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Sardar Patel University
M. Sc. Biochemistry (I Semester) Examination
Thursday, 29th November 2012
10.30 a.m. to 1. 30 p.m.
Paper PS01CBIC01: Cell Biology & Genetics
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.

QI. Select the appropriate answer for the following multiple choice questions (8 X 1 = 8)

1. Which of the following correctly matches an organelle with its function?
   (a) mitochondrion . . . photosynthesis
   (b) nucleus . . . cellular respiration
   (c) ribosome . . . manufacture of lipids
   (d) lysosome . . . movement
   (e) central vacuole . . . storage

2. Mitochondria and chloroplasts share several common features, for example,
   (a) both are capable of semiautonomous growth and reproduction.
   (b) neither are components of the endomembrane system.
   (c) each contains a small amount of DNA
   (d) each organelle synthesises some of its own protein.
   (e) all of the above

3. Of the following organelles, which group is involved in manufacturing substances needed by the cell?
   (a) lysosome, vacuole, ribosome
   (b) ribosome, rough ER, smooth ER
   (c) vacuole, rough ER, smooth ER
   (d) smooth ER, ribosome, vacuole
   (e) rough ER, lysosome, vacuole

4. Which of the following does not apply to chloroplasts?
   (a) They contain chlorophyll and the enzymes required for photosynthesis.
   (b) They contain an internal membrane system consisting of thylakoids.
   (c) They synthesize ATP (adenosine triphosphate) from ADP (adenosine diphosphate) and Pi (inorganic phosphate).
   (d) They are bounded by two membranes, the inner of which is folded into the cristae.

5. Which of the following proteins are useful for condensation of DNA in the prophase?
   (a) Condensins
   (b) Topoisomerase
   (c) Histone
   (d) All of the above

6. Which region of the DNA has highly repeated DNA sequences?
   (a) Telomere
   (b) Centromere
   (c) Euchromatin region
   (d) None of the above

7. Which protein of chromatids makes initial contact with the microtubule?
   (a) Kinetochore
   (b) Condensins
   (c) Kinesein
   (d) Congressin

8. When an individual is crossed to a recessive parent, it is known as
   (a) Parental cross
   (b) Recessive cross
   (c) Test cross
   (d) back cross

(Contd.....2)

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

1. Why is the evolution of photosynthesis thought to have favoured the subsequent evolution of oxidative metabolism?
2. Differentiate between apoplast and symplast transport.
3. 'Some of the eukaryotic organelles evolved through a symbiotic relationship' Explain.
4. Compare and contrast exocytosis and endocytosis.
5. What is the function of Wee 1 and CAK?
6. What is the effect of fusing cells of following types?
   a. Fusing a cell in G1 with a cell in S phase
   b. Fusing a cell in G1 with a cell in M phase
7. Write the two Laws of Mendel.
8. Explain the role of Cyclin in cell cycle regulation.
9. Differentiate between mitosis and meiosis.

QIII. Answer the following questions in detail: **(4 X 12 = 48)**

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)**

1. (b) Give an illustrative account of structure of nucleus and with experimental evidences explain the nuclear transport. **(6)**

<u>OR</u>

(b) (i) Outline the main mechanisms by which material is transported across the cell membrane. **(4)**

(ii) All the present-day cells, both prokaryotes and eukaryotes, are descended from a single ancestor. Justify. **(2)**

2. (a) Draw a diagram of a higher plant chloroplast labeling the inner and outer membranes, the thylakoid membranes, the stroma and the grana stacks. Indicate which membranes contain chlorophyll bound to protein complexes, proteins of the photosynthetic electron transport chain and proteins associated with ATP synthesis. **(6)**

(b) (i) "The Golgi complex consists of a series of sub-compartments that constitute the hub for intracellular membrane traffic".
Based on above statement, explain the mode of intracellular traffic of newly synthesized proteins. **(4)**

(ii) "Endomembrane system divides cell into compartments where different cellular functions occur", Justify. **(2)**

<u>OR</u>

(b) Giving an overview of the composition and organization of cytoskeletal elements, discuss in brief their role in cell division, wall formation and transport. **(6)**

Contd.....3

3. (a) Explain the following terms: **(2 X 3 = 6)**
   (i) Multiple factor hypothesis
   (ii) Phenomenon of multiple allelism

   (b) Name the phases of cell cycle in which following biochemical events occur: (6)
   (i) Packaging of DNA into chromosomes
   (ii) Attachment of spindle fibers to the chromosomes
   (iii) Dissolution of Nuclear envelope
   (iv) Biosynthesis of histones
   (v) Replication of centrioles
   (vi) Ubiquitination and destruction of securing by APC

OR

   (b) Name the functions of following cell cycle regulators: **(3 x 2 = 6)**
   (i) P53 (ii) Cdc 25 (iii) P21

4. (a) In fruitflies the wild eye color (deep red) is dominant over the white (r). If red eyed wild female fruitfly is crossed to a white eyed male, produces 60 red eyed & 63 white eyed offsprings. When this red eyed female fruitfly was crossed to a red male, it produced all red offsprings. What must be the genotype of the three parent flies? (6)

   (b) What is meant by cell cycle check point? What is its importance? How does a cell stop its progress at one of these check points? (6)

OR

   (b) Who rediscovered Mendel's laws? Explain the deviations from the Mendel's findings found after rediscovery of Mendel's laws. (6)

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