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SARDAR PATEL UNIVERSITY

M. Sc. (I Semester) Examination (NC)

Tuesday, 10th April 2018

Time: 10.00 a.m to 1.00 p.m.

Paper: PS 01CBIC01 (Cell Biology and Genetics)

Total Marks: 70

Q1. Give the most correct answers for the following questions: (08 Marks)

1. What part of the membrane protein is within the membrane itself?
(a) hydrophilic region (c) N-terminal region
(b) hydrophobic region (d) C-terminal region
2. During which phase of meiosis synapses between homologous chromosomes, zygonema, begin?
(a) metaphase (c) telophase
(b) leptotene (d) zygotene
3. Which of the following proteins stops the mutated cell from dividing?
(a) p53 (b) CAK (c) cdk (d) Cyclin
4. Which of the following enzymes are involved in breaking down Cyclins
(a) Proteases (b) Phosphatases (c) Cyclases (d) Cyclins are not degraded
5. Blood group as AB is a phenomenon of
(a) Co-dominance (c) Incomplete dominance
(b) Complete dominance (d) None of the above
6. Which of the following organisms are used as a model organism in cell biology and genetics studies?
(a) *Caenorhabditis elegans* (c) *Drosophila melanogaster*
(b) *Schizosaccharomyces pombe* (d) all of the above
7. During which of the following conditions cell cycle will be arrested?
(a) Presence of single break in DNA
(b) Presence of unphosphorylated, unstable p53
(c) Presence of active cyclin dependent kinases
(d) all of the above
8. If a group of normal people produces 318 normal and 104 albino offspring, what could be genotype of parents?
(a) AA x aa (b) Aa x AA (c) aa x aa (d) Aa x Aa

(P.T.O.)

Q.2 Answer any seven of the following questions briefly:

(14 marks)

1. Which eukaryotic organelles are believed to have evolved through symbiotic relationships? Explain in brief.
2. What are the functions of lysosomes in cell?
3. Differentiate between endocytosis and phagocytosis.
4. In which phase of mitosis packaging of DNA into chromosomes occur? Explain the events of this phase.
5. Name all the five phases of prophase I of meiosis in order.
6. In what ways are the cells in G₀ and G₁ similar? How do they differ?
7. Explain the second law of Mendel.
8. Which cell organelle can store water, sugars, ions and pigments?
9. Which organelle is involved in autophagy?

Q.3 (a) Differentiate between plant cells and animal cells.

(06)

- (b) Explain the uniport, symport and antiport mechanisms for transport of substances across the plasma membrane.

(06)

OR

- (b) Compare a prokaryotic and eukaryotic cell on the basis of structural, functional and metabolic differences.

(06)

Q.4 (a) Explain the structure of chloroplast and narrate the sites of light and dark reactions and ATP synthesis.

(06)

- (b) Explain the composition and organization of cytoskeletal elements.

(06)

OR

- (b) Explain the processing of proteins from RER to Golgi apparatus.

(06)

Q.5 (a) Explain the role and importance of cell cycle check points in cell cycle.

(06)

- (b) Differentiate between

(06)

i) Necrosis and Apoptosis

ii) Mitosis and meiosis

OR

- (b) Explain the roles of cyclin, CAK, Wee 1 and Cdc 25 in activation of MPF activity in *S. pombe* cells.

(06)

Q.6 (a) Give examples and explain the concept of multiple allelism.

(06)

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

(06)

OR

- (b) Define/explain the following terms:

(06)

i) dihybrid ratio

ii) isoallele

iii) co-dominance

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

(ii) Figures in the right indicate marks.

Q1. Choose the most appropriate answer for the following multiple choice questions: (8)

1. Phosphoglycerate kinase in glycolysis produces ATP via
 - (a) Oxidative phosphorylation
 - (b) Oxidative decarboxylation
 - (c) Substrate level phosphorylation
 - (d) Phosphorylation
2. The energy released by the breakage of thioester bond of succinyl-CoA in citric acid cycle is used to synthesize
 - (a) a phosphoanhydride bond in GTP
 - (b) a thioester bond in Acetyl-CoA
 - (c) an ester bond in fatty acyl-CoA
 - (d) the primary metabolite
3. Reduction of $\frac{1}{2}$ O₂ molecule to H₂O by electrons transferred from complex I of ETC produces _____ ATP molecules
 - (a) 1
 - (b) 2
 - (c) 2.5
 - (d) 1.5
4. Biosynthesis of ketone bodies is favoured in cells under _____ conditions.
 - (a) hypoglycemic
 - (b) diabetic
 - (c) starvation
 - (d) all of the above
5. When the activity of Phosphofructo kinase-1 is reduced?
 - (a) When ATP concentration is low
 - (b) When ATP concentration is high
 - (c) When Citrate and ATP both are in low concentration
 - (d) It has nothing to do with ATP concentration
6. The precursor to glycogen in the glycogen synthase reaction is
 - (a) Glucose 1- phosphate
 - (b) UDP-glucose
 - (c) Glucose -6- phosphate
 - (d) None of the above
7. Which of the following is a common compound shared by the TCA cycle and the urea cycle.
 - (a) α -ketoglutarate
 - (b) succinyl coA
 - (c) Oxaloacetate
 - (d) fumarate
8. Which out of following amino acids is not required for Glutathione biosynthesis.
 - (a) Cysteine
 - (b) Glutamic acid
 - (c) Serine
 - (d) Glycine

Q2. Answer any SEVEN of the following questions briefly:

(7 X 2 = 14 Marks)

1. Differentiate between free energy change and standard free energy change.
2. Differentiate between Glucokinase and Hexokinase.
3. Differentiate between PFK-1 and PFK-2.
4. Which biomolecule is the major source of energy for hepatocytes during normal metabolism? Why?
5. What is the importance of PEP carboxykinase in metabolism?
6. What are anaploretic reactions? Give examples.
7. An amino acid that yields acetoacetyl-CoA during catabolism is glucogenic or ketogenic?
8. In which cells glucose -6- phosphatase enzyme is found? What is its subcellular location?
9. Name the amino acid sequence of peptide AFDQCTWYR

Q3. (a) Explain the regulation of glycolysis. (6)

(b) Explain the different fates of pyruvate in the cell. Also explain the conditions during which these fates are preferred. (6)

OR

(b) List the tissue where Pentose Phosphate pathway is found active and explain the reactions and importance of this pathway. (6)

Q 4. (a) What are ketone bodies? Under which physiological conditions are they produced? (6)

(b) Explain the oxidation of Myristoyl-coA and calculate the energy production by β - oxidation. (6)

OR

(b) Explain the reactions and importance of ω -oxidation. (6)

Q .5 (a) Give any two examples and explain transamination reactions. (6)

(b) Explain the regulation of the urea cycle. (6)

OR

(b) Explain the reactions for conversion of glycine to serine. (6)

Q.6 (a) Explain the regulation of purine nucleotide biosynthesis. (6)

(b) Write a denovo purine biosynthesis pathway. (6)

OR

(b) What is salvage pathway? Give the salvage pathway for pyrimidine biosynthesis. (6)

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SARDAR PATEL UNIVERSITY
M.Sc.Semester-I Examination, (NC)
SUBJECT- BIOCHEMISTRY

No. of Printed Pages : 3

SEAT No. _____

[17]

Date: 19th April, 2018, Time: 10.00 A.M to 1.00 P.M

Paper: PS01EBIC22-Biomolecules and Bioenergetics

Total Marks: 70

Q.1 Select the appropriate answer for following questions. (08)

1. Which one of the following are an example of epimers?
(a) Glucose and Galactose (b) Glucose and Ribose
(c) Mannose and Glucose (d) a and c
2. The rate of mitochondrial respiration can be controlled by the availability of
(a) ATP (b) ADP (c) FAD (d) NAD^+
3. Which of the following are found in connective tissues?
(a) Glycosaminoglycans (b) Proteoglycans
(c) Glycoproteins (d) Glycolipids
4. DNA denaturation is measured by absorbance at
(a) 220 nm (b) 230 nm (c) 250 nm (d) 260 nm
5. Which of the following glycerophospholipid acts as a lipotropic agent?
(a) Cardiolipin (b) Phosphatidylserine
(c) Phosphatidylinositol (d) Phosphatidylcholine
6. According to Henderson and Hassebach equation, when pH of a solution becomes equal to its pKa, the solution becomes buffer. This condition is achieved when _____
(a) Concentration of proton donor equals the concentration of protonacceptor
(b) Concentration of proton donor become zero
(c) Concentration of proton acceptor become zero
(d) Concentration of proton donor become $\log 1/10^{\text{th}}$ of concentration of proton acceptor
7. Which of the following statements best describes the enthalpy change of a reaction?
(a) The energy released when chemical bonds are formed during a chemical reaction
(b) The energy spent when chemical bonds are broken during a chemical reaction
(c) The difference between the energy released by bond formation and the energy consumed by bond cleavage during a chemical reaction
(d) The increase in disorder of the system as a reaction proceeds

(P.T.O.)

8. The proposal of chemiosmotic hypothesis was given by
- (a) Peter D. Mitchell (b) Charles Darwin
- (c) Mendel (d) Alfred Russell

Q.2 Answer Any Seven in brief. (14)

1. Enlist reducing disaccharides and state its importance in biology.
2. Justify the statement "Carbohydrates act as informational molecules".
3. Give the common structural features of amino acids.
4. Write down the role of glycerophospholipids.
5. Write note on structure of tRNA.
6. Describe the functions of thermogenin protein.
7. Give the role of oxygenases involved in biological oxidation reactions.
8. Write note on inhibitors of electron transport chain.
9. Give the statement of laws of thermodynamics.

- Q.3 (a) Write note on cyclic structures and importance of D-glucose in biology. (06)**
- (b) Describe the structures and biological functions of homopolysaccharides. (06)**

OR

- (b) Explain the role of lectin-ligand interactions in the biological processes. (06)**

- Q.4 (a) Describe the classification of amino acid based on R group in detail. (06)**
- (b) Give detail account on protein sequencing methods. (06)**

OR

- (b) Explain the structure and function of different types of sphingolipids. (06)**

- Q.5 (a) Define pKa value of acid and base and derive Henderson and Hassebach equation. (06)**
- (b) Describe the various types of bond formation in biological reaction and their importance. (06)**

OR

(b) Give a detail account on the bicarbonate buffer system used in biology. (06)

Q.6 (a) What is chemiosmotic model? Describe the structure of ATP synthase complex with its function. (06)

(b) Define oxidative phosphorylation and explain the Type-I reaction of oxidative phosphorylation in green sulphur bacteria. (06)

OR

(b) Explain the structure and function of universal electron acceptor. (06)

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