# COMMON PRE-BOARD EXAMINATION

# BIOLOGY-Code No. 044

# Class-XII-(2025-26)

**SET: 2 MS**

**Time allowed: 3 Hrs.** **Maximum Marks: 70**

| Q. No | Question | Marks |
|---|---|---|
| 1 | C. A transforming principle can transfer genetic traits | **1** |
| 2 | <table><tr><td>D</td><td>Chasmogamous, self/cross-pollination</td><td>Cleistogamous, self- pollination only</td></tr></table> | 1 |
| 3 | B. The winged seed is adapted for wind dispersal, while the aril-covered seed attracts animals for dispersal. | 1 |
| 4. | C. Primary spermatocyte | 1 |
| 5. | B. The presence of repetitive DNA sequences that vary between individuals | 1 |
| 6. | C. Genetic drift is a directional process that always favours beneficial traits. | 1 |
| 7. | C. Unaffected siblings of affected individuals | 1 |
| 8. | D. AUGUCGACAGUCUAAAACAGCGGG | 1 |
| 9. | C. Memory | 1 |
| 10. | B. 64 | 1 |
| 11. | B. A protein that is shorter than its normal version (truncated protein) due to an early stop codon in the new reading frame | 1 |
| 12. | A. Mycorrhizae-mineral uptake from the soil | 1 |
| 13. | A | 1 |
| 14. | C | 1 |
| 15. | A | 1 |
| 16. | C | 1 |
| | **Section - B** | |
| 17 | a) Splicing+ introns that do not code for any protein/amino acids<br><br>b) Split gene arrangement-brief explanation monocistron/coding and noncoding sequence (any 2 pts.) | 1<br><br>½+ ½ |

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| 18 | i) D-exine<br>ii) A-generative cell<br>iii) B-vegetative cell<br>iv) C-Intine<br>OR<br>a) Microsporogenesis-microspore tetrad all have potential to form male gametes. Megasporogenesis- megaspore tetrad,3 degenerate and 1 has the potential to form female gamete.<br>b) Fleshy fruits with lots of seeds, hence to prepare jam they would prefer seedless variety through parthenocarpy. | 1/2 x 4<br><br>1<br><br>1 |
| 19. | a) Brief explanation on vaccination and production of antibodies by active immunity<br>b) brief explanation of acquired immunity based on principle of memory. | 1<br>1 |
| 20. | a) Streptokinase<br>b) GM streptococcus (bacteria)<br>c) cyclosporine A+ source-Trichoderma polysporum | ½<br>½<br>½ +½ |
| 21. | a) Keep prey population under control+ ecosystem stability+ conduits of energy transfer across trophic levels (any 2 relevant pts.)<br><br>b) Chemical defences used by herbivores-**plant toxins**<br>Many herbivores eat toxic plants and store the plant's chemical compounds in their own tissues, becoming poisonous or unpalatable to predators. Example: monarch caterpillars feed on milkweed and accumulate cardiac glycosides, which make adult butterflies distasteful to birds. / Some stick insects and grasshoppers emit defensive secretions that irritate or repel predators (any 1 relevant pt.) | 1<br><br>1 |
| | SECTION C | |
| 22. | Sudesh-Thalassemia + Mahesh-sickle cell anaemia<br><br>Thalassemia-α-under the control of two genes HBA1 and HBA2 on chromosome 16 & β- under the control of one gene HBB on chromosome 11. Due to mutations on any of these genes the synthesis of globin molecule is reduced.<br><br>sickle cell anemia-caused by point mutation-substitution at the sixth codon of βHB from GAG to CUG. Mutant HB undergoes polymerization and becomes sickle shaped. | ½ +½<br><br>1<br><br>1 |
| 23. | a. **Ovulation:** LH surge is essential for ovulation. Low LH → no ovulation → Without ovulation, no corpus luteum forms → low progesterone.<br><br>**b. Endometrium:** Poor progesterone → inadequate endometrial thickening → failed implantation<br><br>**c. Fertility:** Reduced fertility due to absence of egg release and poor uterine preparation. | 1<br><br>1<br><br>1 |
| 24. | a. single sperm is injected directly into oocyte cytoplasm using micromanipulation; used when sperm count/motility is very poor; advantage — bypasses sperm entry problems, increases fertilisation rate in severe male infertility. | 1+1 |

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| | b. progestogens /progesterone-estrogen combinations+ Saheli | 1 |
| 25. | a. frequency of red beetles be q<br>• Red beetles are **bb**, so:<br>• **$q^2$ = 0.30 , q=0.56**<br>p+q =1, hence p=0.44, **p2=0.19**<br>b. sum total of all the allelic frequency in a population is stable + any 2 factors.<br>c. percentage of that beetles are heterozygous (Bb)<br>Heterozygous frequency = **2pq**:<br>• 2pq = 2 × 0.56× 0.44 ≈ 0.2128<br>**Answer: 21.28%** | 1<br>½ +½<br>1 |
| 26 | a. B & C -secondary/biological treatment (B-aerobic & C anaerobic) + brief explanation of both processes.<br>b. BOD-low BOD less pollution | ½ +½ + 1<br>1 |
| 27. | A i. DNA ligase<br>ii. Same sticky ends/hydrogen bonds formed, facilitates ligation.<br>iii. Definition of palindrome with any one eg EoR1, palindrome nucleotide sequence 5'- GAATTC-3'<br>OR<br>B i, Disrupts the tetracycline resistance gene+ r plasmid susceptible to tetracycline but still resistant to ampicillin.<br>ii. Replica plating-brief explanation- ampicillin plate, tetracycline plate<br>iii. They help in easy linkage of foreign DNA and selection of recombinants from non-recombinants | ½<br>½<br>1 +1<br>½ +½<br>1<br>½ +½ |
| 28. | a. X-temperate region-longer days and more direct sunlight during summer and opposite for winters/( more seasonal variation of solar radiation in temperate zone and more constant in tropical zone)<br>b. Y-reasons any 3( stability: undisturbed environments, long evolutionary time, stable and constant climate-this encourages niche specialisation, high productivity-more solar energy) | ½<br>1<br>1.5 |
| | SECTION D | |
| 29. | A. Amniocentesis is based on the presence of foetal cells and soluble foetal-derived substances in the amniotic fluid that surrounds the developing embryo, enabling karyotyping and molecular genetic tests.<br>B.Sex determination, female foeticides<br>C.After the amniocentesis was done, the doctor observed the following Karyotype of the foetus-1, answer in relation to it.<br>i. Down's syndrome | 1<br>1<br>1<br>1 |

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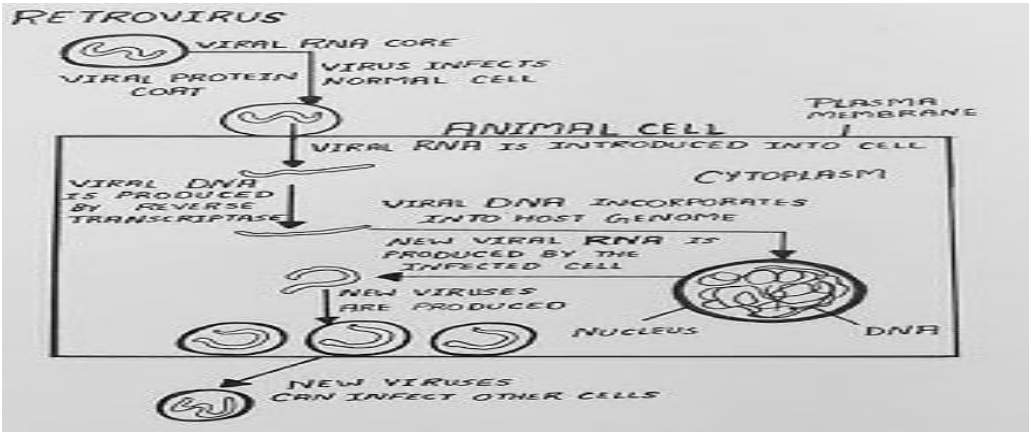
| | ii. Failure of segregation of chromatids during cell division cycle results in the gain or loss of chromosomes (aneupoidy)<br>OR<br>D. i. Klinfelter's syndrome<br>ii. Any two abnormalities of this disorder. | <br><br><br>1<br>½ +½ |
| 30. | A-Body fluids+macrophages<br><br>B. the viral peak in the acute phase+ asymptomatic phase-virus continues to multiply at a low level and immune system gradually weakens+ aids phase-opportunistic infection and severe weight loss<br><br>  <br><br>or<br>D. Enzyme linked Imuno-sorbent Assay+ antigen-antiody-specific binding of an antigen (parts of the HIV virus) to its corresponding antibody and vice versa. | ½ +½<br><br>1<br><br><br><br><br><br><br><br>2<br><br><br><br>1+1 |
| | SECTION E | |
| 31. | a) i sex linked recessive -gen1 only male and gen 2-daughter gets the disease from the carrier mother and diseased father.<br><br>ii. gen 2-$X^d$ X & gen 3- $X^d$ $X^d$<br><br>b. **DNA Wrapping:**<br>Negatively charged DNA wraps around positively charged histone proteins, like a thread around a spool.<br>**Nucleosome Formation:**<br>This structure of DNA wrapped around a histone complex is called a nucleosome, which resembles a "string of beads".<br>**Chromatin Condensation:**<br>Nucleosomes are further coiled and folded into a more compact structure called chromatin, reducing the length of the DNA dramatically. ( any two pts.)<br>c. A test cross determines if an individual showing a dominant trait is homozygous dominant or heterozygous by crossing it with an individual that is homozygous | ½ +½<br><br>½ +½<br><br>1+1<br><br><br><br><br><br><br><br><br><br>1 |

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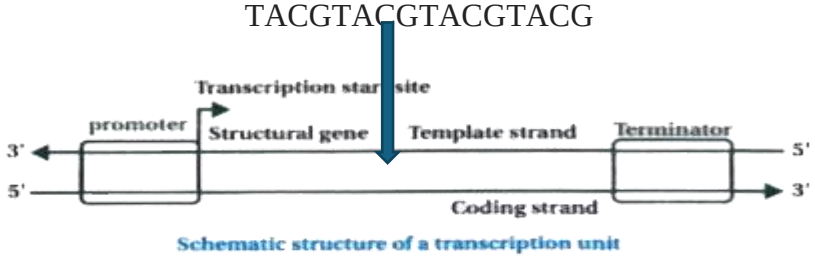
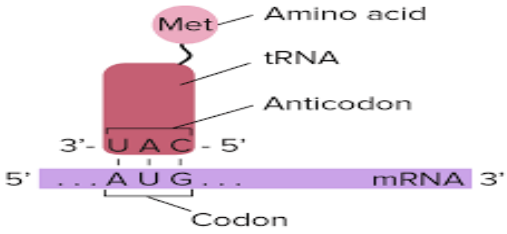
| | recessive for the same trait. Its significance lies in revealing the unknown genotype of an organism with a dominant phenotype by observing the phenotypes of its offspring.<br><br>OR<br><br>a) 5'ATGCAT,GCATGCATGC 3'<br><br>b) 5'AUGCAUGCAUGCAUGC 3'<br><br>c) TACGTACGTACGTACG<br>  <br><br>Schematic structure of a transcription unit<br><br>d)<br>  <br> | 1<br>1<br><br>2<br><br>1 |
| 32 | a. Enzyme replacement therapy, bone marrow transplantation+ gene therapy (any 2) + gene therapy will not require regular revisit by the patient,<br>+Brief explanation of gene therapy method<br>b. Stem cells are undifferentiated, totipotent cells which have the capacity to differentiate into any tissue/organ<br>+ Umbilical cord, bone marrow, blood, adipose tissue (any 2)<br>OR<br>a) Bt cotton is a genetically modified cotton that carries Cry toxin genes (cry1Ac & cry11Ab) from the bacterium Bacillus thuringiensis; the plant produces insecticidal proteins that causes lysis in their midgut and kills the major caterpillar pests (bollworms) that damage cotton bolls. Thus, this **Targeted pest control** reduces the heavy yield losses and hence more yield.<br>b) Tissue culture is the in vitro cultivation of plant cells, tissues, organs, or explants on a sterile, nutrient artificial medium under controlled environmental conditions to regenerate whole plants or specific organs.<br>meristematic explants often remain virus-free even when the parent plant is infected. This is grown in sterile conditions in a nutrient medium, after shoot growth and rooting the plantlets are shifted to the soil in the field.<br>c) RNAi/ silencing RNA-converting it into dsRNA | 1+0.5<br><br>1.5<br><br>1<br>1<br><br>2<br><br>2<br><br>1 |
| 33 | a) a- Expanding & b-Stable+ pre-reproductive+ reproductive+ post-reproductive+ pyramid (a) | 1/2x6=3<br><br>1/2 |

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| | b) Coevolution is a fascinating biological process where two or more species influence each other's evolution over time. this is beautifully illustrated through **mutualism**, where both interacting species benefit and evolve together.<br><br>Example: The Fig and the Wasp<br><br>The fig tree provides a safe place and nourishment for the wasp to lay its eggs.<br><br>The fig wasp, in turn, pollinates the fig flowers while laying eggs, ensuring the tree's reproduction.<br><br>This relationship is highly specific:<br><br>Each species of fig is pollinated by its own specific species of wasp.<br><br>If either partner is absent, the life cycle of the other is disrupted. Thus, an example of **obligate mutualism**, where both species are entirely dependent on each other for survival and reproduction **(any other example with relevant explanation)**<br><br>OR<br><br>a) Gause's '*Competitive Exclusion Principle'* states that two closely related species competing for the same resources cannot co-exist indefinitely and the competitively inferior one will be eliminated eventually.<br>MacArthur showed that five closely related species of warblers living on the same tree were able to avoid competition and co-exist due to behavioural differences in their foraging activities, for instance, different times for feeding or different foraging patterns.<br>b) In this approach, threatened animals and plants are taken out from their natural habitat and placed in special setting where they can be protected and given special care<br>Gametes of threatened species can be preserved in viable and fertile condition for long periods using cryopreservation techniques, eggs can be fertilised *invitro*, and plants can be propagated using tissue culture methods. Seeds of different genetic strains of commercially important plants can be kept for long periods in seed banks. (any two methods)<br>c) The recent illegal introduction of the African catfish *Clarias gariepinus* for aquaculture purposes is posing a threat to the indigenous catfishes in our rivers | 1.5<br><br>1<br><br>1<br><br>1<br><br>1<br><br>1 |