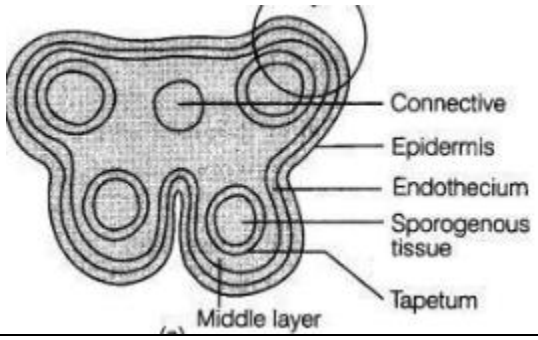
COMMON PRE-BOARD EXAMINATION
BIOLOGY–Code No. 044

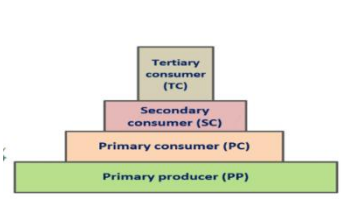
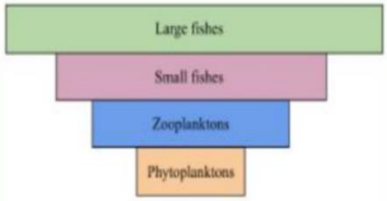
CLASS-XII-(2025-26)

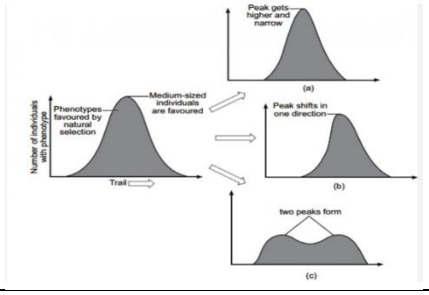
SET: 3

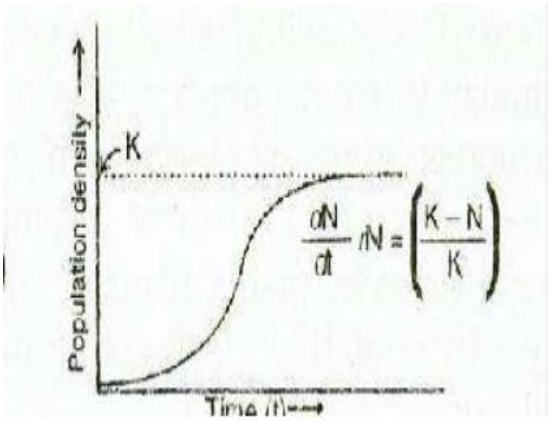
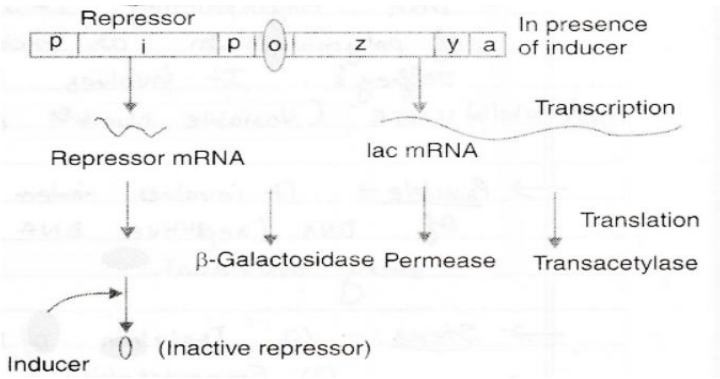
Marking Scheme

SECTION A

1.	B. Unequal cells a larger haploid secondary oocyte and a smaller haploid polar body	**1**
2.	D. Type 3 pollination brings genetically different pollen grains to the stigma	**1**
3.	D. Homologous structures are a result of convergent evolution.	**1**
4.	A.25%	**1**
5.	C. iii, iv, i, ii, v	**1**
6.	D. cryIAb	**1**
7.	B. 5′ (upstream) end and 3′ (downstream) end, respectively of the transcription unit	**1**
8.	A. chitinase	**1**
9.	C. emnbryo sac	**1**
10.	A. convergent evolution	**1**
11.	C. GEAC is Genetic Engineering Approval Company.	**1**
12.	D. B, A, C	**1**
13.	Option D	**1**
14.	Option C	**1**
15.	Option D	**1**
16.	Option A	**1**
	Section – B	
17.	A. In some species, pollen release and stigma receptivity are not synchronized In some other species, the anther and stigma are placed at different positions so that the pollen cannot come in contact with the stigma of the same flower. Self-incompatibility. Production of unisexual flowers. **½ x 4=2marks** **2 marks** B.(i)Diagram **½ mark,** any two outer layers **½ mark each,** (ii)Tapetum- **½ mark**  	**2**
18.	(i) It should be able to generate its replica (Replication). (ii) It should be stable chemically and structurally. (iii) It should provide the scope for slow changes (mutation) that are required for evolution. (iv) It should be able to express itself in the form of 'Mendelian Characters' **½ mark each**.	**2**
19.	Diagram -Sea **(inverted) ½ mark** Biomass of fish far exceeds that of phytoplankton **½ mark** Diagram-Forest(upright) **½ mark** . Biomass of producer exceeds other trophic levels. **½ mark**	**2**

	 	
20	**<u>Attempt either option A or B.</u>** A.A. Opioid B. *Cannabis sativa* C. *Erythroxylum coca* D. Euphoria/Hallucinations **½ mark x 4 = 2marks** B. Reverse transcription, attack macrophages **(1+1=2)**	**2**
21	**<u>Attempt either option A or B.</u>** A.(i) A Vector B Foreign DNA **½ + ½ =1 mark** (ii) GAATTC CTTAAG **½ mark** (iii)DNA Ligase **½ mark** **OR** B.(i) E.coli or other suitable host **½ mark** (ii) Ampicillin,Tetracyclin,to identify the transformed cells from non transformed cells **½ X3=1 ½ marks**	**2**
	Section – C	
22	**LH and FSH ½ + ½ =1 mark** LH acts at the Leydig cells and stimulates synthesis and secretion of androgens. FSH acts on the Sertoli cells and stimulates secretion of some factors which help in the process of spermiogenesis. **1 mark** (ii) After spermiogenesis, sperm heads become embedded in the Sertoli cells, and are finally released from the seminiferous tubules by the process called spermiation. **1mark**	**3**
23	(i) Paul Ehrlich-Rivet popper hypothesis. Rivet-species, aeroplane -ecosystem.Removal of important rivets-species-affect the aeroplane-ecosystem 2 **mark** (ii) Temperate regions have undergone frequent glaciations in the past. It killed most the species. Tropical latitudes have remained relatively undisturbed for millions of years. (b) Tropical environments are less seasonal which promote niche specialization and lead to a greater species diversity. (c) More solar energy is available in the tropics which contributes to higher productivity and in turn might contribute indirectly to greater diversity**-Any two-1 mark**	**3**
24	**Oswald Avery, Colin MacLeod and Maclyn McCarty** purified biochemicals (proteins, DNA, RNA, etc.) from the heat-killed S cells to see which ones could transform live R cells into S cells. protein-digesting enzymes (**proteases**) and RNA-digesting enzymes (**RNases**) did not affect transformation, so the transforming substance was not a protein or RNA. Digestion with **DNase** did **inhibit transformation**, suggesting that the **DNA caused the transformation.**	**3**
25	**Cyclosporin A**, that is used as an **immunosuppressive agent in organ-transplant** patients, is produced by the fungus ***Trichoderma polysporum***. **Statins** produced by the yeast ***Monascus purpureus*** **-blood-cholesterol lowering agents.** **Or any other suitable example ½ x 6= 3marks**	**3**

26	Copper releasing IUDs (CuT, Cu7, Multiload 375) any two = ½ + ½ **=1 mark**. The Cu ions released suppress sperm motility and the fertilising capacity of sperms-½ + ½ **=1 mark** (iii)Intra uterine insemination. **1 mark**	**3**
27	Natural selection can lead to stabilisation (in which more individuals acquire mean character value), directional change (more individuals acquire value other than the mean character value) or disruption (more individuals acquire peripheral character value at both ends of the distribution curve (**1 ½ marks)** Representation: **1½ marks**  	**3**
28	Autosomal recessive, **1 mark** example sickle cell anaemia.**1 mark (or any other suitable example)**. Parents are the carriers of the defective gene-defective genes are expressed in first generation in both of the sexes. Normal individual can be a carrier. (normal, carrier and affected)**1 mark.**	**3**
	Section – D	
29	A. Asteraceae and grasses **1 mark** B. some of the nucellar cells surrounding the embryo sac start dividing, protrude into the embryo sac and develop into the embryos. **2marks** **Attempt either subpart C or D** C. Desirable hybrid characteristics can be maintained over generations without segregation. Farmers do not need to buy hybrid seeds every season, as apomictic plants can produce identical seeds year after year. Apomictic seeds produce offspring that are genetically identical to the parent plant, preserving desirable traits. **Any 2 points =1mark** D. Parthenocarpy **1mark**	**4**
30	A. When ready-made antibodies are directly given to protect the body against foreign agents, it is called passive immunity eg- colostrum secreted by mother or other antibodies received from mother through placenta ½ + ½ **= 1 mark (or any other suitable example)** B. The immune system produces antibodies and **memory cells** specific to that virus. **During anamnestic response/secondary response** due to this memory cells, body recognises the pathogen fast. **2 marks** **Attempt either subpart C or D** C. IgE **1mark** D. Due to genetic and other unknown reasons, the body attacks self-cells. This results in damage to the body and is called auto-immune disease eg-Rheumatoid arthritis. **½ mark+ ½ mark=1mark (or any other suitable example)**	**4**
	Section – E	
31	A.(i) a. Mutualism b. Commensalism	**5**

	c. Competition **1 ½ marks** (ii) Declining. ½ **mark** (iii) A population growing in a habitat with limited resources show initially a lag phase, followed by phases of acceleration and deceleration and finally an asymptote, when the population density reaches the carrying capacity. A plot of N in relation to time (t) results in a sigmoid curve. This type of population growth is called Verhulst-Pearl Logistic Growth and is described by  $dN/dt = rN\left(\frac{K-N}{K}\right)$ Where N = Population density at time t r = Intrinsic rate of natural increase K = Carrying capacity. **Explanation 1 mark+ Diagram 1 mark + Equation 1 mark.= 3marks** **OR** B. **Type of food chains:** • **Aquatic ecosystem:** *Grazing food chain* • **Terrestrial ecosystem:** *Detritus food chain* **1 mark**	
	Differences between Grazing and Detritus Food Chains: **Grazing Food Chain** / **Detritus Food Chain** 1. Begins with living green plants (producers). / 1. Begins with dead organic matter (detritus). 2. Major energy flow occurs through herbivores feeding on producers. / 2. Major energy flow occurs through decomposers feeding on detritus. 3. Common in aquatic ecosystems. / 3. Common in terrestrial ecosystems. Any 2 points-**2marks.** (ii) Chemical nature of detritus - Substances like cellulose and lignin decompose slowly, while sugars and proteins decompose faster. Temperature - Warm and moist conditions f**avour** rapid decomposition, while low temperatures slow it down. **1+1 2marks**	
32.	**A.**  **Diagram with labelling 2 marks**	**5**

	Lactose(inducer**) ½ mark** binds itself to active repressor and changes its structure. The repressor now fails to bind to the operator. **½ mark** Then RNA polymerase starts transcription of operon by binding to the promoter site P. **1 mark** the three enzymes for lactose metabolism are synthesized. **1mark** **OR** B. (i)DNA finger printing/Forensic science-**1 mark. Significance- -**criminal investigations, paternity testing, and identifying genetic relationships **any 2 points (½ + ½ = 1 mark)** (i) **The RNA polymerase I** transcribes rRNAs (28S, 18S, and 5.8S) **½ mark** (ii) **The RNA polymerase III** is responsible for transcription of tRNA, 5srRNA, and snRNAs (small nuclear RNAs). **½ mark** (iii) **The RNA polymerase II** transcribes precursor of mRNA, the heterogeneous nuclear RNA (hnRNA). **½ mark** (iv) The second complexity is that the primary transcripts contain both the exons and the introns and are non-functional. Hence, it is subjected to a process called **splicing** where the introns are removed and exons are joined in a defined order. hnRNA undergoes additional processing called as **capping** and tailing. In capping an unusual nucleotide (methyl guanosine triphosphate) is added to the 5'-end of hnRNA. **In tailing**, adenylate residues (200-300) are added at 3'-end in a template independent manner. It is the fully processed hnRNA, (**1 ½ marks)**	
33.	A.i) Gel electrophoresis- 1 **mark** **DNA fragments are negatively charged molecules**, and when an electric field is applied, they move towards the **positive electrode (anode)**. The **smaller fragments move faster** through the gel matrix than the larger ones, thus separating according to size.-**1mark** (ii) Agarose gel. -1 **mark** (iii) The separated DNA fragments are **visualised under UV light** after staining with a **dye such as ethidium bromide -1mark** The desired DNA band is then **cut out from the gel** and **purified** using **elution. 1 mark** **OR** **B**. (i) PCR-Polymerase chain reaction. **1 mark** (ii) Taq polymerase. *Thermus aquaticus* **1mark** (iii) Multiple copies of the gene (or DNA) of interest is synthesised in vitro using two sets of primers (small chemically synthesised oligonucleotides that are complementary to the regions of DNA) and the enzyme DNA polymerase. Polymerase chain reaction (PCR): Each cycle has three steps: (i) Denaturation; (ii) Primer annealing; and (iii) Extension of primers. The enzyme extends the primers using the nucleotides provided in the reaction and the genomic DNA as template. **3 mark**	**5**