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Sardar Patel University
M. Sc. Botany (I Semester) Examination
Thursday, 29th November 2012
10.30 a.m. to 1. 30 p.m.
Paper PS01CBOT01: Cell & Molecular Biology

Max. Marks: 70 (Seventy only)

N.B.: Answers of all the questions (including multiple choice questions) should be written in the provided answer book only.

Q1. Select the appropriate answer for the following multiple choice questions: **(8 X 1 = 8 Marks)**

1. Which of the following statements does not apply to the nuclear envelope?
   (a) It is a double membrane.
   (b) It has pores through which material enters and leaves.
   (c) It is continuous with the endoplasmic reticulum.
   (d) It has infoldings to form cristae.

2. Some proteins are found in the plasma membrane. What part of the protein is within the membrane itself?
   (a) hydrophilic region (b) hydroponic region
   (c) hydrophobic region (d) hydrocoel region

3. Which of the following is not an accurate description of a chromosome?
   (a) It is a colored body localized in the nucleus.
   (b) It is a protein and nucleic acid complex.
   (c) It is the cellular structure that contains the genetic material.
   (d) In eukaryotes, it is composed of many DNA molecules attached end to end.

4. A researcher made an interesting observation about a protein made by the rough ER and eventually used to build a cell's plasma membrane. The protein in the membrane was actually slightly different from the protein made in the ER. The protein was probably changed in the
   (a) Golgi apparatus (b) smooth ER (c) mitochondrion
   (d) nucleus (e) chloroplast

5. All peroxisomes carry out this function:
   (a) break down fats and amino acids into smaller molecules that can be used for energy production by mitochondria
   (b) digest macromolecules using the hydrolytic enzymes they contain
   (c) synthesize membrane components such as fatty acids and phospholipids
   (d) control the flow of ions into and out of the cell

6. A nucleotide contains
   (a) Nitrogenous base (c) Nitrogenous base and sugar
   (b) Nitrogenous base, sugar and phosphate (d) Nitrogenous base and phosphate

7. Primer synthesis in eukaryotic DNA replication is catalyzed by
   a) DNA polymerase α (c) DNA polymerase δ
   (b) Primase (d) DNA ligase

8. Genes for messenger RNA are transcribed by
   (a) RNA polymerase I (c) RNA polymerase II
   (b) RNA polymerase III (d) Telomerase

(Contd. .....2)

QII. Answer <u>any SEVEN</u> of the following short answer questions: (7 X 2 = 14 Marks)

1. State the role of Cell Biology in the development of several other modern branches of biological sciences.
2. Why is the evolution of photosynthesis thought to have favoured the subsequent evolution of oxidative metabolism?
3. Differentiate between apoplast and symplast transport.
4. 'Some of the eukaryotic organelles evolved through a symbiotic relationship' Explain.
5. Compare and contrast exocytosis and endocytosis.
6. Write any two biological significances of denaturation and renaturation of DNA
7. Outline the role of DNA topoisomerases in DNA replication
8. Describe the essential features of Flap model for primer removal
9. Transcription factor TFII D is a key factor in eukaryotic transcription- Justify

QIII. Answer the following questions: (4 X 12 = 48 Marks)

1.(a) Compare and contrast the properties and strategies of eukaryotic and prokaryotic cells in terms of cell size, compartmentalization, nuclei, internal membranes, DNA and cell specialization. **(6 Marks)**

(b) Giving an illustrative account of structure of nucleus, explain how a single nuclear pore complex can efficiently transport proteins that possess different kinds of nuclear localization signal. **(6 Marks)**

<u>OR</u>

(b) (i) Briefly discuss how the inventions of Phase-Contrast microscope and Electron microscope have helped the development of Cell Biology. **(3 Marks)**

(ii) Write a brief note on glycoxysomes **(3 Marks)**

2. (a) (i) Explaining the structure of plasma membrane, briefly discuss the movement of materials across cell membrane **(4 Marks)**

(ii) State functions of Golgi complex **(2 Marks)**

(b) (i) Discuss that "different components of photosynthetic apparatus are localized in different areas of the grana and the stroma lamellae" and justify "chloroplasts are semi-autonomous organelles". **(4 Marks)**

(ii) Comment upon the polymorphism of lysosomes **(2 Marks)**

<u>OR</u>

(b) (i) Giving a brief over view of ribosomes, present their structure based on asymmetrical model. **(3 Marks)**

(ii) What are the cell cycle check points? Briefly explain the role of cyclins in controlling cell cycle in eukaryotes. **(3 Marks)**

(Contd. .....3)

3. (a) Outline the mechanism of phosphodiester formation by DNA ligase. How is this different from DNA polymerase? **(6 Marks)**

(b) What are ARS? Why are they required in DNA replication? Explain the process of initiation of replication in yeast. **(6 Marks)**

OR

(b) (i) Promoter sequences for RNA polymerase III **(3 Marks)**

(ii) Termination of transcription in eukaryotes **(3 Marks)**

4. (a) Explain aminoacylation of tRNA in detail. Why is this step considered crucial for protein synthesis? **(6 Marks)**

(b) List the characters of genetic code. Explain degeneracy and wobble in genetic code with examples. **(6 Marks)**

OR

(b) Outline the mechanism of Intron splicing. Explain the role of SnRNPs in splicing with an example. **(6Marks)**

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