

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

Maximum Marks: 70

Q.No.	EXPECTED ANSWERS / VALUE POINTS	Marks	Total Marks
SECTION A			
1	(C) / 50%	1	1
2	(D) / Genetic Engineering Approval Committee	1	1
3	(B) / (i) -(c), (ii)-d, (iii)-(b), (iv)-(a)	1	1
4	(A) / inorganic nutrients from humus	1	1
5	(D)/ Cell-mediated immune response	1	1
6	(A) / (a)-(iv),(b)-(i), (c)-(ii),(d)-(iii)	1	1
7	(B) / P - Zygote Q – Suspensor R – Cotyledon S - Plumule	1	1
8	(C) / 1 billion times	1	1
9	(B) / 5' – AAUGCUAGGCAC – 3'	1	1
10	(B) / 200, 50	1	1
11	(B) / <i>Australopithecines</i> → <i>Homo erectus</i> → Neanderthal → <i>Homo sapiens</i>	1	1
12	(A) / Preventing the process of translation of mRNA of the nematode.	1	1
13	(C) / Assertion (A) is true, but Reason (R) is false.	1	1
14	(A) / Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).	1	1
15	(B) / Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).	1	1
16	(C) / Assertion (A) is true, but Reason (R) is false.	1	1

SECTION B									
17	<p>(A) Heroin is obtained by acetylation of morphine / Both are opioids.</p> <p>Effects – Morphine is a very effective sedative/painkiller</p> <p>- Heroin is a depressant/slows down body functions.</p> <p style="text-align: center;">OR</p> <p>(B) (i)</p> <p>(1) Whisky/ Brandy/ Rum</p> <p>(2) Wine/Beer</p> <p>(ii) Cyanobacteria fix atmospheric nitrogen, add organic matter to soil ,and increase soil fertility.</p> <p style="text-align: center;">(Any two uses)</p>	<p>1</p> <p>½</p> <p>½</p> <p>½</p> <p>½</p> <p>½ + ½</p>	2						
18	<p>(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.</p> <p style="text-align: center;">OR</p> <p>(B)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Net Primary Productivity</th> <th style="width: 50%;">Gross Primary Productivity</th> </tr> </thead> <tbody> <tr> <td>i) Gross primary productivity minus respiration losses (R) is the net primary productivity.</td> <td>i) Gross primary productivity of an ecosystem is the rate of production of organic matter during photosynthesis.</td> </tr> <tr> <td>ii) It is the available biomass for the consumption to heterotrophs.</td> <td>ii) A considerable amount of gross primary is utilised by plants respiration.</td> </tr> </tbody> </table> <p style="text-align: center;">(Any one point)</p>	Net Primary Productivity	Gross Primary Productivity	i) Gross primary productivity minus respiration losses (R) is the net primary productivity.	i) Gross primary productivity of an ecosystem is the rate of production of organic matter during photosynthesis.	ii) It is the available biomass for the consumption to heterotrophs.	ii) A considerable amount of gross primary is utilised by plants respiration.	<p>½ x4</p> <p>2</p>	2
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19	<p>1 = Klinefelter’s Syndrome (44 + XXY)</p> <p>2 = Turner’s Syndrome (44 + XO)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Klinefelter’s Syndrome</th> <th style="width: 50%;">Turner’s Syndrome</th> </tr> </thead> <tbody> <tr> <td>Presence of an extra copy of X chromosome / total 47chromosomes/ Trisomy of sex chromosomes</td> <td>Absence of one of the X chromosome/ total 45 chromosomes/ monosomy of sex chromosomes</td> </tr> <tr> <td>Sterile male</td> <td>Sterile female</td> </tr> </tbody> </table>	Klinefelter’s Syndrome	Turner’s Syndrome	Presence of an extra copy of X chromosome / total 47chromosomes/ Trisomy of sex chromosomes	Absence of one of the X chromosome/ total 45 chromosomes/ monosomy of sex chromosomes	Sterile male	Sterile female	<p>½</p> <p>½</p>	
Klinefelter’s Syndrome	Turner’s Syndrome								
Presence of an extra copy of X chromosome / total 47chromosomes/ Trisomy of sex chromosomes	Absence of one of the X chromosome/ total 45 chromosomes/ monosomy of sex chromosomes								
Sterile male	Sterile female								

	Overall-masculine development with feminine features/Gynaecomastia or development of breast/ tall statured/ Rudimentary ovaries / lack of secondary sexual characters/short stature/underdeveloped feminine character (any other relevant symptom)	1	2
(1 mark for any one correct difference)			
20	(a) Individual 1 = I ^B i Individual 2 = I ^A i (b) Individual 5 - Antigens A and B both are present on RBCs Individual 8 - Neither antigen A nor Antigen B is present on the RBCs	½ ½ ½ ½	2
21	(A) The genetically engineered lymphocytes 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 (lymphocytes) 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 which is followed by placing them briefly at 42° C (heat shock) and then putting them back on ice. (Any two techniques).	1 1 ½+½ ½+½ ½+½	2
SECTION C			
22	(a) 3'- CTTAAG – 5' (b) EcoR-I (c) -Restriction enzyme cuts the strand of DNA between the same two bases on the opposite strands. This leaves single stranded portion or overhanging stretches at the two ends known as sticky ends. /	½ ½ 1	

25	<p>(a) Nucleosome (b) P = DNA Q = Histone octamer (c) Basic/ Positively charged (d)</p> <table border="1" data-bbox="180 289 1053 625"> <thead> <tr> <th data-bbox="180 289 599 390">Euchromatin</th> <th data-bbox="599 289 1053 390">Heterochromatin</th> </tr> </thead> <tbody> <tr> <td data-bbox="180 390 599 491">1. Loosely packed chromatin</td> <td data-bbox="599 390 1053 491">1.Densely packed chromatin</td> </tr> <tr> <td data-bbox="180 491 599 541">2. Lightly stained</td> <td data-bbox="599 491 1053 541">2.Darkly stained</td> </tr> <tr> <td data-bbox="180 541 599 625">3. Transcriptionally active chromatin</td> <td data-bbox="599 541 1053 625">3.Transcriptionally inactive chromatin</td> </tr> </tbody> </table> <p style="text-align: center;">(1 mark for any one correct difference)</p>	Euchromatin	Heterochromatin	1. Loosely packed chromatin	1.Densely packed chromatin	2. Lightly stained	2.Darkly stained	3. Transcriptionally active chromatin	3.Transcriptionally inactive chromatin	$\frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$ $\frac{1}{2}$ 1	3
Euchromatin	Heterochromatin										
1. Loosely packed chromatin	1.Densely packed chromatin										
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26	<p>(a) Amniocentesis , In amniocentesis some of the amniotic fluid of the developing 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 or 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>	$\frac{1}{2} + \frac{1}{2}$ $\frac{1}{2} \times 3$ $\frac{1}{2}$	3								
27	<ul style="list-style-type: none"> ◆ Negatively charged DNA molecules move towards the anode under electric field through a medium or matrix , DNA fragments separate according to their size through sieving effect /Small sized DNA fragments move faster. ◆ Resultant DNA fragments can be utilized : For Recombinant DNA technology , In DNA fingerprinting, In Polymerase Chain Reaction <p style="text-align: center;">(any two correct utilisation)</p>	1 + 1 $\frac{1}{2} + \frac{1}{2}$	3								
28	<p>Differences</p> <table border="1" data-bbox="180 1604 1130 1934"> <thead> <tr> <th data-bbox="180 1604 703 1654">Divergent evolution</th> <th data-bbox="703 1604 1130 1654">Convergent evolution</th> </tr> </thead> <tbody> <tr> <td data-bbox="180 1654 703 1839">Divergent evolution occurs when same structures developed along different directions due to adaptations to different needs</td> <td data-bbox="703 1654 1130 1839">Convergent evolution occurs when different structures evolving for the same function and hence having similarities</td> </tr> <tr> <td data-bbox="180 1839 703 1934">Divergent evolution produces homologous structures.</td> <td data-bbox="703 1839 1130 1934">Convergent evolution can result in analogous structures</td> </tr> </tbody> </table>	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	Divergent evolution produces homologous structures.	Convergent evolution can result in analogous structures	1 + 1			
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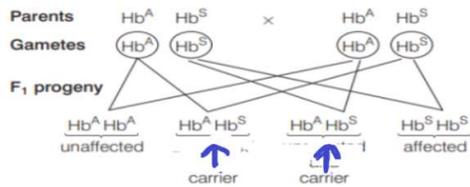
It indicates common ancestry	It indicates similar habitat has resulted in selection of similar adaptive features		
(Any two correct differences)			
Similarities : -both are influenced by the environment / -both contribute to species evolution or any other valid point . (Kindly note- compare and contrast include both similarities and differences)		1	3

SECTION D			
29	a) Luteinising hormone /LH , helps in ovulation / induce rupturing of graafian follicles b) Ovary : Maturation of follicles. Uterus : Proliferation of endometrium lining. c) Q - Progesterone , Maintains pregnancy / maintenance of endometrium <p style="text-align: center;">OR</p> d) Corpus luteum, Graafian follicle transforms into corpus luteum after ovulation	$\frac{1}{2} + \frac{1}{2}$ 1 + 1 $\frac{1}{2} + \frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$	4
30	(a) The butterfly acquires this chemical during its caterpillar stage by feeding on a poisonous weed. (b) $N_{t+1} = N_t + [(B + I) - (D + E)],$ $800 = N_t + [(200 + 200) - (150 + 100)]$ $800 = N_t + (400 - 250)$ $800 = N_t + 150$ $N_t = 800 - 150 = 650$ Comment -As the population density is increasing with time so age pyramid would be of expanding population. (c) Single huge banyan tree - measured in terms of biomass or percent cover , carrot grass- measured in terms of percent cover <p style="text-align: center;">OR</p> (d) Pug marks, faecal pellets.	1 $\frac{1}{2} + \frac{1}{2}$ 1 $\frac{1}{2} + \frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$	4

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

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

 $\frac{1}{2}$

-Ratio 2 : 1 : 1

(Carrier : Disease free: Diseased)

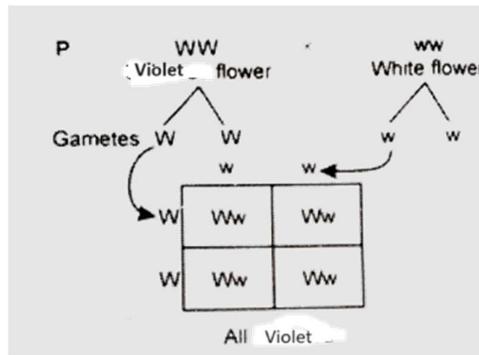
 $\frac{1}{2}$

($\frac{1}{2}$ mark for the correct cross and $\frac{1}{2}$ mark for the correct ratio)

- Adenine is substituted by Thymine

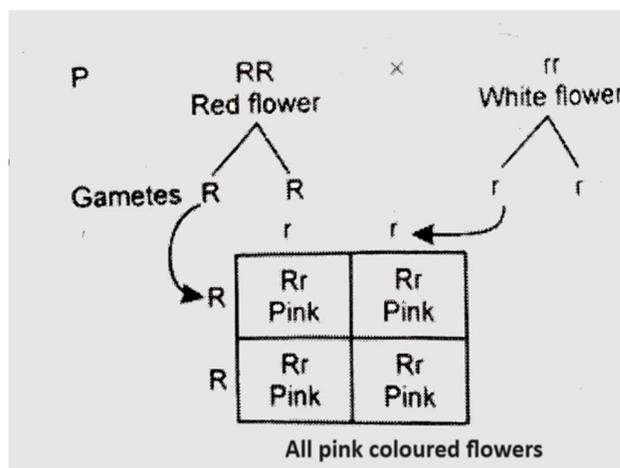
1

(ii) Inheritance pattern of flower colour in garden pea plant follows Law of Dominance because violet colour is dominant over white colour of flower.

 $\frac{1}{2}$ 

1

In case of snapdragon the flower colour shows incomplete dominance and all the F₁ progeny is of pink colour because red colour is not completely dominant over recessive white colour.

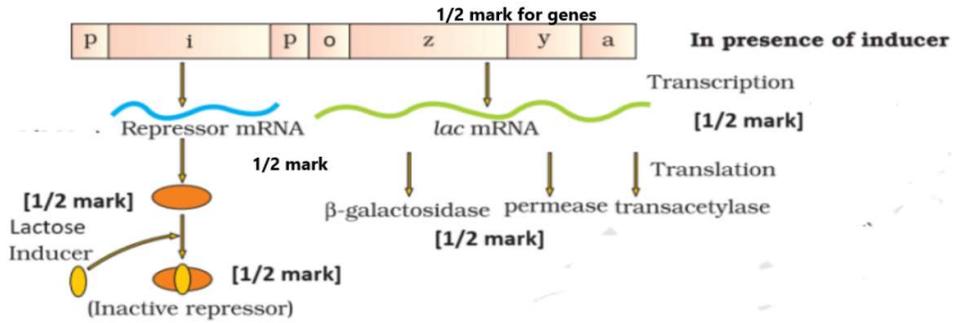
 $\frac{1}{2}$ 

1

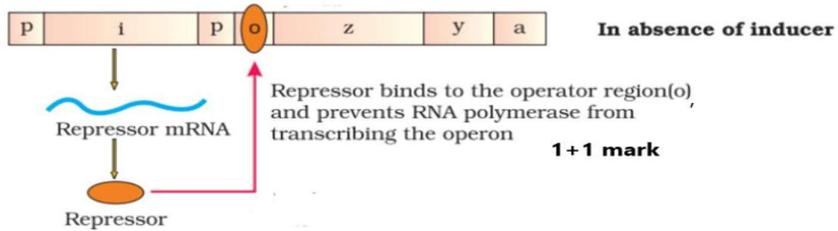
($\frac{1}{2}$ mark for the correct explanation and 1 mark for the correct cross)

OR

B. (i) In presence of inducer



(ii) In absence of inducer



$\frac{1}{2} \times 6$

1+1

5