



Name :

Roll No. :

Invigilator's Signature :

**CS/M.TECH (BT)/SEM-1/MBT-104/2009-10
2009**

GENETICS AND CELL BIOLOGY

Time Allotted : 3 Hours

Full Marks : 70

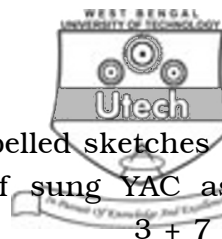
The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer any *three* questions compulsorily attempting at least *one* question from **Group-A** and *one* from **Group-B** :

GROUP – A

1. Describe in brief transformation, transduction, conjugation, transfection and transgenesis with the help of labelled sketches. 10 + 5
2. Discuss in brief Hardy-Weinberg Equilibrium in relation to population genetics. 10 + 5
3. Provide a short account of genetic counselling. Discuss four inborn human diseases due to genetic defects borne on autosomes and on X-chromosome. 2 + 13
4. What is meant by dosage compensation ? Describe with one example the role it plays in the genetic control of sex determination. 3 + 12



5. What does YAC mean ? Describe using labelled sketches the major components. Mention the scope of ~~YAC~~ ^{YAC} as a vector for genetic transformations. 3 + 7 + 5
6. Define the different types of chromosomal aberrations observed in nature. Briefly comment on the cytological and genetical features of the most complex type of chromosomal aberration. 3 + 12

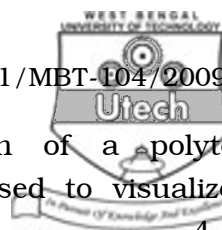
GROUP – B

7. Describe briefly the constituents of ribosome and their role in ribosomal function. 15
8. What is programmed cell death ? Discuss the roles of caspases and TNF in this process. 15
9. Describe the phase of cell cycle and elaborate the events taking place during G_1 and G_2 . 15
10. Present briefly 'signal transduction' in a typical animal cell. State the course taken by a signal to reach the cell target illustrating with a diagram. 15

Answer any *three* questions compulsorily attempting at least *one* question from **Group-C** and *one* from **Group-D** :

GROUP – C

11. Describe RNA interference studied in *Caenorhabditis elegans*. 5
12. What is extracellular DNA (eDNA) ? Note three bulleted points about its implication on the integrity of DNA outside living cells. 3 + 2
13. What is a genetic code ? Write in brief about degeneracy. 3 + 2



14. Draw a labelled sketch of a portion of a polytene chromosome. What stain is normally used to visualize a polytene chromosome ?

4 + 1

GROUP – D

15. Describe cell membrane with labelled illustrations. 5
16. Discuss in brief the organization and function of a typical mitochondrion. 5
17. Present the chain of events in the cell respiration mentioning the ultrastructures involved. 5
18. Present briefly the structure and function of golgi body. 5

Answer any *ten* questions :

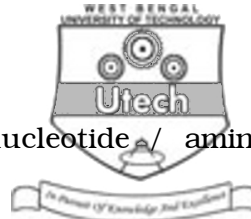
10 × 1 = 10

19. Fill in the blanks :

- i) Extent of linkage is the function of between the genes under consideration.
- ii) polyploidy has played the greatest role in species evolution.
- iii) type of chromosomal aberrations provide raw materials for new gene formation in a genotype.
- iv) A test is a better procedure for gene linkage studies.

Give the correct form of the following :

- v) In the eight-ascospore formation of yeast, the reduction division takes place in division I/II/III.
- vi) The position of *Hfr* has/has no regulatory role in bacterial conjugation to influence the complete transfer of genome.



- vii) According to reverse genetics, the nucleotide / amino acid sequence is the starting point.
- viii) Double-crossover class is produced in linkage of two/three/more than three genes located on the same chromosome.
- ix) The main source of variation in eukaryotic organisms is/are point mutations/polyploidy/recombination/all of these together

Answer briefly :

- x) Provide an account of location and function of cell membrane proteins.
 - xi) Where does 'death domain' occur and what is its significance ?
 - xii) What is the significance of phosphorylation of G-protein in the trimeric state ?
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