



COMMON PRE-BOARD EXAMINATION

BIOLOGY-Code No. 044

Class-XII-(2025-26)



SET: 1 MS

Time allowed: 3 Hrs.

Maximum Marks: 70

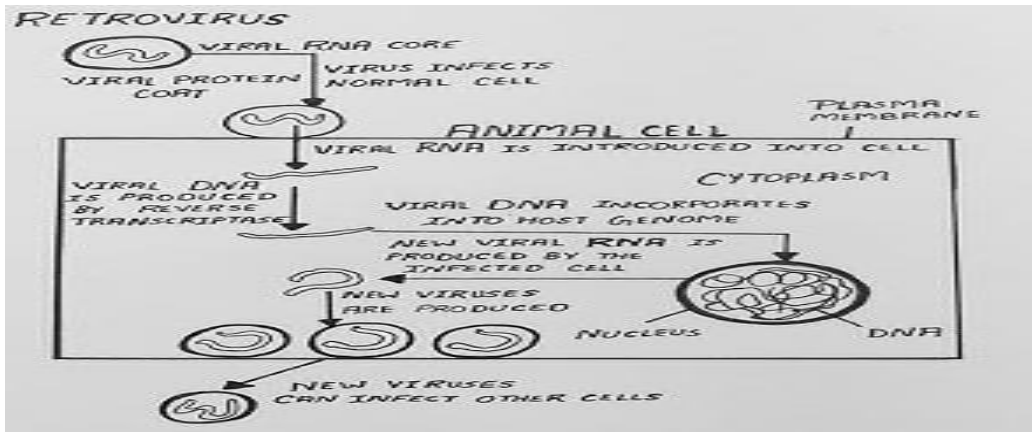
| Q. No | Question | Marks |
|-------|--|---------|
| 1 | D Chasmogamous, self/cross-pollination | 1 |
| | Cleistogamous, self- pollination only | |
| 2 | B. The winged seed is adapted for wind dispersal, while the aril-covered seed attracts animals for dispersal. | 1 |
| 3. | C. Primary spermatocyte | 1 |
| 4. | C. A transforming principle can transfer genetic traits | 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 | i) D-exine ii) A-generative cell iii) B-vegetative cell iv) C-Intine | 1/2 x 4 |
| | OR | |
| | a) Microsporogenesis-microspore tetrad all have the potential to form male gametes. Megasporogenesis- megaspore tetrad,3 degenerate and 1 has the potential to form a female gamete. | 1 |
| | b) Fleshy fruits with lots of seeds; hence, to prepare jam, they would prefer a seedless variety through parthenocarpy. | 1 |

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| 18. | a) Splicing+ introns that do not code for any protein/amino acids b) Split gene arrangement-brief explanation monocistron/coding and noncoding sequence (any 2 pts.) | 1 ½+ ½ |
| 19. | a) Brief explanation on vaccination and production of antibodies by active immunity. b) Brief explanation of acquired immunity based on the principle of memory. | 1 1 |
| 20. | a) Streptokinase b) GM Streptococcus (bacteria) c) cyclosporine A+ source-Trichoderma polysporum | ½ ½ ½+½ |
| 21. | a) Keep prey population under control+ ecosystem stability+ + conduits of energy transfer across trophic levels (any 2 relevant pts.) b) Chemical defences used by herbivores- plant toxins 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 1 |
| SECTION C | | |
| 22. | a) A single sperm is injected directly into the oocyte cytoplasm using micromanipulation; used when sperm count/motility is very poor; advantage — bypasses sperm entry problems, increases fertilisation rate in severe male infertility. b) Progestogens /progesterone-estrogen combinations+ Saheli | 1+1 1 |
| 23. | a) Ovulation: LH surge is essential for ovulation. Low LH → no ovulation → Without ovulation, no corpus luteum forms → low progesterone. b) Endometrium: Poor progesterone → inadequate endometrial thickening → failed implantation c) Fertility: Reduced fertility due to the absence of egg release and poor uterine preparation. | 1 1 1 |
| 24. | Sudesh-Thalassemia + Mahesh-sickle cell anaemia 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 the globin molecule is reduced. sickle cell anemia-caused by a point mutation-substitution at the sixth codon of β HBB from GAG to CUG. Mutant HB undergoes polymerisation and becomes sickle-shaped. | ½+½ 1 1 |
| 25. | a) Frequency of red beetles be q • Red beetles are bb , so: | 1 |

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| | <ul style="list-style-type: none"> $q^2 = 0.30$, $q=0.56$ <p>$p+q = 1$, hence $p=0.44$, $p^2=0.19$</p> <p>b) Sum total of all the allelic frequency in a population is stable + any 2 factors.</p> <p>c) Percentage of that beetles are heterozygous (Bb)</p> <p>Heterozygous frequency = $2pq$:</p> <ul style="list-style-type: none"> $2pq = 2 \times 0.56 \times 0.44 \approx 0.2128$ <p>Answer: 21.28%</p> | <p>$\frac{1}{2} + \frac{1}{2}$</p> <p>1</p> |
| 26 | <p>a) B & C -secondary/biological treatment (B-aerobic & C anaerobic) + brief explanation of both processes.</p> <p>b) BOD-low BOD less pollution</p> | <p>$\frac{1}{2} + \frac{1}{2}$</p> <p>+ 1</p> <p>1</p> |
| 27. | <p>A i. DNA ligase</p> <p>ii. Same sticky ends/hydrogen bonds formed, facilitate ligation.</p> <p>iii. Definition of palindrome with any one eg EcoRI, palindrome nucleotide sequence 5'- GAATTC-3'</p> <p style="text-align: center;">OR</p> <p>B i, Disrupts the tetracycline resistance gene+ r plasmid susceptible to tetracycline but still resistant to ampicillin.</p> <p>ii. Replica plating-brief explanation- ampicillin plate, tetracycline plate</p> <p>iii. They help in the easy linkage of foreign DNA and selection of recombinants from non-recombinants</p> | <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>1 +1</p> <p>$\frac{1}{2} + \frac{1}{2}$</p> <p>1</p> <p>$\frac{1}{2} + \frac{1}{2}$</p> |
| 28. | <p>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)</p> <p>b) Y-reasons any 3(stability: undisturbed environments, long evolutionary time, stable and constant climate-this encourages niche specialization, high productivity-more solar energy)</p> | <p>$\frac{1}{2}$</p> <p>1</p> <p>1.5</p> |
| SECTION D | | |
| 29. | <p>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.</p> <p>B. Sex determination, female foeticides</p> <p>C. After the amniocentesis was done, the doctor observed the following Karyotype of the foetus-1, answer in relation to it.</p> <p>i. Down's syndrome</p> <p>ii. Failure of segregation of chromatids during the cell division cycle results in the gain or loss of chromosomes (aneupoidy)</p> <p style="text-align: center;">OR</p> <p>D. i. Klinefelter's syndrome</p> <p>ii. Any two abnormalities of this disorder.</p> | <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>$\frac{1}{2} + \frac{1}{2}$</p> |
| 30. | A-Body fluids+macrophages | $\frac{1}{2} + \frac{1}{2}$ |

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

1



2

or

D. Enzyme linked Immuno-sorbent Assay+ antigen-antibody-specific binding of an antigen (parts of the HIV virus) to its corresponding antibody and vice versa.

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. 1/2 + 1/2

ii. gen 2- $X^d X$ & gen 3- $X^d X^d$ 1/2 + 1/2

b) DNA Wrapping:

1+1

Negatively charged DNA wraps around positively charged histone proteins, like a thread around a spool.

Nucleosome Formation:

This structure of DNA wrapped around a histone complex is called a nucleosome, which resembles a "string of beads".

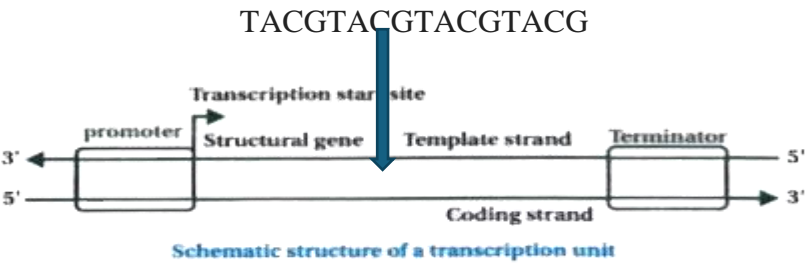
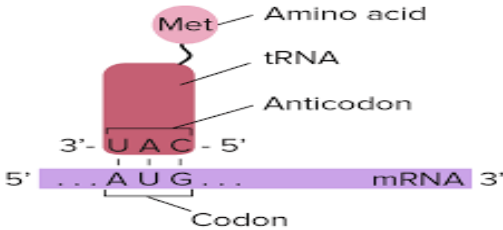
Chromatin Condensation:

Nucleosomes are further coiled and folded into a more compact structure called chromatin, reducing the length of the DNA dramatically. (any two pts.)

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 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. 1

OR

a) 5'ATGCAT,GCATGCATGC 3' 1

| | | |
|----|---|--|
| | <p>b) 5' AUGCAUGCAUGCAUGC 3'</p> <p>c)</p>  <p>Schematic structure of a transcription unit</p> <p>d)</p>  | <p>1</p> <p>2</p> <p>1</p> |
| 32 | <p>a) Enzyme replacement therapy, bone marrow transplantation+ gene therapy (any 2) + gene therapy will not require regular revisit by the patient, +Brief explanation of gene therapy method</p> <p>b) Stem cells are undifferentiated, totipotent cells which have the capacity to differentiate into any tissue/organ + Umbilical cord, bone marrow, blood, adipose tissue (any 2)</p> <p style="text-align: center;">OR</p> <p>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 cause lysis in their midgut and kill the major caterpillar pests (bollworms) that damage cotton bolls. Thus, this Targeted pest control reduces the heavy yield losses and hence more the yield.</p> <p>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. 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.</p> <p>c) RNAi/ silencing RNA-converting it into dsRNA</p> | <p>1+0.5</p> <p>1.5</p> <p>1</p> <p>1</p> <p>2</p> <p>2</p> <p>1</p> |
| 33 | <p>a) a- Expanding & b-Stable+ pre-reproductive+ reproductive+ post-reproductive+ pyramid (a)</p> <p>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.</p> <p>Example: The Fig and the Wasp</p> <p>The fig tree provides a safe place and nourishment for the wasp to lay its eggs.</p> <p>The fig wasp, in turn, pollinates the fig flowers while laying eggs, ensuring the tree's reproduction.</p> | <p>1/2x6=3</p> <p>1/2</p> <p>1.5</p> |

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| <p>This relationship is highly specific:</p> <p>Each species of fig is pollinated by its own specific species of wasp.</p> <p>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)</p> <p style="text-align: center;">OR</p> <p>a) Gause's '<i>Competitive Exclusion Principle</i>' states that two closely related species competing for the same resources cannot co-exist indefinitely and the competitively inferior one will be eliminated eventually.</p> <p>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.</p> <p>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</p> <p>Gametes of threatened species can be preserved in viable and fertile condition for long periods using cryopreservation techniques, eggs can be fertilised <i>invitro</i>, 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)</p> <p>c) The recent illegal introduction of the African catfish <i>Clarias gariepinus</i> for aquaculture purposes is posing a threat to the indigenous catfishes in our rivers</p> | <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> |
|---|--|