

2020

BIOCHEMISTRY — HONOURS

Paper : CC-11

(Gene, Gene Expression and Regulation)

Full Marks : 50

The figures in the margin indicate full marks.

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

1. Answer **any five** questions :

2×5

- (a) What do you mean by annealing and melting temp. of DNA?
- (b) What is transposition?
- (c) Write down two functions of pilus.
- (d) Describe acrocentric chromosome with a diagram.
- (e) What are the major distinguishing features between prokaryotic and eukaryotic genomes?
- (f) What is meant by codon degeneracy? Explain with an example.
- (g) What is splicing?
- (h) What are the functions of SSB protein and DNA polymerase I in replication?
- (i) Differentiate between transition and transversion.
- (j) What is a regulon?

2. Answer **any two** questions :

- (a) (i) What is Shine-Dalgarno Sequence and what is its role in protein synthesis?
(ii) Briefly explain the mechanism of extrinsic termination of transcription in prokaryotes. (1+1)+3
- (b) (i) How does ultraviolet light cause mutations?
(ii) How does the SOS repair system get activated and how does repair take place by this mechanism? 2+(1+2)
- (c) (i) Describe in brief the structure of DNA double helix according to the Watson and Crick model.
(ii) What are heterochromatin and euchromatin? 3+2
- (d) (i) How do Rifampicin and Actinomycin D affect gene expression?
(ii) What is meant by catabolite repression? (1½+1½)+2

Please Turn Over

Unit - I

Answer *any one* question.

3. Explain in brief, what do you understand by :

- (a) Suppressor mutations
- (b) Klenow fragment
- (c) Ames test
- (d) Gene
- (e) Nucleotide Excision Repair.

2+2+2+1+3

4. (a) Mention the important differences between the three classes of transposable elements.

(b) Why is DNA synthesis continuous on one strand and discontinuous on the opposite strand?

(c) Describe a nucleosome briefly.

(3×2)+2+2

Unit - II

Answer *any one* question.

5. (a) What are the properties of genetic code?

(b) What is the function of the sigma factor during transcription in prokaryotes?

(c) Why is mature mRNA in eukaryotes shorter than the primary transcript?

(d) Describe how translation initiation occurs in bacteria with a diagram.

2+2+2+(2½+1½)

6. (a) What is Wobble hypothesis?

(b) Describe briefly how DNA footprinting helps to identify a protein binding site on DNA.

(c) Explain how t-RNA charging occurs in prokaryotes.

(d) Name the subunits of RNA polymerase in prokaryotes, clearly indicating the number of each subunit.

2+3+3+2

Unit - III

Answer *any one* question.

7. Define the following :

(a) Operon

(b) Constitutive gene expression

(c) *Cis* and *trans* acting elements during transcription

(d) Positive and Negative control of gene expression

(e) Hfr strain.

2+1+(1+1)+(1½+1½)+2

8. (a) What are the main differences between transformation and transduction?
- (b) What is the difference between back cross and test cross?
- (c) For each of the following genotypes indicate whether *p*-gal production will be constitutive or inducible (assume that glucose is absent) :
- (i) $i^+ p^+ O^c z^+ y^- / i^s p^+ o^+ z^- y^+$
- (ii) $i^- p^+ o^+ z^+ y^+ / i^+ p^+ o^+ z^- y^+$

Explain your answer.

- (d) A colour-blind male mates with a heterozygous normal female.
- (i) Calculate the probability of having a colour-blind male child. – Explain.
- (ii) Calculate the probability of having a normal female child. – Explain. 2+2+(2+2)+(1+1)
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