



Name :

Roll No. :

Invigilator's Signature :

CS / M.SC (GE) / SEM-1 / MSGEN-102 / 2010-11

2010-11

DNA STRUCTURE AND GENE EXPRESSION

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.*

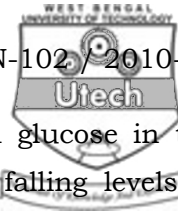
GROUP – A

(Multiple Choice Type Questions)

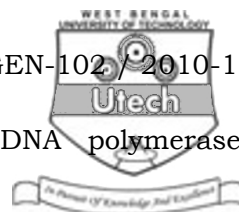
1. Choose the correct alternatives for any *ten* of the following :

10 × 1 = 10

- i) During replication of DNA, which one of the following enzymes polymerizes the Okazaki fragments ?
 - a) DNA polymerase I b) DNA polymerase II
 - c) DNA polymerase III d) RNA polymerase I.
- ii) Helicase for prokaryotes is
 - a) DNA A b) DNA B
 - c) DNA C d) None of these.
- iii) In the absence of glucose, *E. coli* can import lactose to change into glucose and galactose because CAP binds to the
 - a) cAMP b) DNA
 - c) lac operon d) operator.



- iv) *E. coli* is able to use foods other than glucose in the absence of available glucose, because falling levels of glucose cause an increase of
- a) CAP
 - b) lactase
 - c) cAMP
 - d) glu operons.
- v) The most common form of gene expression regulation in both bacteria and eukaryotes is
- a) translational control
 - b) transcriptional control
 - c) post-transcriptional control
 - d) post-translational control.
- vi) When tryptophan is present in the environment of *E. coli*, the tryptophan binds to the
- a) trp operon
 - b) trp promoter
 - c) trp operator
 - d) trp repressor.
- vii) Which of the following is used in rolling circle DNA replication but not in normal cellular DNA replication ?
- a) an endonuclease
 - b) an exonuclease
 - c) primase
 - d) DNA ligase.
- viii) T4 DNA ligase
- a) requires ATP
 - b) joins double-stranded DNA fragments with an adjacent 3-phosphate and 5-OH
 - c) requires NADH
 - d) joins single-stranded DNA.



- ix) The exonuclease activity of the DNA polymerases functions to
- remove the RNA primer sequences
 - proof-read the new DNA strand and remove inappropriate nucleotides
 - maximize the fidelity of DNA replication
 - all of these.
- x) DNA pol alpha helps in
- Initiation of replication
 - Elongation
 - Termination
 - None of these.
- xi) In prokaryotes DNA G acts as a
- Helicase
 - Primase
 - Both (a) and (b)
 - None of these.
- xii) The clamp loader in eukaryotic DNA replication is :
- PCNA
 - RPA
 - RFC
 - None of these.

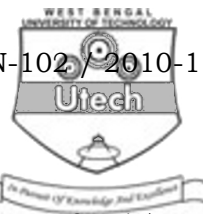
GROUP – B

(Short Answer Type Questions)

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

- Describe Holliday Model of recombination.
- How does base excision repair mechanism repair mutated DNA ?
- What are the characteristics of Genetic Code ?
- How tautomeric shift effects DNA mutation ?
- What are transposons? How is transposition detected in bacteria ?

1 + 4



GROUP – C

(Long Answer Type Questions)

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

7. 'DNA replication is semi-conservative.' Explain. What is the role of DNA gyrase, primase, SSB proteins in DNA replication ? What are the different models of prokaryotic DNA replication ? Describe rolling cycle model with diagram. What is leading and lagging strand ? $3 + 3 + 2 + 5 + 2$
8. What is the utility of two trp codons in the leader polypeptide of trp-operon ? What is the basic difference in the repression system of lac and trp operons ? How is trp-operon regulated by overall availability of tryptophan in the media ? $4 + 4 + 7$
9. How nascent mRNA get protected before entering to cytoplasm ? What are the different methods of splicing of mRNA ? Why is this method necessary ? How does RNA get transported through Nuclear Pore Complex ? $4 + 4 + 2 + 5$
10. Describe the Genetic organization of Lac operon. Mention the function of each gene. What are the different regulations present in Lac operon ? Why in presence of both glucose and lactose in the medium, Lac operon is not fully active ? $4 + 3 + 2 + 6$
11. What do you mean by RNA silencing ? What are the different methods of RNA silencing ? What are mi-RNA and si-RNA ? Describe Double stranded break repair mechanism. $3 + 4 + 4 + 4$

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