



Name :
Roll No. :
Invigilator's Signature :

CS / M.SC (GE) / SEM-1 / MSGEN-104 / 2010-11
2010-11

GENETICS OF ORGANELLES

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

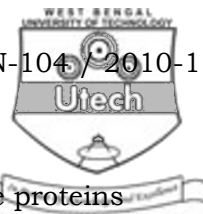
*Candidates are required to give their answers in their own words
as far as practicable.*

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :

10 × 1 = 10

- i) An intimate biological partnership that literary means living together and helping each other is called as
 - a) partnership b) endosymbiosis
 - c) togetherness d) none of these.
- ii) Petite colonies in yeast are actually a defect in
 - a) glucose metabolism b) starch metabolism
 - c) lipid metabolism d) none of these.
- iii) Mitochondrial genome in mammals is about
 - a) 42.5 kb b) 18.5 kb
 - c) 23.0 kb d) 16.5 kb.



- iv) *mtDNA* lacks
- a) non-histone proteins b) histone proteins
- c) ATPase d) none of these.
- v) The number of mating types present in *Chlamydomonas* is
- a) two b) four
- c) five d) six.
- vi) In yeast very small colonies can arise through respiration-deficient
- a) mitochondrial mutants
- b) plastid mutants
- c) nuclear mutants
- d) none of these.
- vii) The killer phenotype in *Paramecium* must contain a symbiotic
- a) Algae b) Bacteria
- c) Fungi d) Virus.
- viii) Late onset degenerative diseases are labelled as disorders of
- a) Cytoplasm b) Nucleus
- c) Mitochondria d) Lysosome.
- ix) In *mtDNA* of human the methionine codon is
- a) AUA b) AGA
- c) AAG d) GAU.



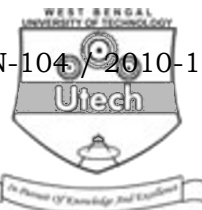
- x) In *mtDNA* of vertebrates the stop codon is
- | | |
|--------|---------|
| a) AUA | b) AGA |
| c) AAG | d) GAU. |
- xi) Size of the *mtDNA* in *Xenopus leavis* is
- | | |
|----------|-------------------|
| a) 14284 | b) 17533 |
| c) 27694 | d) none of these. |
- xii) In a rat liver cell out of total cellular DNA, *mtDNA* constitutes
- | | |
|--------|--------|
| a) 10% | b) 5% |
| c) 3% | d) 1%. |

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

- What types of evidence indicate that mitochondria and chloroplasts are derived from bacteria ? State Endosymbiotic theory. 4 + 1
- A mutant strain of yeast that produced tiny colonies when grown on glucose rich medium was crossed to a wild type strain. All the progenies were wild type. What kind of mutation was responsible for the tiny colonies ? Explain the result. $3\frac{1}{2} + 1\frac{1}{2}$
- Define guide RNAs mentioning their functions.
- Write a short note on ancestral and derived mitochondrial genome.
- Discuss the characteristic features of yeast mitochondrial DNA.



GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. Briefly describe the organization of the genes on the chloroplast genome. What is meant by the term 'promiscuous DNA' ? Write about the biogenesis of chloroplast. $8 + 3 + 4$
8. An *mt* (+) strain of *Chlamydomonas* that was resistant to the antibiotic spectinomycin was crossed with a sensitive *mt* (–) strain. Half the progeny were *mt* (+) and half were *mt* (–), but all were resistant to spectinomycin. When the *mt* (–) spectinomycin-resistant cells were crossed to *mt* (+) spectinomycin-sensitive cells, all the progeny were spectinomycin-sensitive. Explain the inheritance of spectinomycin resistance / sensitivity with diagram.
9. Write short notes on any three : 3×5
 - a) Heteroplasmy and homoplasmy
 - b) Organization of human mitochondrial genome
 - c) Poky mutation in neurospora exhibiting maternal inheritance
 - d) Cytoplasmically inherited male sterility.
 - e) Mitochondrial proteins.
10. 'Mitochondrial DNA undergoes rapid evolutionary changes than nuclear DNA.' Explain. Discuss two diseases that result from mitochondrial gene mutation. Discuss the distinctive features of mitochondrial genome replication. $5 + 5 + 5$

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