Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

IV SEMESTER B.TECH (BIOTECHNOLOGY)

END SEMESTER EXAMINATIONS, NOV/DEC 2015

SUBJECT: CELL AND MOLECULAR BIOLOGY [BIO 202]

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** the questions.
- Missing data may be suitable assumed.

1A.	Antibiotics have been useful in elucidating the steps of protein synthesis. If you have an artificial messenger RNA with the sequence AUGUUUUUUUUUUUU….., it will produce the following polypeptide in a cell-free protein-synthesizing system: fmet-Phe-Phe-Phe….. Assume that, in your search for new antibiotics, you find one called putyermycin, which blocks protein synthesis. When you try it with your artificial mRNA in a cell-free system, the product is fmet-Phe. What step in protein synthesis does putyermycin affect? Why?	**4m**
1B.	Imagine a world in which proteins are made from 65 different amino acids. Assume that in this imaginary world the genetic code is nonoverlapping and utilizes the smallest possible size for a codon that accommodates all amino acids unambiguously. In this particular world, state with justification which of the following mutations in the coding region of a gene would **not** cause a frame-shift? a. an insertion of 2 nucleotides b. an insertion of 3 nucleotides. c. a deletion of 8 nucleotides d. a deletion of 5 nucleotides.	**3m**
1C.	Colchicine is a poison that binds to tubulin and prevents its assembly into microtubules; cytochalasins are compounds that bind to the ends of actin filaments and prevent their elongation. What effects do you think that these two substances would have on cell division in animal cells?	**3m**
2A.	You have purified a virus that infects turnip leaves. Treatment of a sample with phenol removes viral proteins. Application of the residual material to scraped leaves results in the formation of progeny virus particles. You infer that the infectious substance is a nucleic acid. Propose a simple and highly sensitive means of determining whether the infectious nucleic acid is DNA or RNA.	**4m**

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2B.	Hershey and Chase showed that when phages were labeled with ^{32}P and ^{35}S, the ^{35}S remained outside the cell and could be removed without affecting the course of infection, whereas the ^{32}P entered the cell and could be recovered in progeny phages. What distribution of isotopes would you expect to see if parental phages were labeled with isotopes of a) C? b) N? c) H? Explain your answer.	**3m**
2C.	All base pairs in the genome are replicated during the DNA synthesis phase of the cell cycle, but only some of the base pairs are transcribed into RNA. How is it determined which base pairs of the genome are transcribed into RNA?	**3m**
3A.	Stem cell show asymmetric cell division, symmetric cell division or both? Justify your answer.	**4m**
3B.	When a signal transduction pathway involves a phosphorylation cascade, how does the cell's response get turned off?	**3m**
3C.	Since there are about 10^{13} cells in an adult human, and about 10^{10} cells die and are replaced each day, we become new people every three years. State with reason if this statement is true or false.	**3m**
4A.	Nerve growth factor (NGF) is a water-soluble signaling molecule. Would you expect the receptor for NGF to be intracellular or in the plasma membrane? Why?	**4m**
4B.	As a cell grows, its plasma membrane expands. Does this involve endocytosis or exocytosis? Explain.	**3m**
4C.	In order for proliferating cells to maintain a relatively constant size, the length of the cell cycle must match the time it takes for the cell to double in size. State with reason if this statement is true or false.	**3m**
5A.	What are G-protein coupled receptors?	**4m**
5B.	A mutant Tetrahymena has an altered repeated sequence in its telomeric DNA. What change in the telomerase enzyme would produce this phenotype?	**3m**
5C.	A certain mutation in *E.coli* changes the *lac* operator so that the active repressor cannot bind. How would this affect the cell's production of beta-galactosidase?	**3m**
6A.	How does cordycepin (3 -deoxyadenosine) block the synthesis of RNA?	**5m**
6B.	Approximately 70% of human mRNAs undergo alternative splicing. What is the advantage of alternative splicing?	**5m**