Register Number:……..

KUMARAGURU
college of technology
character is life

B.TECH DEGREE EXAMINATIONS: MAY 2017

(Regulation 2015)

Fourth Semester

BIOTECHNOLOGY

U15BTT404 : Cell and Molecular Biology

COURSE OUTCOMES

CO1: Recognize the fundamental concepts in the cell structure and function and membrane transport processes.

CO2: Comprehend the diversified roles of cytoskeletal filaments, the cascade of events in signal transduction

CO3: Discuss and distinguish the replication of prokaryotic and eukaryotic DNA

CO4: Describe the synthesis of RNA and post-transcriptional modifications

CO5: Relate genetic code and protein synthesis

CO6: Evaluate gene regulation, DNA damage and repair mechanisms

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Match the proteins in List I with their corresponding functions in List II CO1 [K_3]

List I	List II
A. Acetylcholine receptor	i. Energy driven ion pumps
B. Bacteriorhodopsin	ii. Simple diffusion channels
C. Porins	iii. Transmembrane ion channels
D. Ca^{2+} ATPase	iv. Light driven proton pump

	A	B	C	D
a)	ii	i	iii	iv
b)	iii	iv	ii	i
c)	ii	iv	iii	i
d)	iii	i	ii	Iv

2. Why do plant cells behave differently to animal cells, when placed in a hypotonic solution? CO1 [K_4]

a) Plant cells are permeable to water
b) Plant cells do not carry out active transport
c) Plant cells contain a vacuole
d) Plant cells have a cell wall

3. Which set of the following events occur during elongation step of translation? CO5 [K_2]

1. Attachment of mRNA with smaller subunit of ribosome.
2. Loading of correct aminoacyl t-RNA into the A site
3. Formation of peptide bond between the aminoacyl t-RNA in the A site and the peptide chain that is attached to the peptidyl-tRNA in the P site.
4. Dissociation of ribosomal subunits.
5. Translocation of peptidyl tRNA from the A site to the P site of the ribosome.

a) 1, 2 & 3
b) 1, 2 & 5
c) 2, 3 & 5
d) 3, 4 & 5

4. Characteristics of intracellular receptors that regulate gene transcription include all of the following except CO2 [K_2]

a) a DNA binding site
b) an extracellular binding site
c) a transcription activating domain
d) may be signaled by lipid soluble molecules

5. **Assertion (A):** In Griffith transformation experiment, the live R had been replaced by S bacteria. CO3 [K_4]

Reason (R): The explanation for this phenomenon is that R cells restored the viability of dead S cells

a) Both A and R are Individually true and R is the correct explanation of A
b) Both A and R are Individually true but R is not the correct explanation of A
c) A is true but R is false
d) A is false but R is true

6. Elongation of telomeres by the enzyme telomerase and the processing of pre-mRNA to mRNA by the spliceosome share which of the following characteristics? CO3 [K_2]

a) Both processes require double stranded DNA for enzyme function
b) Both processes occur primarily in the cytoplasm
c) Both processes require G-proteins and downstream effectors
d) Both process require an RNA component for enzyme function

7. Predict the correct sequence of events in extracellular signaling : CO2 [K_2]

1. Detection of the signal by a specific receptor protein in target cell
2. Transport of signal to the target cell.
3. A change in cellular metabolism or gene expression triggered by the receptor-signalling complex.
4. Synthesis and release of signaling molecules by the signaling cell.

a) 2-3-4-1 b) 1-3-2-4

c) 3-4-2-1 d) 4-2-1-3

8. Which ONE of the following processes does NOT occur in prokaryotic gene expression, but occurs in eukaryotic gene expression? CO4 [K_4]

a) Transcription of mRNA, tRNA and rRNA b) Binding of RNA polymerase to the promoter

c) Addition of a poly-A tail to the 3'end and the 5' capping of an mRNA d) Translation begins as soon as transcription is initiated

9. **Assertion (A):** Coupled transcription-translation does not occur in eukaryotes. CO5 [K_4]

Reason (R): mRNA is synthesized and processed in the nucleus and later transported through the nuclear membrane to the cytoplasm, where the ribosomes are located.

a) Both A and R are Individually true and R is the correct explanation of A b) Both A and R are Individually true but R is not the correct explanation of A

c) A is true but R is false d) A is false but R is true

10. In the lac operon, under which of the following conditions will the lac genes be transcribed at high levels? CO6 [K_4]

a) low glucose, low lactose b) high glucose, low lactose

c) low glucose, high lactose d) high glucose, high lactose

PART B (10 x 2 = 20 Marks)

(Answer not more than 40 words)

11. Why is golgi complex called "traffic police of the cell"? CO1 [K_2]
12. Plasma membrane is fluid in nature. Justify. CO1 [K_5]
13. What is cadherin? Analyze its role in cell-cell adhesion. CO2 [K_4]
14. How do membrane phospholipids acts as second messengers? CO2 [K_2]

15.	Write the different conformations of DNA and their characteristics.	CO3	[K_2]
16.	Compare and contrast the activity of helicase with that of topoisomerase in the context of DNA replication.	CO3	[K_4]
17.	How does transcription differ from replication in the context of initiation?	CO4	[K_4]
18.	Cite the action of GTP in protein synthesis.	CO5	[K_2]
19.	What is the action of base analog mutagens in mutagenesis?	CO6	[K_2]
20.	What is photoreactivation? Summarize its role in DNA repair mechanism.	CO6	[K_2]

Answer any FIVE Questions:-

PART C (5 x 14 = 70 Marks)

(Answer not more than 300 words)

Q.No. 21 is Compulsory

21.	Many regulatory mechanisms are used in bacterial gene expression which depend upon on/off switch systems. Justify the statement with an operon model as an example.	CO6	[K_5]
22.	Discuss the various events in cell cycle with its regulation and critically analyse the check points in cell cycle.	CO1	[K_4]
23.	Analyze the role of receptors and second messengers in signal transduction cascade.	CO2	[K_4]
24.	Describe the process of replication in eukaryotic chromosomes and add a note on replication of telomere in the ends of chromosome.	CO3	[K_3]
25.	Discuss post transcriptional processing is essential for generation of mature mRNA molecule in eukaryotes.	CO4	[K_5]
26.	Elaborate on the initiation, elongation and termination stages of protein synthesis	CO5	[K_2]
27.	Illustrate different types of chemical mutagens and their mechanism of action in mutagenesis	CO6	[K_3]

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