# B.K. BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS
A CBSE DAY-CUM-BOYS' RESIDENTIAL SCHOOL

PRE-BOARD-II EXAMINATION 2025-26
BIOLOGY (044)
SET-I MARKING SCHEME
Class: XII — Duration: 3 Hours
Date: 09/12/2025 — Max. Marks:70

| Q. | Question | |
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| | SECTION-A | |
| 1. | B. 200, 50 | 1 |
| 2. | B. Zygote \| Suspensor \| Cotyledon \| Plumule | 1 |
| 3. | B. Human chorionic gonadotropin | 1 |
| 4. | B. ii and iii | 1 |
| 5. | D. Down's syndrome | 1 |
| 6. | A. present in the medium and it binds to the repressor. | 1 |
| 7. | C. anti-parallel and complementary | 1 |
| 8. | A. Splicing | 1 |
| 9. | A. AUG | 1 |
| 10. | A. Female Aedes mosquito | 1 |
| 11. | C. Fruit juice | 1 |
| 12. | B. Toxin is inactive | 1 |
| 13. | B. Both A and R are true, and R is not the correct explanation of A. | 1 |
| 14. | B. Both A and R are true, and R is not the correct explanation of A. | 1 |
| 15. | A. Both A and R are true, and R is the correct explanation of A. | 1 |
| 16. | C. A is true but R is false. | 1 |
| | SECTION-B | |
| 17. | A. Pollen tube enters through micropyle by chemotropic guidance.<br>OR<br>B. One male nucleus fuses with egg (syngamy) and the other with polar nuclei (triple fusion). | 2 |
| 18. | Four criteria for genetic material:<br>• Must replicate • Must store information<br>• Must undergo mutation/variation • Must express information. | 2 |
| 19. | (i) Cannabis sativa (ii) Causes euphoria, hallucinations, impaired coordination. | 2 |
| 20. | A. Curd easier to digest because:<br>• Lactose → lactic acid • Proteins partially digested • Increases digestibility.<br>OR<br>B. Blue–white screening principle:<br>• Recombinant colonies are white (lacZ disrupted)<br>• Non-recombinant blue (functional β-galactosidase). | 2 |
| 21. | A. Upright pyramid (forest ecosystem) vs inverted pyramid (pond ecosystem).<br>OR<br>B. Parasitism: one benefits, other harmed (ex: lice).<br>Gause: no two species with same niche can coexist indefinitely. | 2 |
| | SECTION-C | |

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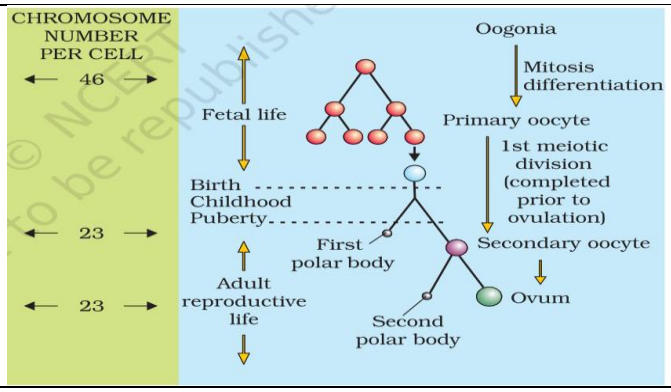
| 22. |  | 3 |
| 23. | (i) IVF is named so because fertilisation of the ovum by the sperm occurs outside the human body, in a laboratory glass dish or test tube. It helps infertile couples who cannot conceive naturally due to: Blocked fallopian tubes, Low sperm count / motility<br>(ii)GIFT (Gamete Intra-fallopian Transfer)<br>Gametes (sperm + oocytes) are placed directly into the fallopian tubes. Fertilisation occurs inside the female body. Used when the woman has normal ovulation.<br>ZIFT (Zygote Intra-fallopian Transfer)A zygote (fertilized egg) formed in the lab is transferred into the fallopian tube. Fertilisation occurs outside the body (in vitro).<br>Used when fertilisation fails inside the body. | 3 |
| 24. | (i)W Karyotype: 47, XXY<br>Genetic disorder: Klinefelter's syndrome<br>(ii) Taller than average with long limbs<br>Underdeveloped testes → sterility<br>Feminine features such as gynecomastia (breast development)<br>Low testosterone levels (Any two)<br>(iii) Non-dysjunction during oogenesis, where the two X chromosomes fail to separate during meiosis. | 3 |
| 25. | (i) Oparin–Haldane Theory (Chemical Evolution Theory)<br>Life originated gradually from non-living inorganic molecules on the primitive Earth.<br>Early Earth conditions included:<br>High temperature, Reducing atmosphere ($CH_4$, $NH_3$, $H_2$, $H_2O$)<br>Frequent lightning, UV radiation<br>These conditions caused simple molecules to combine into organic molecules (amino acids, sugars).<br>These later formed coacervates / protocells → eventually primitive living cells.<br>(ii) Miller's Experiment (1953):<br>He created a closed apparatus simulating primitive Earth conditions:<br>Gases: $CH_4$, $NH_3$, $H_2$, water vapour<br>Heat to evaporate water (simulating oceans) Electric sparks (simulating lightning)<br>Results: After one week, the liquid contained: Amino acids (glycine, alanine)<br>Simple organic compounds | 3 |
| 26. | i)Trichoderma polysporum (a fungus)<br>ii) Biological role in transplant patients. It acts as an immunosuppressant.<br>Prevents the patient's immune system from rejecting the transplanted kidney.<br>iii)It produces large amounts of citric acid, a major industrial product.<br>It also produces important enzymes such as pectinases and lipases. | 3 |
| 27. | Transgenic animals: Animals whose DNA has been altered by introducing a foreign gene through genetic engineering.<br>Uses: Pharmaceutical production | 3 |

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| | Produce human proteins like insulin, clotting factors, antithrombin in their milk.<br>Disease models: Used to study human diseases such as cancer, Alzheimer's.<br>Toxicity testing: Test safety of drugs before human use. | |
| 28. | a) Birth rate calculation<br>Given:Initial population = 200 frogs, New births = 40<br>Birth rate = Number of births / Initial population<br>= 40 / 200 = 0.20 per year (or 20 births per 100 individuals per year)n a pond.<br>b) Population density can be measured in other ways when number alone is misleading.<br>Examples: 1. Very large organisms<br>Example: A forest with only 10 banyan trees spread across 10 km.<br>Number = small, but biomass and ecological impact = very high.<br>Better measure = biomass or area covered, not count.<br>2. Microscopic organisms<br>Example: bacteria in a pond.<br>Counting individuals is nearly impossible.<br>Density is measured as cells per mL, biomass, or colony-forming units. | 3 |
| | SECTION-D | |
| 29. | A. One embryo sac per ovule; each has 1 egg.<br>B. (i) Fruit P shows polyembryony. Embryos no variation (nucellar = maternal clones).<br>(ii) Ploidy = diploid (2n).<br>C. Fruit Q → parthenocarpic (hormonal induction without fertilisation).<br>OR<br>D. Fruit S → true fruit with seeds (from fertilised ovary). | 4 |
| 30. | A. Temperature pattern: malaria cyclical fever due to RBC rupture.<br>B. Pathogen multiplies asexual reproduction (schizogony) in RBCs.<br>C. Transmitted by female Anopheles mosquito.<br>D. Stages in mosquito gut: Gametocytes → gametes → zygote → ookinete → oocyst | 4 |
| | SECTION-E | |
| 31. | A. (i) No.Only the exons + introns within the transcriptional unit are transcribed. Regulatory promoter regions are not transcribed, and introns are later removed.<br>(ii) Name the shaded and unshaded parts of the gene. Shaded region: Exons<br>Unshaded region: Introns<br>Exons = coding sequences<br>Introns = non-coding sequences that interrupt exons<br>(iii) Gene expression involves:1. Transcription<br>RNA polymerase binds to the promoter.<br>Entire transcription unit (exons + introns) is transcribed into pre-mRNA.<br>2. RNA Processing<br>Splicing removes introns; exons join to form mRNA.<br>Capping at 5′ end and polyadenylation at 3′ end occurs.<br>3. Translation<br>Mature mRNA moves to cytoplasm, binds ribosome.<br>Ribosome decodes the mRNA → synthesizes a polypeptide.<br>(iv) Eukaryotic Gene — Prokaryotic Gene<br>Contains introns and exons — No introns; continuous coding sequence<br>mRNA undergoes capping, tailing,splicing — mRNA needs no processing<br>Transcription occurs in nucleus, translation in cytoplasm — Transcription and translation are coupled<br>Usually monocistronic — Often polycistronic (operons)<br>OR | 5 |

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| | (i) Lac Operon: Regulatory gene: i-gene<br>It produces repressor protein.<br>When lactose is absent, the repressor binds to the operator region, blocking RNA polymerase → operon switched OFF.<br>(ii) lac operon regulation called negative regulation because the repressor inhibits transcription.<br>Operon is active only when repressor is inactivated by lactose (allolactose).<br>(iii) Inducer and functions of Z and Y gene products<br>Inducer: Allolactose (derivative of lactose)<br>Gene Product Function<br>Z β-galactosidase Breaks lactose → glucose + galactose<br>Y Permease Increases permeability for lactose entry | |
| 32. | A. PCR and Insulin<br>(i) Principle of PCR and applications<br>Principle: PCR amplifies a DNA segment through repeated cycles of:<br>Denaturation: DNA strands separate at ~95°C<br>Annealing: Primers bind to template at ~50–60°C<br>Extension: Taq polymerase synthesizes new strands at ~72°C<br>Each cycle doubles DNA → exponential amplification.<br>Applications: DNA fingerprinting, Diagnosis of diseases (HIV, mutations),Forensic science<br>(ii) Structure of mature human insulin + advantage of recombinant insulin<br>Structure<br>Mature insulin has two polypeptide chains: A-chain (21 amino acids) B-chain (30 amino acids)<br>Chains linked by two inter-chain disulfide bonds and one intra-chain bond.<br>Advantage of recombinant insulin: Recombinant human insulin is identical to natural human insulin →<br>No allergic reactions, No risk of contamination<br>Large-scale production possible.<br>OR<br>(i) Gene therapy: Introduction of a normal functional gene to replace or repair a defective gene.<br>Example: Successful in treating SCID (Severe Combined Immunodeficiency) caused by ADA gene defect.<br>(ii) Two ways to protect indigenous knowledge and biological resources<br>Patent laws & Intellectual Property Rights (IPR)<br>Protect inventions and traditional formulations.<br>Biodiversity Act & Access Benefit Sharing (ABS)<br>Ensures local communities receive benefits from using biological resources.<br>Traditional Knowledge Digital Library (TKDL)<br>Digitally documents traditional knowledge to prevent biopiracy. | 5 |

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| 33. | A. Even unrelated species compete when they require similar resources.<br>Examples: Cattle and goats grazing on same pasture<br>Birds and squirrels competing for fruits<br>Barnacles vs mussels on rocky shores<br>B. Competition can be interference-based, not resource-based.<br>Examples: Territorial fights among birds or tigers<br>Hyenas and lions fighting over carcasses even when food is abundant<br>C. Gause's experiments: Paramecium aurelia outcompetes Paramecium caudatum when grown together → caudatum dies out.<br>Shows no two species with identical niches can coexist indefinitely.<br>D. Species undergo niche differentiation or resource partitioning.<br>Examples: Warblers feed on different parts of the same tree<br>Lions and cheetahs hunt different prey sizes<br>Plants flower at different times to reduce competition for pollinators<br>E. When a superior competitor is removed, the inferior species expands into the freed niche.<br>Examples:<br>Removal of one fish species → another species increases rapidly<br>If wolves disappear, deer population expands as grazing area is "released"<br>OR<br>A. First Law: Energy cannot be created or destroyed, only transformed.<br>In a food chain: Solar → chemical energy (plants) Plants → herbivores → carnivores<br>Energy flows but total amount is conserved; only its form changes.<br>B. Regions with higher bird diversity – Common factor: Tropical regions / warm, moist climate<br>Reasons for higher diversity: Stable climate over long periods → speciation<br>High productivity → more food resources<br>Complex habitats (forests, canopy layers) → many ecological niches<br>Less seasonal variation → constant breeding opportunities | 5 |