

**BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE
PILANI (RAJ.) -333031
BIO G512 (Mol. Mech. Gene Expr.)**

03.10.2016

**II Semester 2016-17
MID SEM Examination**

Max Marks 60.0

NOTE: Codon table is provided overleaf

Q.1 The genetic code is degenerate. Amino acids are encoded by either 1,2,3,4 or 6 triplet codons. An interesting question is whether the frequency of triplet codes is in any way correlated with the frequency that amino acid appears in proteins? That is, is the genetic code optimized for its intended use? Some approximations of the frequency of appearance of nine amino acids in proteins in *E.coli* are shown in the adjacent table.

<u>Amino acids</u>	<u>Percentage</u>
Met	2
Cys	2
Gln	5
Pro	5
Arg	6
Ile	7
Glu	8
Ala	10
Leu	

- (a) Determine how many triplets encode each amino acid.
- (b) Analyze your data to determine what if any, correlations can be drawn between the relative frequencies of amino acids making up proteins with the number of triplets for each. Write a paragraph that states your specific and general conclusions.
- (c) What would be the next steps in your analysis if you wanted to pursue this analysis?
(3 + 4 + 5)
- Q.2** What characteristic of TFIIF make the protein important for transcriptional initiation and elongation? Why? **(7.0 Marks)**
- Q.3** The overall error rate in translation is low, at approximately one wrong amino acid for every 10^4 or 10^5 incorporated. What stages in translation can introduce errors and which of these is the weak point in translation? **(7.0 Marks)**
- Q.4** The protein encoded by some group II introns has independent endonuclease and maturase activities. What does this suggest about the origin of the intron? **(7.0 Marks)**
- Q.5** In eukaryotes, there is a surveillance system that degrades nonfunctional mRNAs that contain termination codons in the coding region. Explain how mRNA degradation is coupled with translation. **(7.0 Marks)**
- Q.6** In nonsense-mediated decay, how is a premature termination codon distinguished from the normal termination codon? **(7.0 Marks)**

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Q.7 What are group I and group II introns, where are they found, and what makes them different from other introns? **(7.0 Marks)**

Q.8 How is the intron splicing process related to the transport of mRNA from the nucleus to the cytoplasm? **(6.0 Marks)**

The genetic code is triplet

First base
Second base

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	U	C	A	G
U	UUU } Phe UUC } UUA } Leu UUG }	UCU } UCC } Ser UCA } UCG }	UAU } Tyr UAC } UAA } STOP UAG }	UGU } Cys UGC } UGA } STOP UGG } Trp
C	CUU } CUC } Leu CUA } CUG }	CCU } CCC } Pro CCA } CCG }	CAU } His CAC } CAA } Gln CAG }	CGU } CGC } Arg CGA } CGG }
A	AUU } AUC } Ile AUA } AUG } Met	ACU } ACC } Thr ACA } ACG }	AAU } Asn AAC } AAA } Lys AAG }	AGU } Ser AGC } AGA } Arg AGG }
G	GUU } GUC } Val GUA } GUG }	GCU } GCC } Ala GCA } GCG }	GAU } Asp GAC } GAA } Glu GAG }	GGU } GGC } Gly GGA } GGG }