

(69)

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.

Q1. 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) Kinesin (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 any SEVEN 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)

OR

- (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)

OR

- (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 securin 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)

@#@#@#@#@#@

18-1321

2

19

18-1321

115

116

117

118

18-1321

19

18-1321

19

18-1321

19

18-1321

[69]

SARDAR PATEL UNIVERSITY
VALLABH VIDYANAGAR-388120.
M.Sc. (I Sem) Biochemistry
PS01C BIC03 – Cellular Metabolism
4 Dec 2012, Tuesday, 10.30 m. to 1.30 p.m.

No. of Printed Pages: 03

Total Marks: 70
(1x8=8)

Q1

1. Glycolysis is inhibited by
 - a) Excess of ATP
 - b) Lack of NAD⁺
 - c) Excess of citrate
 - d) all of the above
2. Phosphofructokinase, the major flux-controlling enzyme of glycolysis is allosterically inhibited by ____ and activated by ____
 - a) AMP, Pi
 - b) ADP, AMP
 - c) Citrate, ATP
 - d) ATP, PEP
3. The rate of the FA oxidation can be increased by increasing ____ in the diet.
 - a) PUFA
 - b) MUFA
 - c) Carnitine
 - d) creatinine
4. The increased LDL in the blood due to lipid rich diet is uptaken and reprocessed by
 - a) Small blood capillaries
 - b) Adipose tissue
 - c) Liver
 - d) Brown adipose tissue
5. Micelles of fatty acids in water are organized such that the ____ face the solvent and the ____ are directed toward the interior
 - a) hydrophilic heads; hydrophobic tails
 - b) carboxylic acid groups; hydrocarbon chains
 - c) hydrophobic tails; hydrophilic heads
 - d) Both A And B are both correct
6. When blood glucose level becomes lower than normal, it is replenished by glycogen break down from
 - a) Liver
 - b) Muscle
 - c) Liver or Muscle
 - d) None of the above

7. α helix most closely matches the level of protein structure described below.

- a) Primary structure
- b) Secondary structure
- c) Tertiary structure
- d) Quaternary structure

8. The major control of de novo pyrimidine nucleotide synthesis in man is:

- a) feedback inhibition of aspartate transcarbamylase.
- b) availability of N-acetyl glutamate.
- c) substrate availability.
- d) competitive inhibition of carbamoyl phosphate synthetase II.

QII Answer any seven questions

(2x7=14)

- a) Why Glucose -6-phosphatase and Glucokinase don't make futile cycle in liver cell cytoplasm?
- b) How does Acetyl-coA come to cytoplasm for FA biosynthesis?
- c) What are anaplorotic reactions? Give examples
- d) Which is the regulatory enzyme between fatty acid oxidation and fatty acid biosynthesis?
- e) What is the end product of glycolysis in erythrocytes and why?
- f) Differentiate the reactions catalysed by carbamoyl phosphate synthase I and II
- g) What is the difference in Free energy and standard free energy of reaction
- h) Explain transamination reaction with any one example
- i) What are the precursors for salvage pathway of purine nucleotides

QIII

- a. Explain the coordinated regulation of Glycolysis and TCA cycle. (6)
- b. Give a detailed account on Glycogen breakdown. (6)

OR

- b. Explain the regulation of citric acid cycle. (6)

QIV

- a. Explain: "The free energy changes of a reaction is independent of the pathway by which the reaction occurs, it is only that the reaction proceeds from high energy status to the lower energy status". (6)
- b. How oxidative phosphorylation is regulated? Explain. (6)

OR

- b. Write the reactions for conversion of palmitoyl Co-A to acetyl Co A. (6)

QV

- a. Give a detail mechanism of oxidative deamination of Glutamate. (6)
- b. Explain the role of glycolytic intermediates for amino acid biosynthesis. (6)

OR

- i. What are essential and non essential amino acids. (3)
 - ii. Name the all amino acid/s and carbohydrate intermediate/s required for heme biosynthesis. (3)
-

QVI

- a. Give the importance of HGPRT in purine and pyrimidine metabolism. (6)
 - b. Explain the reactions for conversion of ribonucleotides to deoxy ribonucleotides (6)
- OR

- b. Give an account on purine nucleotide biosynthesis (6)
-

~~2x 2x =~~

[124]

SARDAR PATEL UNIVERSITY
M.Sc (II Semester) Examinations
Friday, 30th November, 2012
2.30 pm to 5.30 pm
PS02CBIC01- Molecular Biology

Total marks: 70

1. Choose the correct answer.

(8 x 1 = 8)

- i) Which of the following is true about a circular double stranded DNA genome that is determined by chemical means to be 21% adenosine?
- A) The genome is 10.5% guanosine B) The genome is 21% guanosine
C) The genome is 29% guanosine D) The genome is 58% guanosine
- ii) Which of the following steps of translation does not consume high energy phosphate bond?
- a. Translocation c. Peptidyl transferase reaction
b. Amino acid activation d. Aminoacyl tRNA binding to A site
- iii) Deletion of a single base from a coding sequence of m-RNA may result in a polypeptide product with any of the following except:
- A) A amino acids sequence that differs from the sequence of the logical polypeptide
B) A polypeptide with more amino acids
C) A polypeptide with less amino acids
D) A single amino acid replaced by another amino acid
- iv) RNA is very much susceptible to hydrolysis in alkali because
- A) It contain Uracil residue in its structure
B) Its 2' OH group participates in cleavage of phosphodiester backbone
C) Cleavage occurs in the glycosylic bonds of purine base
D) Cleavage occurs in the glycosylic bonds of pyrimidine base
- v) Which of the following equation is correct for double stranded DNA
- A) $A+T = G+C$ B) $G/A = T/C$ C) $A+C = G+T$ D) $A/G = C/T$

vi) The enzyme responsible for movement of genetic element around the genome is

- A) DNA Helicase B) Primase C) Transposases D) Reverse transcriptase

vii) Telomerase is an enzyme whose macromolecular composition is

- A) Lipoprotein B) Ribonucleo protein only
C) Ribonucleic acid only D) Protein only

viii) Which of the following statement about post transcriptional changes in RNA is true?

- A) Chemical modifications are very rare in eukaryotic rRNAs
B) Splicing of introns occur in prokaryotic mRNAs
C) Prokaryotic tRNAs do not undergo any chemical modifications
D) 5' cap in mRNA is found in only eukaryotes

2. Write short notes on: (Attempt any seven): (7 x 2 = 14)

- a) Structure of ARS1 in yeast
- b) DNA polymerase α
- c) Conserved and consensus sequences
- d) Functions of -10 and -35 promoters
- e) Wobble theory
- f) Role of IF-3 in translation in bacteria
- g) Aminoacyl tRNA synthetases
- h) Thymine dimers

3. (a) What is T_m value? How is it determined? What are its applications? (6)
(b) Give a comparative account of different forms of DNA (6)

OR

- (b) Give a comparative account of mechanism of action of DNA polymerase and DNA ligase (6)
4. a) Explain the steps involved in initiation of transcription in bacteria in detail (6)
b) Write a note on Zinc finger and Helix-turn-helix proteins (6)

OR

- b) Write a note on promoter clearance during transcriptional initiation in eukaryotes (6)
5. a) Give an account of termination of transcription by RNA polymerase II. Briefly write on the role of Poly (A) polymerase Binding Protein (6)
b) Explain the role of snRNAs in intron splicing in detail (6)

OR

- b) Write a note on chemical modifications of rRNA and tRNA with suitable examples (6)
6. a) Describe the secondary and tertiary structure and functions of tRNA (6)
b) Explain the role of elongation factors in eukaryotic protein synthesis. (6)

OR

- b) What is Operon? Explain gene regulation in bacteria with a suitable example (6)

XXXXXXXXXXXX