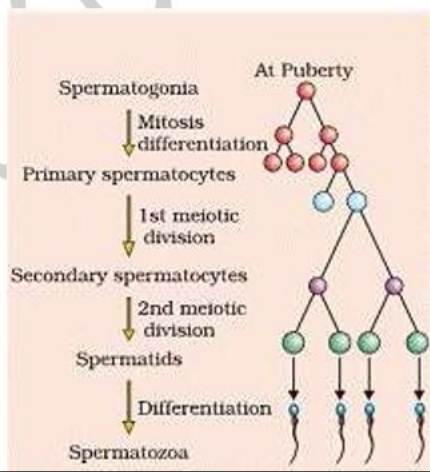
34	<p><b>Write the schematic representation of replication of retrovirus.</b></p> 	3	155
----	--	---	-----

35	<p><b>Explain any three benefits of creating transgenic animals.</b></p> <p>(i) <b>Normal physiology and development:</b> Transgenic animals can be specifically designed to allow the study of how genes are regulated, and how they affect the normal functions of the body and its development.</p> <p>(ii) <b>Study of disease:</b> Many transgenic animals are designed to increase our understanding of how genes contribute to the development of disease. These are specially made to serve as models for human diseases so that investigation of new treatments for diseases is made possible.</p> <p>(iii) <b>Biological products:</b> Transgenic animals that produce useful biological products can be created by the introduction of the portion of DNA (or genes) which codes for a particular product such as human protein (α-1-antitrypsin) used to treat emphysema. Similar attempts are being made for treatment of phenylketonuria (PKU) and cystic fibrosis. In 1997, the first transgenic cow, Rosie, produced human protein-enriched milk (2.4 grams per litre). The milk contained the human alpha-lactalbumin and was nutritionally a more balanced product for human babies than natural cow-milk.</p> <p>(iv) <b>Vaccine safety:</b> Transgenic mice are being developed for use in testing the safety of vaccines before they are used on humans.</p> <p>(v) <b>Chemical safety testing:</b> This is known as toxicity/safety testing. The procedure is the same as that used for testing toxicity of drugs. Transgenic animals are made that carry genes which make them more sensitive to toxic substances than non-transgenic animals.</p> <p>(Any 3)</p>	3	212-213
----	--	---	---------

36	<p><b>Schematically represent carbon cycle.</b></p>  <p style="text-align: center;"><u>Basic Carbon Cycle Flow Diagram</u></p>	3	255
----	--	---	-----

**PART- D**

**V. Answer any TWO of the following questions in 200-250 words each, wherever applicable: 2 x 5 = 20**

<p>37</p>	<p><b>Explain the pollen-pistil interaction.</b></p> <p>Pollination does not guarantee the transfer of the right type of pollen (compatible pollen of the same species as the stigma). Often, pollen of the wrong type, either from other species or from the same plant (if it is self-incompatible), also land on the stigma.</p> <p>The pistil has the ability to recognize the pollen, whether it is of the right type (compatible) or of the wrong type (incompatible).</p> <p>If it is of the right type, the pistil accepts the pollen and promotes post-pollination events that leads to fertilization. If the pollen is of the wrong type, the pistil rejects the pollen by preventing pollen germination on the stigma or the pollen tube growth in the style.</p> <p>The ability of the pistil to recognize the pollen followed by its acceptance or rejection is mediated by chemical components of the pollen interacting with those of the pistil.</p> <p>Following compatible pollination, the pollen grain germinates on the stigma to produce a pollen tube through one of the germ pores. The contents of the pollen grain move into the pollen tube. Pollen tube grows through the tissues of the stigma and style and reaches the ovary.</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>31-33</p>
<p>38</p>	<p><b>a. Draw sectional view of seminiferous tubule.</b></p> <p><b>b. Schematically represent spermatogenesis.</b></p> <p>a.</p>  <p>b.</p> 	<p>3</p> <p>2</p>	<p>47</p> <p>49</p>
<p>39</p>	<p><b>Explain Morgan's experiment on <i>Drosophila</i> to show relation between linkage and recombination.</b></p> <p>Morgan carried out several dihybrid crosses in <i>Drosophila</i> to study genes that were sex-linked. The crosses were similar to the dihybrid crosses carried out by Mendel in peas. For example, Morgan hybridized yellow-bodied, white-eyed females to brown-bodied, red-eyed males and intercrossed their F1 progeny. He observed that the two genes did not segregate independently of each other and the F2 ratio deviated very significantly from the 9:3:3:1 ratio.</p>	<p>5</p>	<p>83</p>

	<p>Morgan and his group knew that the genes were located on the X chromosome and saw quickly that when the two genes in a dihybrid cross were situated on the same chromosome, the proportion of parental gene combinations were much higher than the non-parental type.</p> <p>Morgan attributed this due to the physical association or linkage of the two genes and coined the term linkage to describe this physical association of genes on a chromosome and the term recombination to describe the generation of non-parental gene combinations.</p> <p>Morgan and his group also found that even when genes were grouped on the same chromosome, some genes were very tightly linked (showed very low recombination) while others were loosely linked (showed higher recombination).</p> <p>For example, he found that the genes white and yellow were very tightly linked and showed only 1.3 per cent recombination while white and miniature wing showed 37.2 per cent recombination.</p>		
40	<p><b>Mention any five salient features of Human genome.</b></p> <p>(i) The human genome contains 3164.7 million bp.</p> <p>(ii) The average gene consists of 3000 bases, but sizes vary greatly, with the largest known human gene being dystrophin at 2.4 million bases.</p> <p>(iii) The total number of genes is estimated at 30,000—much lower than previous estimates of 80,000 to 1,40,000 genes. Almost all (99.9 per cent) nucleotide bases are exactly the same in all people.</p> <p>(iv) The functions are unknown for over 50 per cent of the discovered genes.</p> <p>(v) Less than 2 per cent of the genome codes for proteins.</p> <p>(vi) Repeated sequences make up very large portion of the human genome.</p> <p>(vii) Repetitive sequences are stretches of DNA sequences that are repeated many times, sometimes hundred to thousand times. They are thought to have no direct coding functions, but they shed light on chromosome structure, dynamics and evolution.</p> <p>(viii) Chromosome 1 has most genes (2968), and the Y has the fewest (231).</p> <p>(ix) Scientists have identified about 1.4 million locations where singlebase DNA differences (SNPs – single nucleotide polymorphism, pronounced as ‘snips’) occur in humans. This information promises to revolutionise the processes of finding chromosomal locations for disease-associated sequences and tracing human history.</p> <p>(Any 5)</p>	5	120
41	<p><b>Give reasons:</b></p> <p><b>i. <i>Sonalika</i> and <i>Kalyan Sona</i> varieties are superior to the traditional varieties of wheat.</b></p> <p><b>ii. Biofortified maize and wheat are considered as nutritionally improved.</b></p> <p><b>iii. <i>Methylophilus methylotrophus</i> is a preferred microorganism in the production of single cell proteins.</b></p> <p>a. High yielding and disease resistant</p> <p>b. Biofortified maize hybrids have twice the amount of the amino acids, lysine and tryptophan, compared to existing maize hybrids.</p> <p>Biofortified wheat variety have a high protein content.</p> <p>c. High rate of biomass production and growth.</p>	2 1 1 1	173 176 176 176
42	<p><b>Explain the role of microbes as biofertilisers.</b></p> <p>Biofertilisers are organisms that enrich the nutrient quality of the soil.</p> <p>The main sources of biofertilisers are bacteria, fungi and cyanobacteria.</p>	5	188

	<p>The nodules on the roots of leguminous plants are formed by the symbiotic association of <i>Rhizobium</i>. These bacteria fix atmospheric nitrogen into organic forms, which is used by the plant as nutrient.</p> <p>Other bacteria can fix atmospheric nitrogen while free-living in the soil (examples <i>Azospirillum</i> and <i>Azotobacter</i>), thus enriching the nitrogen content of the soil.</p> <p>Fungi are also known to form symbiotic associations with plants (mycorrhiza). Many members of the genus <i>Glomus</i> form mycorrhiza. The fungal symbiont in these associations 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.</p> <p>Cyanobacteria are autotrophic microbes widely distributed in aquatic and terrestrial environments many of which can fix atmospheric nitrogen, e.g. <i>Anabaena</i>, <i>Nostoc</i>, <i>Oscillatoria</i>, etc. In paddy fields, cyanobacteria serve as an important biofertiliser. Blue green algae also add organic matter to the soil and increase its fertility.</p>		
<b>VI. Answer any TWO of the following questions in 200-250 words each, wherever applicable: 2 x 5= 10</b>			
43	<p><b>Define (i) Saltation (ii) Gene pool (iii) Founder effect (iv) Divergent evolution (v) Genetic drift</b></p> <p>a. Single step large mutation leading to speciation.</p> <p>b. Total genes and their alleles in a population.</p> <p>c. The effect caused by the original drifted population which results in a different species.</p> <p>d. The same structure developed along different directions due to adaptations to different needs.</p> <p>e. New genes/alleles are added to the new population and these are lost from the old population by chance.</p>	1 1 1 1 1	135 136 137 130/131 137
44	<p><b>Explain prevention and control measures of alcohol and drug abuse.</b></p> <p>(i) <b>Avoid undue peer pressure</b> - Every child has his/her own choice and personality, which should be respected and nurtured. A child should not be pushed unduly to perform beyond his/her threshold limits; be it studies, sports or other activities.</p> <p>(ii) <b>Education and counselling</b> - Educating and counselling him/ her to face problems and stresses, and to accept disappointments and failures as a part of life. It would also be worthwhile to channelise the child's energy into healthy pursuits like sports, reading, music, yoga and other extracurricular activities.</p> <p>(iii) <b>Seeking help from parents and peers</b> - Help from parents and peers should be sought immediately so that they can guide appropriately. Help may even be sought from close and trusted friends. Besides getting proper advise to sort out their problems, this would help young to vent their feelings of anxiety and guilt.</p> <p>(iv) <b>Looking for danger signs</b> - Alert parents and teachers need to look for and identify the danger signs discussed above. Even friends, if they find someone using drugs or alcohol, should not hesitate to bring this to the notice of parents or teacher in the best interests of the person concerned. Appropriate measures would then be required to diagnose the malady and the underlying causes. This would help in initiating proper remedial steps or treatment.</p> <p>(v) <b>Seeking professional and medical help</b> - A lot of help is available in the form of highly qualified psychologists, psychiatrists, and deaddiction</p>	1 1 1 1 1	162-163



	and rehabilitation programmes to help individuals who have unfortunately got in the quagmire of drug/alcohol abuse. With such help, the affected individual with sufficient efforts and will power, can get rid of the problem completely and lead a perfectly normal and healthy life.		
45	<p><b>Give reasons:</b></p> <p><b>i. Alien DNA is linked with 'ori' site of a vector in gene cloning.</b></p> <p><b>ii. Restriction enzymes are called 'molecular scissors'.</b></p> <p><b>iii. DNA ligase are called 'molecular glues'.</b></p> <p><b>iv. Gel electrophoresis is an important technique in recombinant DNA technology.</b></p> <p><b>v. Bacterial cells are made 'competent' by treating them with specific concentration of a divalent cation like calcium.</b></p> <p>i. Alien piece of DNA can replicate and multiply itself in the host organism.</p> <p>ii. Cut DNA at specific locations.</p> <p>iii. Join DNA fragments with same kind of 'sticky-ends' (end-to-end).</p> <p>iv. Fragments of DNA can be separated.</p> <p>v. Increases the efficiency with which DNA enters the bacterium through pores in its cell wall.</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>194</p> <p>194</p> <p>197</p> <p>198</p> <p>200</p>
46	<p><b>i. Differentiate between Emigration and Immigration.</b></p> <p><b>ii. Write a note on altitude sickness.</b></p> <p>i. Immigration is the number of individuals of the same species that have come into the habitat from elsewhere during the time period under consideration. Emigration is the number of individuals of the population who left the habitat and gone elsewhere during the time period under consideration.</p> <p>ii. At high altitude regions, due to low atmospheric pressure, the body does not get enough oxygen and results in altitude sickness. Its symptoms include nausea, fatigue and heart palpitations. Gradually the body gets acclimatized and stops experiencing altitude sickness. The body compensates low oxygen availability by increasing red blood cell production, decreasing the binding affinity of hemoglobin and by increasing breathing rate.</p>	<p>1</p> <p>1</p> <p>3</p>	<p>228</p> <p>226</p>
47	<p><b>Explain organic farming technique practised by Ramesh Chandra Dagar. Mention its advantages.</b></p> <p>Integrated organic farming is a cyclical, zero-waste procedure, where waste products from one process are cycled in as nutrients for other processes. This allows the maximum utilization of resource and increases the efficiency of production. Ramesh Chandra Dagar, a farmer in Sonipat, Haryana, is doing just this. He includes bee-keeping, dairy management, water harvesting, composting and agriculture in a chain of processes, which support each other and allow an extremely economical and sustainable venture. There is no need to use chemical fertilizers for crops, as cattle excreta (dung) are used as manure. Crop waste is used to create compost, which can be used as a natural fertilizer or can be used to generate natural gas for satisfying the energy needs of the farm. Enthusiastic about spreading information and help on the practice of integrated organic farming, Dagar has created the Haryana Kisan Welfare Club, with a current membership of 5000 farmers.</p>	<p>5</p>	<p>280</p>

TIME: 3 HOURS 15 MINUTES

MAX. MARKS: 70

**General instructions:**

1. The question paper consists of four parts A, B, C, and D.
2. PART-A consists of I & II and Part-D consists of V & VI.
3. All the parts are compulsory.
4. Draw diagrams wherever necessary, unlabelled diagrams or illustrations do not attract any marks.

**PART- A****I. Select the correct alternative from the choices given below:****1 x 15 = 15**

1. Monoecious condition is observed in  
a) Papaya b) Date palm c) *Marchantia* d) Coconut
2. Tassels in corn cob represent  
a) Ovary b) Anther c) Filament d) Stigma and style
3. Progesterone hormone is secreted by  
a) Testis b) Pituitary gland c) Corpus luteum d) Graafian follicle
4. Which among the following sexually transmitted infection cannot be cured?  
a) Genital warts b) Trichomoniasis c) Genital herpes d) Gonorrhoea
5. Gynaecomastia is the characteristic of  
a) Haemophilia b) Turners'syndrome c) Down's syndrome d) Klinefelter's syndrome
6. Select opioid from the following  
a) Charas b) Ganja c) Morphine d) Hashish
7. Sonalika is a hybrid variety of  
a) Wheat b) Rice c) Sugarcane d) Maize
8. Identify the nitrogen fixing cyanobacteria among the following  
a) *Rhizobium* b) *Aspergillus* c) *Trichoderma* d) *Anabena*
9. The presence of r-DNA in the coding sequence of the enzyme  $\beta$ -galactosidase does not produce chromogenic substrates. Hence bacterial colonies do not produce any colour. The inference drawn is  
a) Plasmids in bacterial colonies do not have an insert and are non-transformants.  
b) Plasmids in bacterial colonies have an insert and are transformants.  
c) Plasmids in bacterial colonies do not have selectable markers and are non-transformants.  
d) Plasmids in bacterial colonies do not have cloning sites and are transformants.
10. The rate of biomass production is called  
a) Productivity b) Secondary productivity c) GPP d) NPP
11. Emergency contraceptives are found to be effective if used within  
a) 24 hours of coitus b) 48 hours of coitus  
c) 72 hours of coitus d) 80 hours of coitus
12. The method of sex determination in *Drosophila* is  
a) XY b) XO c) ZW d) ZO
13. Biological control method adopted in agricultural pest control is based on  
a) Competition b) Predation c) Parasitism d) Commensalism
14. In higher altitudes body compensates low oxygen availability by increasing red blood cell production. This is an example for  
a) Morphological adaptation b) Behavioural adaptation  
c) Physiological adaptation d) Biochemical adaptation
15. The reservoir for sedimentary cycle exists in

- a) Earth crust b) Atmosphere c) Stratosphere d) Troposphere

**II. Fill in the blanks by choosing the appropriate word/words from those given below:**

(Rice, Seaweeds, Lichens, Carrot grass, Coelacanth)

**1 x 5 = 5**

16. The agarose gel used in gel-electrophoresis is obtained from .....
17. The pioneer species in xerarch succession are .....
18. ....came to India as contaminant with imported wheat and causes pollen allergy.
19. An example for plant whose genome has been sequenced is .....
20. The fish caught in South Africa in 1938 which was thought to be extinct is .....

**PART-B**

**III. Answer any FIVE of the following questions in 3-5 sentences each, wherever applicable:**

**2 x 5 = 10**

21. What are hermaphrodites? Give an example.
22. What is perisperm? Give an example.
23. List the levels of regulation of gene expression in eukaryotes.
24. List any four factors that affect Hardy-Weinberg equilibrium.
25. Differentiate between oestrous cycle and menstrual cycle.
26. Distinguish between dominant and recessive factors.
27. Draw the pedigree symbols for: a) 5 unaffected male offspring b) Sex unspecified
28. Sketch and label electrostatic precipitator.

**PART – C**

**IV. Answer any FIVE of the following questions in about 40-80 words each, wherever applicable:**

**3 x 5 = 15**

29. State the functions of placenta.
30. Define infertility. Mention any two reasons for infertility in human beings.
31. List any three goals of human genome project.
32. Draw a labelled diagram of antibody molecule.
33. Explain the selection of dark-winged moths in response to industrial revolution in England to illustrate the theory of natural selection as proposed by Darwin.
34. Define poultry. Mention any four components for successful poultry farm management.
35. Tropical regions show greater diversity compare to temperate regions. List any three reasons for this.
36. Schematically represent pyramid of biomass.

**PART- D**

**V. Answer any THREE of the following questions in about 200-250 words each, wherever applicable:**

**5 x 3 = 15**

37. Draw the structure of L.S of monocot embryo and label the parts.
38. Describe Meselson and Stahl experiment that provides a scientific proof for semi conservative mode of DNA replication.
39. Give a brief account of a) AI b) MOET
40. Mention the roles played by microbes in industrial products.
41. Briefly explain the different steps involved in genetic engineering.
42. Define the following:
- a) Solid wastes b) Reforestation c) Pollution
- d) Snow blindness e) Ozone hole

**VI. Answer any TWO of the following questions in about 200-250 words each, wherever applicable:**

**5 x 2 = 10**

43. Draw a sectional view of the human female reproductive system.
44. What is RNAi? Explain how it is used in giving resistance to tobacco plant.

45. In a genetic experiment, it was found that  $F_1$  had a phenotype that did not resemble either of the two parents and was in between the two. Justify this by representing schematically with a suitable example.
46. a) Differentiate between eurythermal animals and stenothermal animals. (2)  
b) Describe mutualism with any three examples. (3)
47. Explain the life cycle of *Plasmodium*.

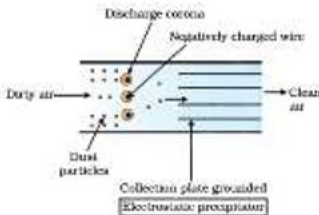
SAMPLE COPY-NOT FOR SALE

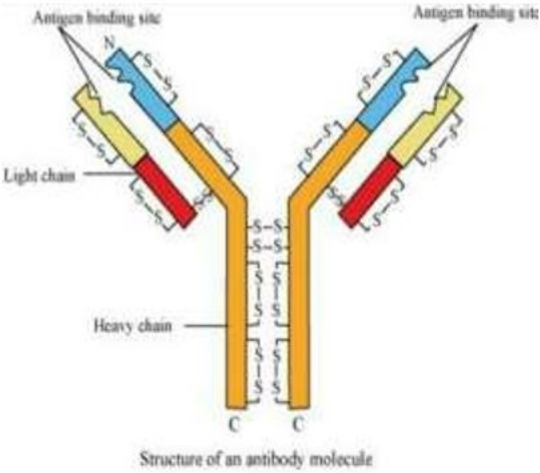
DEPARTMENT OF PREUNIVERSITY EDUCATION  
SCHEME OF EVALUATION  
II PUC  
SUB: BIOLOGY (36)

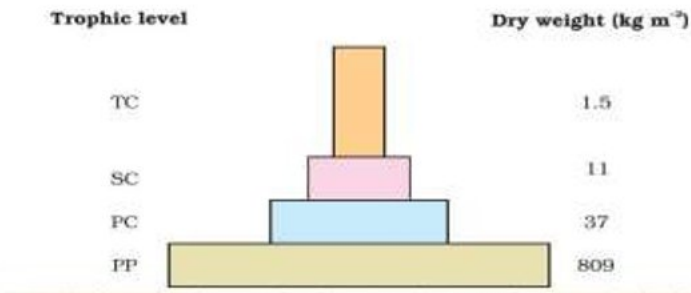
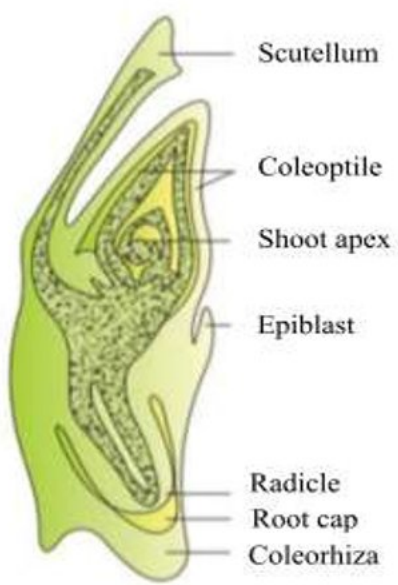
MQP-5

2022-23

Q.NO	VALUE POINTS / KEY POINTS	MARKS	ANSWER REFERENCE PAGE NO
	<b>PART- A</b>		
I	<b>Select the correct alternative from the choices given below:</b>	<b>1x15=15</b>	
1	d) Coconut	1	11
2	d) Stigma and style	1	29
3	c) Corpus luteum	1	51
4	c) Genital herpes	1	63
5	d) Klinefelter's syndrome	1	91
6	c) Morphine	1	158-159
7	a) Wheat	1	173
8	d) <i>Anabena</i>	1	188
9	b) Plasmids in bacterial colonies have an insert and are transformants.	1	200
10	a) Productivity	1	243
11	c) 72 hours of coitus	1	61
12	a) XY	1	86
13	b) Predation	1	233
14	c) Physiological adaptation	1	226
15	a) Earth crust	1	253
II	<b>Fill in the blanks by choosing the appropriate word/words from those given below:</b>		<b>1 x 5 = 5</b>
16	Seaweeds	1	198
17	Lichens	1	251
18	Carrot grass	1	23
19	Rice	1	119
20	Coelacanth	1	138
	<b>PART- B</b>		
III	<b>Answer any FIVE of the following questions in 3-5 sentences each, wherever applicable:</b>	<b>2x5=10</b>	
21	<b>What are hermaphrodites? Give an example.</b> The bisexual animals that possess both the male and female reproductive organs <b>Examples:</b> Earthworms, tapeworm, sponge, leech <b>Any one example</b>	1 1	11
22	<b>What is perisperm? Give an example.</b> The residual persistent nucellus in the seed is perisperm <b>Example:</b> Black pepper and beet <b>Any one example</b>	1 1	36
23	<b>List the levels of regulation of gene expression in eukaryotes.</b> The levels regulation of gene expression in eukaryotes 1. Transcriptional level 2. Processing level 3. Transport of mRNA from nucleus to the cytoplasm 4. Translational level	4x½=2	115
24	<b>List any four factors that affect Hardy-Weinberg equilibrium.</b> 1. Gene flow/ Gene migration 2. Genetic drift 3. Mutation 4. Genetic recombination	Any 4 4x½=2	137

	5. Natural selection								
<b>25</b>	<b>Differentiate between oestrous cycle and menstrual cycle.</b>								
	<table border="1"> <thead> <tr> <th>Oestrus cycle</th> <th>Menstrual cycle</th> </tr> </thead> <tbody> <tr> <td>It is the cyclical changes in the female reproductive system of non-primate mammals during reproduction. <b>Example:</b> Cow, sheep, rats etc.,</td> <td>It is the cyclical changes in the female reproductive system of primate mammals during reproduction. <b>Example:</b> Monkeys, apes, and humans etc.,</td> </tr> <tr> <td></td> <td><b>One example on either side</b></td> </tr> </tbody> </table>	Oestrus cycle	Menstrual cycle	It is the cyclical changes in the female reproductive system of non-primate mammals during reproduction. <b>Example:</b> Cow, sheep, rats etc.,	It is the cyclical changes in the female reproductive system of primate mammals during reproduction. <b>Example:</b> Monkeys, apes, and humans etc.,		<b>One example on either side</b>	1 1	9
Oestrus cycle	Menstrual cycle								
It is the cyclical changes in the female reproductive system of non-primate mammals during reproduction. <b>Example:</b> Cow, sheep, rats etc.,	It is the cyclical changes in the female reproductive system of primate mammals during reproduction. <b>Example:</b> Monkeys, apes, and humans etc.,								
	<b>One example on either side</b>								
<b>26</b>	<b>Distinguish between dominant and recessive factors.</b> In a pair of dissimilar factors, one dominates the other is called dominant factor while the other factor is called recessive.	2	72						
<b>27</b>	<b>Draw the pedigree symbols for:</b> a) Unaffected male offspring <input type="checkbox"/> b) Sex unspecified <input type="checkbox"/>	1 1	88						
<b>28</b>	<b>Sketch and label electrostatic precipitator.</b>  	<b>Diagram with any 4 labelling</b> 4x½=2	271						
<b>IV</b>	<b>PART-C</b> <b>Answer any FIVE of the following questions in about 40-80 words each, wherever applicable:</b>	<b>3x5=15</b>							
<b>29</b>	<b>State the functions of placenta.</b> 1. It facilitates the supply of oxygen and nutrients to the embryo. 2. It helps in removal of carbon dioxide and excretory wastes produced by the embryo. 3. It also produces several hormones like Human chorionic gonadotropin (hCG), human placental lactogen (hPL), oestrogens and progestogens	3x1=3	53						
<b>30</b>	<b>Define infertility. Mention any two reasons for infertility in human beings.</b> Inability to produce children in spite of unprotected sexual cohabitation is called infertility. The reasons for infertility could be physical / congenital / immunological / diseases / drugs or even psychological.  <b>Any two</b>	1  2x1=2	63						
<b>31</b>	<b>List any three goals of human genome project.</b> <b>Goals of human genome project (HGP):</b> 1. To identify all the approximately 20,000 - 25,000 genes in human DNA. 2. To determine the sequences of the 3 billion base pairs that make up human DNA. 3. To store this information in databases. 4. Improve tools for data analysis. 5. Transfer related technologies to other sectors, such as industries. 6. Address the ethical, legal and social issues (ELSI) that may arise from the project.	Any three 3x1=3	118						

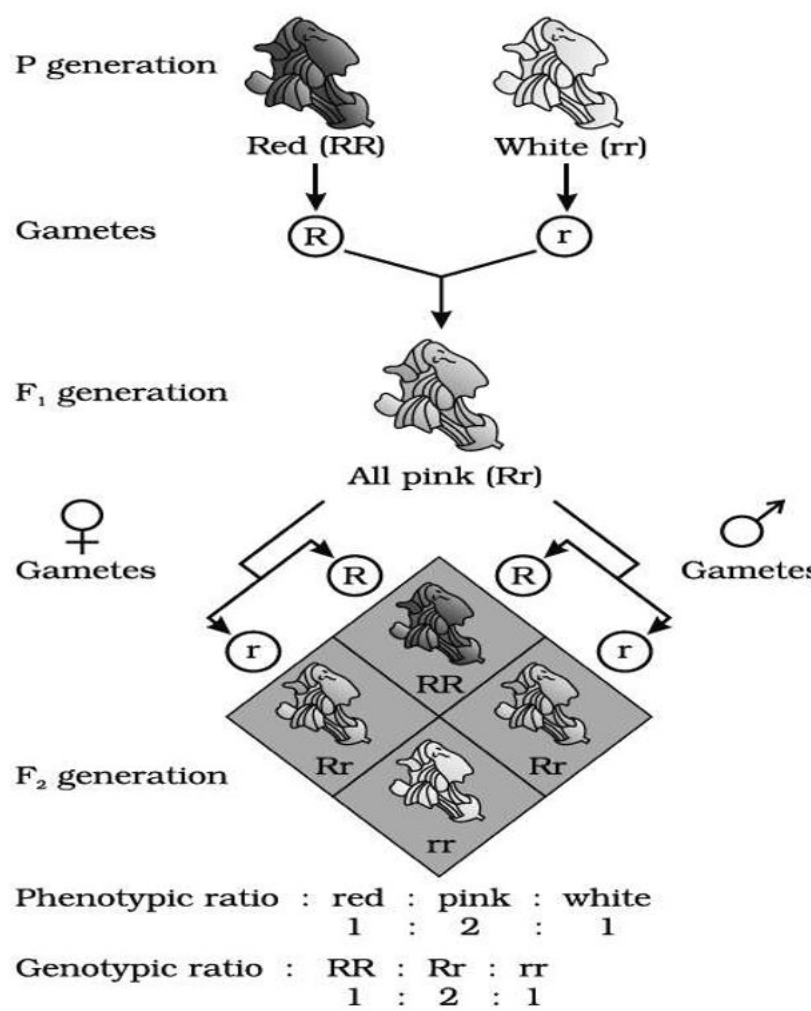
<p><b>32</b></p>	<p><b>Draw a labelled diagram of antibody molecule.</b></p>  <p style="text-align: center;"><i>Diagram with any three labelling</i></p>	<p>3x1=3</p>	<p>151</p>
<p><b>33</b></p>	<p><b>Explain the selection of dark- winged moths in response to industrial revolution in England to illustrate the theory of natural selection as proposed by Darwin.</b></p> <p>A classical example for evolution by natural selection was observed in moths in England during 1850. Prior to industrial revolution white winged moths were abundant all over England, as they could hide among the rich flora of lichens covering the tree trunks than dark winged (melanised) moths but after industrial revolution tree trunks became black due to industrial smoke and lichens were disappeared. Under this condition the white winged moths did not survive as they were easily identified by their predator birds and their number decreased but it increased the dark winged (melanised) moths' population, as they were easily blended with the black colour of the tree trunks. Thus, natural selection favoured black coloured (melanic) moths in response to industrial pollution. This is known as industrial melanism.</p>	<p>3</p>	<p>131-132</p>
<p><b>34</b></p>	<p><b>Define poultry. Mention any four components for successful poultry farm management</b></p> <p>Poultry is the class of domesticated fowls used for meat and eggs.</p> <p>Measures for successful poultry farm management:</p> <ol style="list-style-type: none"> <li>1. Selection of disease-free breeds and suitable breeds</li> <li>2. Proper and safe farm conditions</li> <li>3. Proper feed, water and</li> <li>4. Hygiene and health care</li> </ol>	<p>1</p> <p>4x½=2</p>	<p>166</p>
<p><b>35</b></p>	<p><b>Tropical regions show greater diversity compare to temperate regions. List any three reasons for this.</b></p> <ol style="list-style-type: none"> <li>1. Tropical environments are less seasonal, relatively more constant and predictable, these environments promote niche specialisation.</li> <li>2. More solar energy available in tropics which contribute to more productivity.</li> <li>3. Tropical latitudes have remained relatively undisturbed for millions of years, thus had a long evolutionary time for speciation.</li> </ol>	<p>3x1=3</p>	<p>261-262</p>

<p>36</p>	<p><b>Schematically represent pyramid of biomass.</b></p>  <p>Pyramid of biomass shows a sharp decrease in biomass at higher trophic levels</p> <p style="text-align: center;"><b>Diagram with any 6 labelling</b></p>	<p>248</p>	<p>6x½=3</p>
<p>V</p>	<p style="text-align: center;"><b>PART-D</b></p> <p>Answer any <b>THREE</b> of the following questions in about 200-250 words each, wherever applicable:</p>	<p>5x3=15</p>	
<p>37</p>	<p><b>Draw the structure of L.S of monocot embryo and label the parts.</b></p>  <p style="text-align: center;"><b>Diagram with any 5 labelling</b></p>	<p>35</p>	<p>5x1=5</p>
<p>38</p>	<p><b>Describe Meselson and Stahl experiment that provides a scientific proof for semi conservative mode of DNA replication.</b></p> <p>Mathew Meselson and Franklin Stahl conducted experiments on <i>E.coli</i> bacterium to prove that DNA replicates semi-conservatively. They grew <i>E.coli</i> bacterium in a culture medium containing <math>^{15}\text{NH}_4\text{Cl}</math> (<math>^{15}\text{N}</math> is the heavy isotope of nitrogen) as the only nitrogen source for many generations. The result was <math>^{15}\text{N}</math> incorporated into newly synthesized DNA and other nitrogen containing compounds. The heavy DNA molecules (<math>^{15}\text{N}</math>) can be separated from the normal DNA by centrifugation in a caesium chloride (<math>\text{CsCl}_2</math>) density gradient. The bacteria were transferred in to another culture medium containing normal <math>^{14}\text{NH}_4\text{Cl}</math>. As bacteria multiplied, samples of DNA were separated on a <math>\text{CsCl}_2</math> density gradient at various time intervals to measure the densities of DNA. The DNA extracted from the bacteria after generation-1 (after 20 minutes) was hybrid or intermediate DNA. The DNA extracted from the bacteria after generation -2 (after 40 minutes) was composed of equal amounts of hybrid DNA and light DNA. Thus, proves that DNA replication is semiconservative.</p>	<p>5</p>	<p>105-106</p>



<p>39</p>	<p><b>Give a brief account of a) AI b) MOET</b></p> <p><b>a) Artificial insemination (AI):</b> In this method semen of superior male is collected and introduced into the reproductive tract of selected female by the breeder.</p> <p><b>Advantages :</b></p> <ul style="list-style-type: none"> <li>• It helps to overcome several problems of natural mating.</li> <li>• The semen can be frozen and used in later stages.</li> <li>• Frozen semen can be easily transported.</li> </ul> <p><b>b) MOET (Multiple Ovulation Embryo Transfer Technology) :</b> In this method a superior cow is administered with hormones like FSH for inducing follicular maturation and super ovulation. The cow produces 6-8 eggs instead of one egg per cycle (superovulation). The cow is either mated with an elite bull or artificially inseminated. The fertilized eggs at 8 - 32 cell stage are recovered and transferred to surrogate mother cows.</p> <p><b>Advantages :</b></p> <ul style="list-style-type: none"> <li>• This is a technique for herd improvement.</li> <li>• High milk yielding herd of females and high meat yielding bulls have been mated successfully to increase herd size in a short time.</li> <li>• This technology has been successfully used for cattle, sheep, rabbit, mares and buffaloes.</li> </ul>	<p>2</p> <p>3</p>	<p>168-169</p>
<p>40</p>	<p><b>Mention the roles played by microbes in industrial products.</b></p> <p><b>1. Fermented Beverages</b> Yeasts have been used for the production of beverages like wine, beer, whisky, brandy or rum. Yeast <i>Saccharomyces cerevisiae</i> is used for bread-making and for fermenting malted cereals and fruit juices to produce ethanol.</p> <p><b>2. Antibiotics:</b> The fungus <i>Penicillium notatum</i> is used to obtain Penicillin.</p> <p><b>3. Organic acids:</b></p> <ul style="list-style-type: none"> <li>• <i>Aspergillus niger</i> is used for production of citric acid.</li> <li>• <i>Acetobacter aceti</i> is used for production of acetic acid.</li> <li>• <i>Clostridium butylicum</i> is used for production of butyric acid.</li> <li>• <i>Lactobacillus</i> is used for production of lactic acid.</li> </ul> <p><b>4. Enzymes:</b> Microbial enzymes have many economic uses.</p> <ul style="list-style-type: none"> <li>• Lipases are used in detergents to remove oil stains from laundry.</li> <li>• Pectinases and proteases are used to clarify bottled juices.</li> <li>• Streptokinase from <i>Streptococcus</i> is used as clot buster in patients with heart attack (myocardial infarction).</li> </ul> <p><b>5. Bioactive molecules :</b></p> <ul style="list-style-type: none"> <li>• <b>Cyclosporin A:</b> It is an immunosuppressive agent produced by <i>Trichoderma polysporum</i> is used in organ transplant patients.</li> <li>• <b>Statins:</b> It is produced by yeast <i>Monascus purpureus</i> is used as blood cholesterol lowering agent.</li> </ul>	<p>5x1=5</p>	<p>181-183</p>
<p>41</p>	<p><b>Briefly explain the different steps involved in genetic engineering.</b></p> <p><b>1. Isolation of the genetic material (DNA):</b> The DNA is isolated by treating the bacterial / plant / animal tissues with enzymes such as lysozyme in (bacteria), cellulose in plant cell, &amp; chitinase in fungal cell. The DNA intertwined with proteins, RNA, and other molecules and can be removed by appropriate treatment. The purified DNA ultimately precipitates out after the addition of chilled ethanol.</p>	<p>5x1=5</p>	

	<p><b>2. Cutting of DNA at specific locations:</b> Restriction enzyme digestions are performed by incubating purified DNA molecule with restriction at optimal condition.</p> <p><b>3. Amplification of gene of interest using PCR:</b> In this reaction, multiple copies of the gene (or DNA) of interest is synthesized invitro using two sets of primers and the enzyme DNA polymerase.</p> <p><b>4. Insertion of Recombinant DNA into the host cell / organisms.</b> The rDNA is introduced into the host cell using techniques such as microinjection, biolistic or gene gun methods, eletroporation and heat shock method.</p> <p><b>5. Obtaining the foreign gene product:</b> The recombinant gene is expressed in heterogonous host. The gene product is obtained by a process called downstream processing.</p>		210-203
42	<p><b>Define the following: a) Solid wastes b) Reforestation c) Pollution d) Snow blindness e) Ozone hole</b></p> <p>a) <b>Solid wastes:</b> Anything that goes out in trash.</p> <p>b) <b>Reforestation:</b> Process of restoring forest that was existed earlier but was removed in the past.</p> <p>c) <b>Pollution:</b> Any undesirable change in physical, chemical and biological characteristics of air, land, water or soil.</p> <p>d) <b>Snow blindness:</b> In human eye cornea absorb UV -B radiation and high dose of UV-B causes inflammation of cornea called snow-blindness, cataract etc.</p> <p>e) <b>Ozone hole:</b> The large area of thinned ozone layer is called ozone hole.</p>	1 1 1 1 1	283 285 270 283 283
VI	<b>Answer any TWO of the following questions in about 200-250 words each, wherever applicable:</b>	5x2=10	
43	<p><b>Draw a sectional view of the human female reproductive system.</b></p> <p style="text-align: center;">Diagrammatic sectional view of the female reproductive system</p> <p style="text-align: center;"><b>Diagram with any 10 labelling</b></p>		45
44	<p><b>What is RNAi? Explain how it is used in giving resistance to tobacco plant.</b></p> <p>The process by which double-stranded RNA (dsRNA) directs sequence-specific degradation of mRNA is called RNAi. Using <i>Agrobacterium</i> vectors, nematode-specific genes were introduced into</p>	1	208

	<p>the host plant. The introduction of DNA was such that it produced both sense and anti-sense RNA in the host cells. This two RNA's being complementary to each other formed a double stranded (dsRNA) that initiated RNAi and thus, silenced the specific mRNA of the nematode. The consequence was that the parasite could not survive in a transgenic host expressing specific interfering RNA. The transgenic plant therefore got itself protected from the parasite.</p>	4			
45	<p><b>In a genetic experiment, it was found that F<sub>1</sub> had a phenotype that did not resemble either of the two parents and was in between the two. Justify this by representing schematically with a suitable example.</b></p>  <p>Phenotypic ratio : red : pink : white 1 : 2 : 1</p> <p>Genotypic ratio : RR : Rr : rr 1 : 2 : 1</p>	5	76		
46	<p><b>a) Differentiate between eurythermal animals and stenothermal animals.</b></p> <table border="1" data-bbox="159 1601 1220 1758"> <tr> <td data-bbox="159 1601 702 1758"> <p><b>Eurythermal organisms</b> They can tolerate and survive in a wide range of temperatures</p> </td> <td data-bbox="702 1601 1220 1758"> <p><b>Stenothermal organisms</b> They are restricted to a narrow range of temperatures</p> </td> </tr> </table>	<p><b>Eurythermal organisms</b> They can tolerate and survive in a wide range of temperatures</p>	<p><b>Stenothermal organisms</b> They are restricted to a narrow range of temperatures</p>	2	222
<p><b>Eurythermal organisms</b> They can tolerate and survive in a wide range of temperatures</p>	<p><b>Stenothermal organisms</b> They are restricted to a narrow range of temperatures</p>				
b)	<p><b>b) Describe mutualism with any three examples.</b> It is a type of population interaction in which both the interacting species in relation are mutually benefitted. <b>Examples :</b></p> <ol style="list-style-type: none"> <li><b>1. Plant and pollinator relationship:</b> Plants get their pollination done by insects in return insects get their reward in the form of pollen and nectar.</li> <li><b>2. Association of fungi with the roots of higher plants (Mycorrhiza):</b> The fungi help in the absorption of essential nutrients from the soil, while plant in turn provides energy yielding carbohydrates for fungi.</li> </ol>	1 1	237-238		

	<b>3. Algae and fungi in lichens:</b> The fungi absorb water and minerals and give it to algae while algae provide prepared food for fungi.	1	
<b>47</b>	<b>Explain the life cycle of <i>Plasmodium</i>.</b> 1. <i>Plasmodium</i> enters the human body as sporozoite through the bite of infected female Anopheles mosquito. 2. The parasites reproduce asexually within the liver cells and then attack red blood cells. In the red blood cells parasites multiply asexually, this results in rupturing of red blood cells. 3. The rupture of red blood cells is associated with release of toxin haemozoin, which is responsible for the chill and high fever. 4. When female Anopheles mosquito bites an infected person, the parasites enter the mosquito in the form of gametocytes and undergo further development. 5. The parasites multiply sexually within the mosquito. Further development takes place in mosquito's digestive system to form sporozoites, which migrate the salivary glands of mosquito and when it bites a healthy person, the sporozoites are introduced in to his body.	1 1 1 1 1	147-148

SAMPLE COPY - NOT FOR SALE