SOLUTIONS

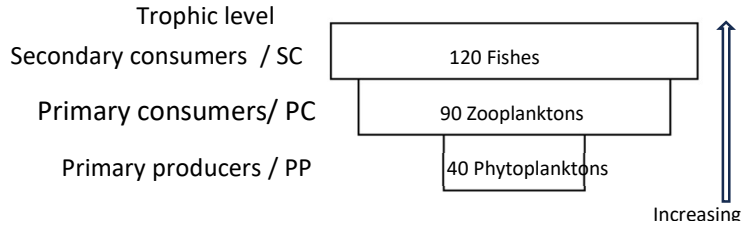
Senior Secondary School Examination, 2025

BIOLOGY (Subject Code-044)

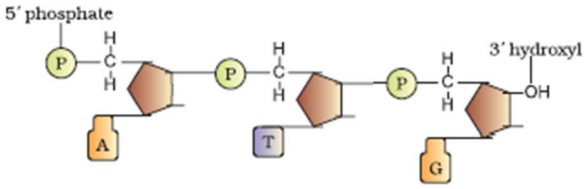
[Paper Code: 57/4/2]

Maximum Marks: 70

Q. No.	EXPECTED ANSER/VALUE POINTS	MARKS	TOTAL MARKS
	Section A		
1.	(B)/ Histones and about 200 bp of DNA	1	1
2.	(B)/ (ii), (iii), and (v)	1	1
3.	(C)/ Single polypeptide chain and functional RNA only	1	1
4.	(C)/ Nil	1	1
5.	(A)/ IgE	1	1
6.	(B)/ (ii) and (iii)	1	1
7.	(C)/ *Australopithecines*	1	1
8.	(A)/ Isoleucine	1	1
9.	(B)/ PCR	1	1
10.	(A) / 	1	1
11.	(D)/ *Propionibacterium sharmanii*	1	1
12.	(A)/ 3 : 1	1	1
13.	(D) / Assertion (A) is false, but Reason (R) is true.	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.	(A) / Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).	1	1
	Section B		
17.	(a) DNA ligase (b) Transformation (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.	½ ½ 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 neither derive any benefit nor get harmed from the clownfish. **OR** (b)  (Award 1 mark for diagram of inverted pyramid of biomass, and 1 mark for correct trophic level)	1 + 1 1 + 1	2
19.	(a) 7 amino acids, the genetic code is a triplet (b) 7 amino acids, the genetic code is triplet	½ + ½ ½ + ½	2
20.	(a) - The immunity will decrease. - Immature lymphocytes will not differentiate into antigen – sensitive lymphocytes / development and maturation of T-lymphocytes does not take place. **OR** (b) (i) • Virus infected cells secrete proteins called interferons. • Interferons protect non-infected cells from further viral infection (ii) Cytokine barriers.	1 1 ½ ½ 1	2
21.	(a) • User-friendly, easily available, effective, reversible, no or least side effects, should not interfere with the sexual drive or desire and/or the sexual act of the user, any other correct feature. **(any two features)**	½ + ½	

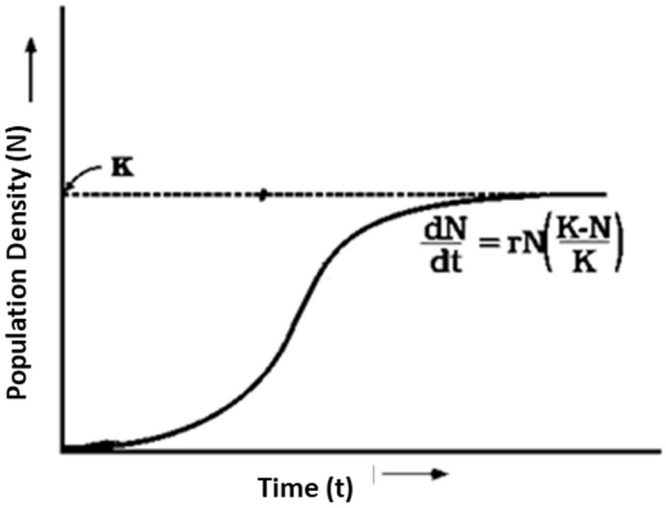
	• – Periodic abstinence, couples avoid or abstain from coitus from day 10 to 17 of the menstrual cycle. – Withdrawal or coitus interruptus, the male partner withdraws his penis from the vagina just before ejaculation. – Lactational amenorrhea, after parturition when mother breast feeds the child intensely ovulation does not occur thus menstrual cycle also not occurs. (**any one method**) **or** (b) • GIFT : Transfer of an ovum collected from a donor into the fallopian tube of another suitable female. • ICSI: Sperm is directly injected into the ovum in *vitro* to form an embryo	½ + ½ 1 1	2
	Section C		
22.	– 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
23.	(a) Wind pollination or 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
24.	• **Advantages 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) (a) Phosphoester linkage/ Phosphoester bond (b) Phospho-di-ester linkage / Phospho-di-ester bond (b) Two (c)  correct 3′-5′ ends correct sugar phosphate backbone correct nitrogenous bases	½ ½ ½ ½ x 3	3
26.	(a) –Can be grown on simple synthetic medium in the laboratory –Complete their life cycle in about two weeks / short life cycle –Single mating could produce a large number of progeny –There is a clear differentiation of the sexes/ the male and female flies are easily distinguishable/show sexual dimorphism –It shows many heritable variations	½ x 4	

	– Inheritable variations can be observed under low power microscope easily **(Any four reasons)** (b) The tightly linked genes show very low recombination frequencies whereas, loosely linked genes show higher recombination frequencies	½ + ½	3
27.	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
28.	(a) Removal of *Lantana* allows other plants to grow, due to which herbivore population increases and that helps to restore the tiger population (b) *Lantana* being invasive does not allow other grasses of plants to grow in its surroundings, this will decrease in herbivore population which can in turn cause decline in the tiger population.	1+ 1 ½ + ½	3
	Section D		
29.	(a) As opioids are generally taken intravenously and use of contaminated needles or contaminated injections increases the chances of hepatitis B (liver diseases). (b) Direct drug related disease means diseases due to overdoses of opioids / fatal overdose of opioids. (c) (i) – *Papaver somniferum* – Latex 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. **(any two signs)**	1 1 1 1 1+1	4

30.	(a) (i) Human and Macaque = Divergent evolution. (ii) Human and Frog = Divergent evolution. (b) Biochemical similarities in haemoglobin suggests common ancestry. (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. **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.	½ ½ 1 1+1 1+1	4
	Section E		
31.	(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) (iii) Logistic growth curve / Verhulst – Pearl Logistic Growth curve/sigmoid growth curve/S-Shaped curve.	½ x 3 1 ½	

Correct graphical plot of logistic growth curve.



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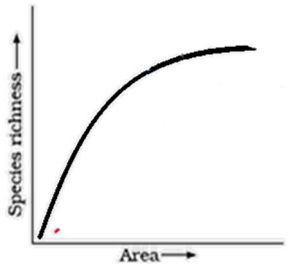
OR

(b)

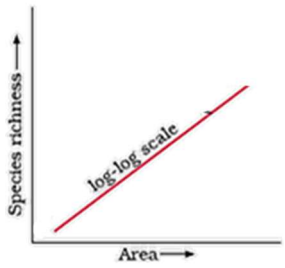
(i)

- Within a region species richness increases with increasing explored area but only upto a limit — 1
- Nature of the graph - rectangular hyperbola. — 1

(ii)



OR



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(any one graph will be considered)

	(iii) Correct equation – $S = CA^Z$ / log S = log C + Z log A (S = Species richness, A = Area, Z = Slope of the line (regression coefficient), C = Y-intercept)	1	5
32.	(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). (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. • Two types of cells – Male germ cells/ spermatogonia, undergo meiotic divisions finally leading to sperm formation – Sertoli cells, provide nutrition to the germ cells. (ii) – GnRH acts at the anterior pituitary gland, and stimulates secretion of (two) gonadotropins, – luteinising hormone (LH) – Follicle stimulating hormone (FSH).	1 x 3 1 + 1 ½ + ½ ½ + ½ ½ + ½ ½ + ½ ½ ½	5
33.	(a) (i) *cryIAc* and *cryIIAb*.	½ + ½	

	(ii) Bt toxin is coded by a gene *cry* , on expression the gene toxic insecticidal protein crystals are formed , which remain in inactive protoxin form , but once an insect ingests the inactive toxin it becomes active , due to the alkaline pH of the gut , it solubilises the crystals , and binds to the surface of epithelial cells of midgut and create pores swelling and lysis , and eventually cause death of the insect.	½ x 8	
	OR		
	(b) (i) (I) In biolistics cells are bombarded with high velocity micro-particles of gold or tungsten coated with DNA, into plant cells (II) In microinjections recombinant DNA is injected directly into the nucleus of, animal cell. (ii) *E. coli* is treated with a specific concentration of a divalent cation such as calcium, this creates (temporary) pores in the cell wall of bacterium which facilitates entry of plasmid or rDNA into the bacterium.	1+ ½ 1 + ½ 1+1	5