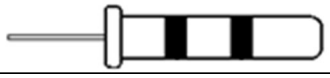
SOLUTIONS

Senior Secondary School Examination, 2025

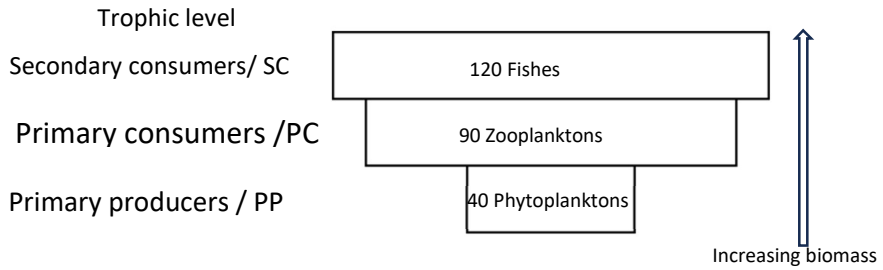
BIOLOGY (Subject Code–044)

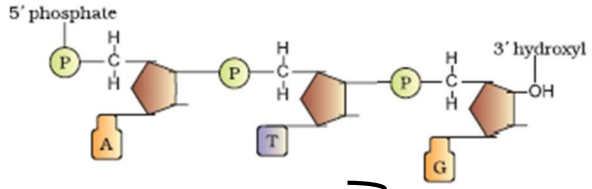
[Paper Code: 57/4/1]

Maximum Marks: 70

Q. No.	EXPECTED ANSER/VALUE POINTS	MARKS	TOTAL MARKS
	Section A		
1.	(C) / Nucleosomes	1	1
2.	(B) / (ii), (iii), (v)	1	1
3.	(B) / Deoxyribonucleoside triphosphate	1	1
4.	(D) / Sex-linked recessive trait	1	1
5.	(D) / Rheumatoid arthritis	1	1
6.	(D) / (ii) and (iv)	1	1
7.	(B) / *Dryopithecus* and *Ramapithecus*	1	1
8.	(C) / Tyrosine	1	1
9.	(D) / ELISA	1	1
10.	(A) / 	1	1
11.	(C) / *Trichoderma polysporum*	1	1
12.	(D) / 3 : 1	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.	(D) / Assertion (A) is false, but Reason (R) is true.	1	1
16.	(C) / Assertion (A) is true, but Reason (R) is false.	1	1
	Section B		
17.	(a) - The immunity will decrease. - Immature lymphocytes will not differentiate into antigen – sensitive lymphocytes / development and maturation of T-lymphocytes does not take place.	1 1	

	OR (b) (i) • Virus infected cells secrete proteins called interferons. • Interferons protect non-infected cells from further viral infection (ii) Cytokine barriers.	½ ½ 1	2
18.	(a) 7 amino acids, the genetic code is a triplet (b) 7 amino acids, the genetic code is triplet	½ + ½ ½ + ½	2
19.	(a) • Medical termination of pregnancy before full term /(Intentional or voluntary) termination of pregnancy before full term. • Get rid of unwanted pregnancies either due to casual unprotected intercourse or failure of the contraceptive used during coitus or rapes, if pregnancy is harmful or even fatal either to the mother or to the foetus or both. **(any one reason)** **OR** (b) - Gonorrhoea , syphilis , genital herpes , chlamydiasis , genital warts , trichomoniasis , hepatitis-B , AIDS, any other correct answer **(any two disease)** - Itching , fluid discharge , slight pain , swelling in genital region , redness, any other correct answer **(any two symotoms)**	1 1 ½ + ½ ½ + ½	2
20.	(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
21.	(a) The clownfish gets protection from the predators due to the presence of stinging tentacles thus deriving benefit from sea	1 + 1	

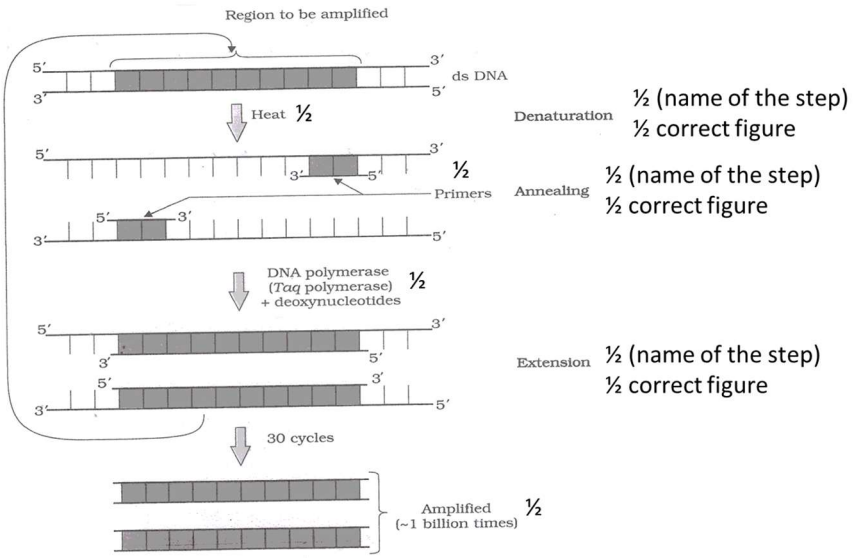
	anemone, the sea anemone neither derive any benefit nor get harmed from the clownfish. **OR** (b)  (Award 1 mark for diagram of inverted pyramid of biomass, and 1 mark for correct trophic level)	1 + 1	2
	Section C		
22.	After implantation of blastocyst finger-like projections appear on the trophoblast**,** 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
23.	(a) True breeding pea plant varieties were selected, distinct contrasting characters were selected for different traits, artificial (self and cross) pollination was conducted carefully, large sample size was used, results were confirmed by performing experiments for several generations, any other correct point **(any two reasons)** (b) When two pairs of traits are combined in a hybrid, segregation of one pair of characters is independent of the other pair of characters.	1 + 1 ½ x 2	3
24.	(a) (a) Phosphoester linkage/ Phosphoester bond (b) Phospho-di-ester linkage / Phospho-di-ester bond (b) Two	½ ½ ½	

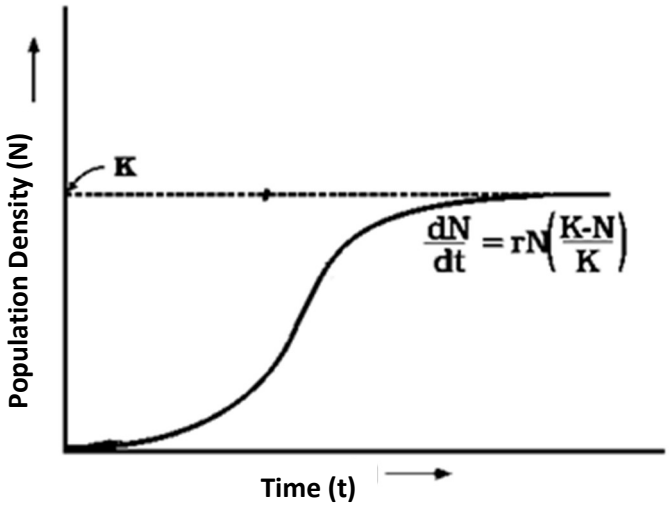
	(c)  correct 3'-5' ends correct sugar phosphate backbone correct nitrogenous bases ½ x 3	½ x 3	3
25.	– The sewage is constantly agitated mechanically and air is pumped into it – This allows the vigorous growth of useful microbes into flocs (masses of bacteria associated with fungal hyphae to form mesh 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
26.	(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
27.	(a) Removal of *Lantana* allows other plants to grow, due to which herbivores population increases and that helps to restore the tiger population (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.	1+ 1 ½ + ½	3
28.	• **Advantage of Green revolution**: - Increase in the production of crops, support more population in terms of food **(any one advantage)**	1	

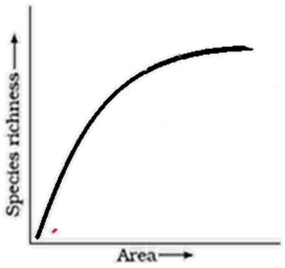
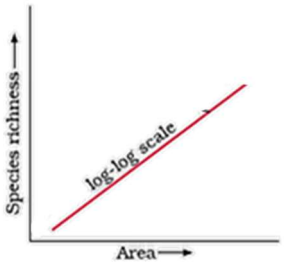
	• **Disadvantages of Green revolution**: - Use of agrochemicals (fertilisers and pesticides) led to the pollution of soil or water in long run (biomagnification) - Crop management practices such as irrigation is expensive - Agrochemicals were too expensive - Led to increase in soil salinity - Agrochemicals reduce natural soil fertility - Crops become dependent on fertilisers & pesticides - Or any other correct answer **(any two disadvantages)**	1 + 1	3
	Section D		
29.	(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

30.	(a) As opiodis 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
	Section E		
31.	(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) and develops into the endosperm, while the zygote develops into an embryo.	1 x 3 1 + 1	

	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).	½ + ½ ½ + ½ ½ + ½ ½ + ½ ½ ½	5
32.	(a) • RNA interference or RNA*i* • Steps of RNA*i* – Using *Agrobacterium* vectors nematode-specific genes were introduced into the host plants – The introduction of DNA was such that it produced both sense and anti-sense RNA in the host cells – Two RNA's being complementary to each other form a double stranded RNA (dsRNA) – This initiated RNA*i* and thus silenced the specific mRNA of the nematode. (consequently the parasite could not survive in a transgenic host expressing specific interfering RNA) **OR**	1 1 x 4	
	(b) • Each cycle in PCR has three steps: Denaturation, Annealing, Extension – **Denaturation**: DNA subjected to higher temperature, the two strands of DNA separate due to broken hydrogen bonds between nitrogenous bases	½ x 3 ½ + ½	

	– **Annealing**: Two sets of primers, which are complementary attach on 3' end of both template strands. – **Extension**: the new strand of DNA is formed using thermostable *Taq* polymerase enzyme (derived from *Thermus aquaticus* bacterium), extends the primers and the nucleotides provided in the reaction and the genomic DNA act as the template. – The process of replication of DNA is repeated 30 times the segment of DNA is amplified 1 billion times i.e. 1 billion copies are made. // (Marks to be allotted if the key points are depicted in the form of the diagram)  	½ + ½ ½ + ½ ½ ½ x 10	5
33.	(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.	½ x 3	

	(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. Correct graphical plot of logistic growth curve.  **OR**	1 ½ 2	
	(b) (i) • Within a region species richness increases with increasing explored area but only upto a limit • Nature of the graph - rectangular hyperbola.	1 1	

	(ii)  **Or**  (any one graph)	2	
	(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