

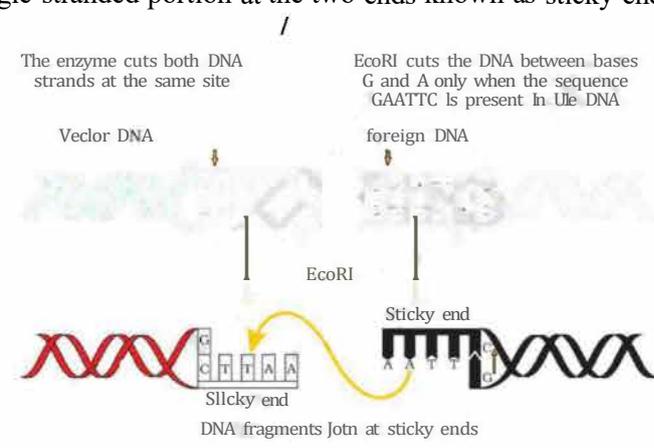
SOLUTIONS
Senior Secondary School Examination, 2025
BIOLOGY (Subject Code--044)
[Paper Code: 57/1/3]

Maximum Marks: 70

Q.No.	EXPECTED ANSWERS /VALUE <i>POINTS</i>	Marks	Total Marks
	SECTION A		
1	(C) / Inverted Pyramid of biomass	1	1
2	(D)/Wind	1	1
3	(B)/ P-Zygote Q- Suspensor R- Cotyledon S- Plumule	1	1
4	(B)/ <i>Australopithecines- Homo erectus- Neanderthal - Homo sapiens</i>	1	1
5	(C) / 50%	1	1
6	(D) /Pea and Groundnut	1	1
7	(D)/ Genetic Engineering Approval Committee	1	1
8	(D)/ Cell mediated immune response	1	1
9	(C) /1 billion times	1	1
10	(A)/ Preventing the process of translation of mRNA of the nematode	1	1
11	(B)/ 5'-AAUGCUAGGCAC-3'	1	1
12	(D) /1:1:1:1 ratio of phenotypes and genotypes	1	1
13	(B) / Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).	1	1
14	(C) /Assertion (A) is true, but Reason (R) is false.	1	1
15	(C) / Assertion (A) is true, but Reason (R) is false.	1	1
16	(B) / Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).	1	1

SECTION B						
17	(A) c = aa and d = AA/Aa (B) (i) Autosomal (ii) Recessive	$\frac{1}{2} + \frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	2			
18	1 = Turner's Syndrome (44 + XO) 2 = Down's Syndrome (45 + XY / 45 + XX)	$\frac{1}{2}$ $\frac{1}{2}$	2			
	<table border="1"> <thead> <tr> <th>Turner's Syndrome</th> <th>Down's syndrome/ Trisomy</th> </tr> </thead> <tbody> <tr> <td>(i) Absence of one of the X chromosome 45 with XO. (ii) Sterile female (iii) Rudimentary ovaries/ lack of secondary sexual characters /Short stature and underdeveloped feminine character</td> <td>i) Trisomy 21st chromosome/ autosomal chromosome extra ii) Sterile male or sterile female iii) affected are short statured with small round head/furrowed tongue/physical psychomotor and mental development is retarded/ partially open mouth /broad flat face/any other relevant symptoms (Any one differences)</td> </tr> </tbody> </table>	Turner's Syndrome		Down's syndrome/ Trisomy	(i) Absence of one of the X chromosome 45 with XO. (ii) Sterile female (iii) Rudimentary ovaries/ lack of secondary sexual characters /Short stature and underdeveloped feminine character	i) Trisomy 21 st chromosome/ autosomal chromosome extra ii) Sterile male or sterile female iii) affected are short statured with small round head/furrowed tongue/physical psychomotor and mental development is retarded/ partially open mouth /broad flat face/any other relevant symptoms (Any one differences)
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19	(A) Heroin is obtained by acetylation of morphine / Both are opioids. Effects - Morphine is a very effective sedative/painkiller Heroin is a depressant/slows down body functions. OR (B) (i) (!) Whisky/ Brandy/ Rum (2) Wine/ Beer (ii) Cyanobacteria fix atmospheric nitrogen, add organic matter to soil and increase soil fertility. (Any two uses)	1 $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$	2			
20	(A) Natural old forest will be more productive, As it contains more biomass or high biodiversity which will trap and store solar radiation in form of biomass , Young forest is still developing and contain fewer trees will not capture solar radiations as much as old forest, so productivity is low , Shallow polluted lake contains less number of producers and high amount of dead organic matter so productivity is less in comparison to natural old forest. OR (B)	$\frac{1}{2} \times 4$				

	Net Primary Productivity	Gross Primary Productivity		
	i)Gross primary productivity minus respiration losses (R) is the net primary productivity. ii)It is the available biomass for the consumption to heterotrophs.	i)Gross primary productivity of an ecosystem is the rate of production of organic matter during photosynthesis. ii)A considerable amount of gross primary utilised by plants respiration. (Any one point)		2
21	(A) The genetically engineered l_y phocytes have a life span because these cells are not immortal hence, the patient requires periodic infusion There could be permanent cure if the gene isolated from bone marrow cells producing ADA is introduced into cells (l_y phocytes) at early embryonic stages OR (B) Micro-injection: Recombinant DNA is directly injected into the nucleus of an animal/ Biolistics or gene gun: plants cells are bombarded with high velocity micro-particles of gold or tungsten coated with DNA/ Heat shock : Recombinant DNA can then be forced into such cells by incubating the cells with recombinant DNA on ice, followed by placing them briefly at 42° C (heat shock), and then putting them back on ice. (Any two techniques)		1 1 $\frac{1}{2}+\frac{1}{2}$ $\frac{1}{2}+\frac{1}{2}$ $\frac{1}{2}+\frac{1}{2}$	2
22	SECTION C			
	Differences			
	Divergent evolution	Convergent evolution		
	Divergent evolution occurs when same structures developed along different directions due to adaptations to different needs	Convergent evolution occurs when different structures evolving for the same function and hence having similarities		1+1
	Divergent evolution produces homologous structures.	Convergent evolution can result in analogous structures		
	It indicates common ancestry	It indicates similar habitat has resulted in selection of similar adaptive features		
	(Any two correct differences)			
	Similarities : ◆ both are influenced by the environment ◆ both contribute to species evolution or any other valid point . (Kindly note- compare and contrast include both similarities and differences)			$\frac{1}{2} + \frac{1}{2}$
23	(a) Amniocentesis , In amniocentesis some of the amniotic fluid of the developing		$\frac{1}{2} + \frac{1}{2}$	3

	<p>embryo is taken to analyse the foetal cells and dissolved substances to test the presence of genetic disorders.</p> <p>(b) Medical Termination of Pregnancy/MTP, Yes, as MTP is comparatively safe upto 12 weeks (the first trimester) of pregnancy.</p> <p>(c) When it is performed by quacks / if foetus is a normal female followed by MTP leading to female foeticide</p>	<p>$\frac{1}{2} \times 3$</p> <p>$\frac{1}{2}$</p>	<p>3</p>
24	<p>(a) 3'-CTTAAG-5'</p> <p>(b) EcoRI</p> <p>(c) -Restriction enzyme cut the strand of DNA a little away from the Centre of the palindrome site, but between the same two bases on the opposite strands. This leaves single stranded portion at the two ends known as sticky ends.</p>  <p>-Role of sticky ends : Sticky ends forms hydrogen bond with their complementary cut counter part/ they help in joining of vector DNA and foreign DNA during rDNA technology/ stickiness of ends facilitates the action of enzyme DNA ligase</p>	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>1</p> <p>1</p>	<p>3</p>
25	<p>(a) Sporozoites</p> <p>(b) In the gut of the female <i>Anopheles</i> mosquito</p> <p>(c) P: Salivary glands Q: Gametocytes</p> <p>(d) Asexual phase = In human Sexual phase = In mosquito</p>	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>	<p>3</p>
26	<p>(a) Nucleosome</p> <p>(b) P = DNA Q = Histone octamer</p> <p>(c) Basic/ Positively charged</p>	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2} + \frac{1}{2}$</p> <p>$\frac{1}{2}$</p>	

	<p>(d)</p> <p>Euchromatin</p> <ol style="list-style-type: none"> Loosely packed chromatin Lightly stained Transcriptionally active chromatin 	<p>Heterochromatin</p> <ol style="list-style-type: none"> Densely packed chromatin Darkly stained Transcriptionally inactive chromatin <p>(Any two difference)</p>	$\frac{1}{2} + \frac{1}{2}$	3
27	<p>(A) Columbia , as it is located near the equator / as we move from equator towards poles the biodiversity decreases.</p> <p>(B) Paul Ehrlich gave rivet popper hypothesis in an airplane (ecosystem) all parts are joined together using thousands of rivets (species), If every passenger travelling starts popping a rivet to home (causing a species to become extinct) it may not affect flight safety (ecosystem functioning) initially, but as more and more rivets are removed, the plane becomes dangerously weak over a period of time, furthermore which rivet is removed may also be critical loss of rivets on wings (key species) is more serious threat to flight safety.</p>		$\frac{1}{2} + \frac{1}{2}$	3
28	<p>(a) Recombinant DNA is formed by joining together two DNA fragments from two different sources. cDNA or complimentary DNA is formed by the reverse transcription of mRNAs.</p> <p>(b) After treatment with divalent cation such as calcium, which increases the efficiency with which DNA enters the bacterium through pores in its cell wall, then incubated the cell on ice, followed by placing them briefly at 42 ° C (heat shock) and then putting them back on ice.</p>		$\frac{1}{2}$ $\frac{1}{2}$	3
SECTION D				
29	<p>(a) The butterfly acquires this chemical during its caterpillar stage by feeding on a poisonous weed.</p> <p>(b) $N_{t+1} = N_t + [(B + I) - (D + E)]$, $800 = N_t + [(200 + 200) - (150 + 100)]$ $800 = N_t + (400 - 250)$ $800 = N_t + 150$ $N_t = 800 - 150 = 650$</p> <p>Comment As the population density is increasing with time so age pyramid would be of expanding population.</p> <p>(c) Single huge banyan tree - measured in terms of biomass or percent cover, carrot grass- measured in terms of percent cover</p> <p style="text-align: center;">OR</p> <p>(d) Pug marks, faecal pellets.</p>		1 $\frac{1}{2} + \frac{1}{2}$ 1 $\frac{1}{2} + \frac{1}{2}$	4
30	<p>a) Luteinizing hormone /LH , helps in ovulation / induce rupturing of graffian follicles</p> <p>b) Ovary : Maturation of follicles. Uterus : Proliferation of endometrium lining.</p>		$\frac{1}{2} + \frac{1}{2}$ 1 + 1	

	<p>c) Q - Progesterone , Maintains pregnancy/ maintenance of endometrium</p> <p style="text-align: center;">OR</p> <p>Corpus luteum, Graffian follicle transform into corpus luteum after ovulation</p>	<p>$\frac{1}{2} + \frac{1}{2}$</p> <p>$\frac{1}{2} + \frac{1}{2}$</p>	4
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SECTION E

31	<p>(A) (i)</p> <div style="display: flex; justify-content: space-around;"> <div style="width: 45%;"> <p>Case - I</p> <p>$AV \times av$</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td></td><td>AV</td></tr> <tr><td>av</td><td>AaVv</td></tr> <tr><td></td><td>Axial Violet</td></tr> </table> <p>If 100% axial Violet then genotype - <u>AAVV</u> (1/2 Mark)</p> </div> <div style="width: 45%;"> <p>Case - II</p> <p>$AoVV \times aoVv$</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td></td><td>AV</td><td>av</td></tr> <tr><td>Ao...Vv-</td><td>Ao...Vv-</td><td>o-o.Vv-</td></tr> <tr><td>Axial Violet</td><td>Axial Violet</td><td>Terminal Violet</td></tr> </table> <p>If 50% axial violet and 50% terminal violet then genotype - <u>AoVV</u> (1/2 Mark)</p> </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="width: 45%;"> <p>Case III</p> <p>$AAVv \times aaVv$</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td></td><td>AV</td><td>A_v</td></tr> <tr><td>av</td><td>AaVv</td><td>Aaolv</td></tr> <tr><td></td><td>Axial Violet</td><td>Axial White</td></tr> </table> <p>If 50% axial violet and 50% axial white then genotype - <u>AAVv</u> (1/2 Mark)</p> </div> <div style="width: 45%;"> <p>Case IV</p> <p>$AaVv \times aaVv$</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td></td><td>AV</td><td>av</td></tr> <tr><td>av</td><td>AaVv</td><td>aaVv</td></tr> <tr><td></td><td>Axial Violet</td><td>Terminal White</td></tr> </table> <p>If 50% axial violet and 50% terminal white then genotype - <u>AaVv</u> (1/2 Mark)</p> </div> </div>		AV	av	AaVv		Axial Violet		AV	av	Ao...Vv-	Ao...Vv-	o-o.Vv-	Axial Violet	Axial Violet	Terminal Violet		AV	A _v	av	AaVv	Aaolv		Axial Violet	Axial White		AV	av	av	AaVv	aaVv		Axial Violet	Terminal White	$\frac{1}{2} \times 8$	
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	<p>(ii) In Honey bee males are haploid, females are diploid</p> <p style="text-align: center;">OR</p> <p>(B) Steps of DNA fingerprinting:</p> <ol style="list-style-type: none"> 1. Isolation of DNA from both the samples R and S 2. Digestion of the DNAs of both the samples same restriction endonucleases 3. Separation of DNA fragments by electrophoresis by placing them in different wells of the agarose gel 4. Transferring (blotting) of separated DNA fragments to synthetic membranes, such as nitrocellulose or nylon. 5. Hybridisation using labelled VNTR probe followed by detection of hybridised DNA fragments by autoradiography 	$\frac{1}{2} + \frac{1}{2}$	5																																	

32	(A) (i)		
	+ MALT is Mucosa Associated Lymphoid Tissue	1/2	
	+ It is located within the lining of the major tracts like Respiratory or digestive or urogenital tract.	1/2	
	(ii) Cytokine barriers - virus infected cells secrete proteins called interferons which protect non-infected cells from further viral infection.	1	
	(iii) Enzyme Linked Immuno-sorbent Assay or ELISA ,ELISA is based on the principle of antigen-antibody interaction / PCR or Pol _{y_m} erase Chain Reaction , amplification of nucleic acid	1 + 1	
	(iv) Both Bone marrow and thymus provide micro- environment for the development and maturation of T-lymphocytes / immature lymphocyte differentiate into antigen sensitive l _{y_m} phocytes / Bone marrow is the main lymphoid organ where all blood cells including l _{y_m} phocytes are produced and some l _{y_m} phocytes migrate to th _{y_m} us for development and maturation.	1	
	OR		
	(B) (i)	1/2	
	a) H = <i>Clostridium butylicum</i>	1/2	
	I = Bacteria	1/2	
	b) J = Statin	1/2	
	K = Fungi / Yeast	1/2	
	c) L = <i>Trichoderma polysporum</i>	1/2	
	M = Immunosuppressant / Suppress immune system in patients with newly transplanted organs		
	(ii) Species specific, narrow spectrum insecticidal properties, No negative impact on non target species like plants or mammals or birds or fishes, Any other valid point	1 + 1	
	(any two point)		5
33	(A)		
	(a)		
	vegetative cell	generative cell	1/2
	It is big with abundant food reserve and an irregular shaped nucleus	Generative cell is small, floats in the cytoplasm of the vegetative cell	1
Helps in the formation of pollen tube	Forms two male gamete		

	<p>(Any one difference) (1/2 mark for correct names and 1 mark for the correct difference) (b)(i) 1 =Autogamy 2 = Geitonogamy 3 =Xenogamy (ii) a = by Insects or wind b = by Water (iii) Genetic variation, Healthier offspring, Elimination of recessive traits, Disease resistance ,Evolution, no inbreeding depression</p> <p style="text-align: right;">(Any two)</p> <p style="text-align: center;">OR</p> <p>(B) (i) P is able to penetrate or fertilise the ovum ,whereas Q and R are unable to penetrate or fertilize. (ii) When a sperm comes in contact with the zona pellucida layer of the ovum it induces changes in the membrane that blocks the entry of additional sperms. (iii) Entry of sperm induces completion of meiotic division of the secondary oocyte and formation of second polar body and a haploid ovum (ootid) (iv) ♦ Acrosome : It is filled with the enzyme which helps the sperm to enter into the cytoplasm of the ovum ♦ Middle piece : It has numerous mitochondria which produce energy for the movement of tail that facilitate sperm motility for fertilisation</p>	<p>$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ 1 $\frac{1}{2} + \frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$ 1 1 1</p>	<p style="text-align: right;">5</p>
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