Senior Secondary School Examination, 2025

BIOLOGY (Subject Code–044)

## [Paper Code: 57/4/3]

Maximum Marks: 70

Q. No.	Expected Answer/Value Points	Marks	Total marks
	Section A		
1.	(A)/ Linker DNA	1	1
2.	(D)/ (i), (iii) and (iv)	1	1
3.	(B)/ Thalassemia is due to less synthesis of globin molecules.	1	1
4.	(B)/ Aa, aa	1	1
5.	(A)/ Histamine and Serotonin	1	1
6.	(C)/ (iii) and (iv)	1	1
7.	(B)/ *Homo habilis*	1	1
8.	(C)/ Serine	1	1
9.	(D)/ Mice	1	1
10.	(A) /	1	1
11.	(B) *Monascus purpureus*	1	1
12.	(D) 3 : 1	1	1
13.	(C) / Assertion (A) is true, but Reason (R) is false.	1	1
14.	(C) / Assertion (A) is true, but Reason (R) is false.	1	1
15.	(A) / Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).	1	1
16.	(D) / Assertion (A) is false, but Reason (R) is true.	1	1
	Section B		
17.	(a) DNA ligase	½	
	(b) Transformation	½	
	(c) Same restriction EcoRI is used to cut both the vector DNA and alien DNA because it will produce complementary overhangs or sticky ends which will help in joining two DNA strands through hydrogen bonds.	1	2

18.	(a) The clownfish gets protection from the predators due to the presence of stinging tentacles thus deriving benefit from sea anemone, the sea anemone does neither not derive any benefit nor get harmed from the clownfish.	1+1	
	OR		
	(b)		
	Trophic level Secondary consumers /SC — 120 Fishes Primary consumers / PC — 90 Zooplanktons Primary producers / PP — 40 Phytoplanktons ↑ Increasing biomass	1 + 1	
	(Award 1 mark for diagram of inverted pyramid of biomass, and 1 mark for correct trophic levels)		2
19.	(a) - The immunity will decrease.	1	
	- Immature lymphocytes will not differentiate into antigen – sensitive lymphocytes / development and maturation of T-lymphocytes does not take place.	1	
	OR		
	(b) (i)		
	• Virus infected cells secrete proteins called interferons.	½	
	• Interferons protect non-infected cells from further viral infection	½	
	(ii) Cytokine barriers.	1	2
20.	(a) 7 amino acids, the genetic code is a triplet	½ + ½	
	(b) 7 amino acids, the genetic code is a triplet	½ + ½	
			2
21.	(a) (i)		
	(I) Seminal plasma provides nutrition as it is rich in fructose calcium and certain enzymes, provides transportation medium for sperm, helps in maintaining pH of the semen, helps in maturation and motility of sperms, helps in lubrication of penis, or any other correct point **(Any one function)**	½	

	(II) Acrosome is filled with enzymes which help to fertilize ovum/The secretions of the acrosome help the sperm enter into the cytoplasm of the ovum	½		

(ii)

Menarche	Menopause
Is the beginning of the first menstrual cycle	It marks the end of the menstrual cycle
Starts at puberty	Ceases/stops around the age of 50 years

1

(any one difference)

OR

(b)

(i) **Apomixis** is production of seeds without fertilisation whereas **parthenocarpy** is formation of fruits without fertilisation.   1

(ii) Floral parts other than the ovary also contribute to form fruit in cashew and apple so they are not called as true fruits/ in apple and cashew the thalamus also contributes to fruit formation.   1

2

Section C

22. (a) Removal of *Lantana* allows other plants to grow**,** due to which herbivores population increases and that helps to restore the tiger population   1+ 1

(b) *Lantana* being invasive does not allow other plants to grow in its surroundings**,** this will decrease in herbivore population which can in turn cause decline in the tiger population.   ½ + ½

3

23. (a) True-breeding line is one that having undergone continuous self-pollination**,** shows the stable trait inheritance**,** and expression for several generations.   ½ x 3

(b) Law of dominance
– Characters are controlled by discrete unit called factors
– Factors occur in pairs.
– In a dissimilar pair of factors one member of the pair dominates (dominant) the other (recessive).   ½ x 3

3

24. • **Advantage of Green revolution**:
  - Increase in the production of crops, support more population in terms of food**,**   **(Any one advantage)**   1

	• **Disadvantages of Green revolution:** - Use of agrochemicals (fertilisers and pesticides) led to the pollution of soil or water in long run (biomagnification) - Crop management practices such as irrigation is expensive - Agrochemicals were too expensive - Led to increase in soil salinity - Agrochemicals reduce natural soil fertility - Crops become dependent on fertilisers & pesticides. - Or any other correct answer **(Any two disadvantages)**	1+1		3
25.	(a) Wind pollination / Anemophily. (b) To trap air-borne pollen grains. (c) Pollen grains are light and, non-sticky (d) As they need not attract insects or birds or bats/ facilitate the flow of wind	½ ½ ½ + ½ 1		3
26.	After implantation of blastocyst finger-like projections appear on the trophoblast, called chorionic villi, which are surrounded by the uterine tissue, and maternal blood, the chorionic villi and uterine tissue become interdigitated with each other, and form a structural and functional unit between developing embryo or foetus and maternal tissue or body called placenta.	½ x 6		3
27.	– The sewage is constantly agitated mechanically and air is pumped into it. – This allows the vigorous growth of useful microbes into flocs (masses of bacteria associated with fungal hyphae to form mesh like structures). – While growing these microbes consume the major part of the organic matter in the effluent. – This significantly reduces the Biochemical Oxygen Demand or BOD.	1 1 ½ ½		3

28.	(a)		
	(a) Phosphoester linkage/ Phosphoester bond	½	
	(b) Phospho-di-ester linkage / Phospho-di-ester bond	½	
	(b) Two	½	
	(c)		
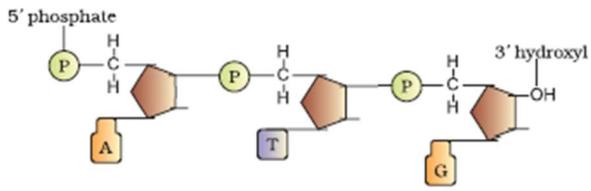
correct 3'-5' ends

correct sugar phosphate backbone   ½ x 3

correct nitrogenous bases

½ x 3

3

Section D

29.	(a)		
	(i) Human and Macaque = Divergent evolution.	½	
	(ii) Human and Frog = Divergent evolution.	½	
	(b)		
	Biochemical similarities in haemoglobin suggests common ancestry.	1	
	(c)		
	(i) Macaque is more closely related to humans than lamprey, because the number of amino acid differences between human and macaque is less / Human and macaque have more biochemical similarities in the structure of haemoglobin than human and lamprey.	1+1	

OR

	(c)			
		(ii) Dog is more closely related to human than frog, because the number of amino acid differences between human and dog is less / dog and human have more biochemical similarities in the structure of haemoglobin than human and frog.	1 + 1	
				4
30.	(a) As opioids are generally taken intravenously and use of contaminated needles or contaminated injections increases the chances of hepatitis B (liver diseases).		1	
	(b) Direct drug related disease means diseases due to overdoses of opioids / fatal overdose of opioids.		1	
	(c) (i)			
		– *Papaver somniferum*	1	
		– Latex	1	
	OR			
	(c) (ii)			
	Drop in academic performance, unexplained absence from school or college , lack of interest in personal hygiene , withdrawal , isolation , depression , fatigue , aggressive , rebellious behaviour , deteriorating relationships with family and friends , loss of interest in hobbies , change in sleeping and eating habits , fluctuations in weight, appetite, stealing , mental and financial destress, or any other correct point.		1 + 1	
	(any two warning signs)			4
	Section E			
31.	(a) (i) • **ELISA**: Enzyme Linked Immuno Sorbent Assay • **Principle**: Antigen – Antibody interaction –		½ ½	

	(ii) – Bone marrow transplantation from a healthy donor. – Enzyme replacement therapy, is when functional ADA is given to the patient by injection. – Gene therapy, lymphocytes from the blood of the patient are grown in a culture outside the body, A functional ADA cDNA (using a retrovirus) is then introduced into these lymphocytes which are subsequently returned to the patient. – If the gene isolated from marrow cells producing ADA is introduced into cells at early embryonic stages it could be a permanent cure. **OR** (b) – DNA fragments are negatively charged molecules, they can be separated by forcing them to move towards the anode, under an electric field, through a medium or matrix of agarose gel, the fragments separate according to their size, the smaller fragments will move farther, fragments are stained with ethidium bromide, and viewed under UV light and are seen as bright orange bands. – The separated band of DNA are cut out from the gel, DNA is extracted from the gel by elution.	1 ½ + ½ ½ x 3 ½ ½ x 8 ½ + ½		
			5	
32.	(a) (i) A population growing in a habitat with limited resources initially shows a lag phase, followed by phases of acceleration and deceleration and, finally a asymptote when the population density reaches the carrying capacity. (ii) Equation: $$\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$$ (N = population density at time t, r = intrinsic rate of natural increase, k = carrying capacity)	½ x 3 1		

(iii)   Logistic growth curve / Verhulst – Pearl Logistic Growth curve/sigmoid growth curve/S-Shaped curve.

½

Correct graphical plot of logistic growth curve.

$$\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$$
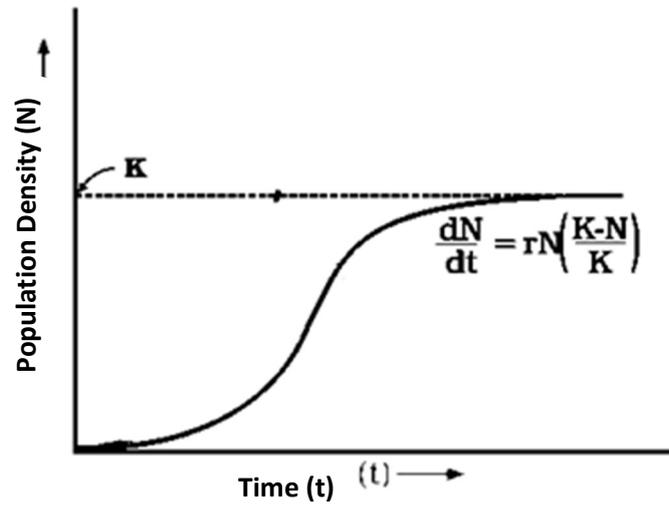
2

OR

(b)

(i)

- Within a region species richness increases with increasing explored area but only upto a limit

1

- Nature of the graph - rectangular hyperbola.

1

	(ii)		
		2	
	(iii) Correct equation – $$S = CA^z \ / \ \log S = \log C + Z \log A$$	1	
	(S = Species richness, A = Area, Z = Slope of the line (regression coefficient), C = Y-intercept)		5
33.	(a) (i) After entering one of the synergids the pollen tube releases the two male gametes into the cytoplasm of the synergid, one of the male gametes moves towards the egg cell and fuses with its nucleus thus completing the syngamy to form zygote, the other male gamete moves towards the two polar nuclei located in the central cell and fuses with it causing triple fusion to form Primary endosperm nucleus (PEN) or Primary endosperm cell (PEC).	1 x 3	
	(ii) Primary endosperm cell (PEC) develops into the endosperm, while the zygote develops into an embryo. **OR** (b) (i) • Each testicular lobule consists of 1-3 highly coiled seminiferous tubules, in which sperms are produced. •	1 + 1 ½ + ½	

Species richness → (vs) Area → curve graph

Or

Species richness → (vs) Area → log-log scale linear graph

(any one graph will be considered)

	– Male germ cells/ spermatogonia, undergo meiotic divisions finally leading to sperm formation	½ + ½	
	– Sertoli cells, provide nutrition to the germ cells.	½ + ½	
(ii)			
	– GnRH acts at the anterior pituitary gland, and stimulates secretion of (two) gonadotropins,	½ + ½	
	– luteinising hormone (LH)	½	
	– follicle stimulating hormone (FSH).	½	5