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SEAT No. _____

No. of Printed Pages : 2

SARDAR PATEL UNIVERSITY

M. Sc. (I Semester) BIOCHEMISTRY (CBCS) Examination

Monday, 22nd October 2018

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

Paper: PS01CBIC271 (Cell Biology and Genetics)

Total Marks: 70 (Seventy only)

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)

- (i) Oxidative metabolism is carried out _____ of mitochondria
 (a) in the intermembrane space
 (b) on the surface of the inner membrane
 (c) in the inside of the outer membrane
 (d) in the matrix
- (ii) Proteins synthesized by the rough ER are
 (a) for internal storage
 (b) to build more membranes in the cell
 (c) to digest food in lysosomes
 (d) exported from the cell
- (iii) Glycoproteins and glycolipids assembled in Golgi bodies are packaged for distribution in
 (a) cisternae
 (b) lysosomes
 (c) peroxisomes
 (d) liposomes
- (iv) Which of the following cytoskeleton filament is attached by adapter proteins to cell junctions?
 (a) Microfilament
 (b) intermediate filament
 (c) Microtubules
 (d) desmosomes
- (v) When fused with an S-phase cell, cells in which of the following phases of the cell cycle will initiate DNA replication prematurely?
 (a) G1
 (b) G2
 (c) M
 (d) all of the above
- (vi) Which of the following proteins can arrest cell cycle in G1 or G2 phases?
 (a) ATM
 (b) Tumor suppressor gene CHK2
 (c) p53
 (d) all of the above
- (vii) Linkage results in
 (a) Formation of more dominant phenotype
 (b) Formation of more parental phenotype
 (c) Formation of more wild type phenotype
 (d) Formation of more recombinant phenotype
- (viii) Which blood type would not be possible for children of a type AB mother and a type A Father?
 (a) O
 (b) A
 (c) B
 (d) AB

(1)

(P.T.O.)

(7 x 2 = 14)

Q2. Answer any SEVEN of the following questions briefly:

- (i) Explain how the inventions of Phase-Contrast microscope and Electron microscope have helped the development of Cell Biology.
- (ii) Differentiate between Pinocytosis and Phagocytosis.
- (iii) Briefly explain the endosymbiotic origin of eukaryotic cell organelles
- (iv) With the help of which proteins, sister chromatids formed by DNA replication in the S phase remain linked at the centromere?
- (v) Distinguish apoplast mode of transport from active transport
- (vi) How intermediate filaments in one cell are indirectly connected to intermediate filaments in a neighboring cell or to the extracellular matrix?
- (vii) Differentiate between necrosis and apoptosis.
- (viii) Explain the phenomenon of epistasis.
- (ix) Give the formula for calculating Recombination frequency.

Answer the following questions in detail:

Q3 (a) With suitable illustrations, discuss the types of membrane proteins and their functions. Also add notes on the main mechanisms by which material is transported across the cell membrane. (6)

(b) Presenting a very brief illustrative account of structure of nucleus, briefly discuss the molecular traffic through nuclear pore complexes (6)

OR

(b) 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". (6)

Q4 (a) Write concise note on (i) Endomembrane system and (ii) Mechanism of vesicle transport and vesicle fusion (6)

(b) Discuss the types and the role of ER in Protein synthesis (6)

OR

(b) Present an over view of protein folding and exporting of proteins and lipids from ER to golgi and add a brief note on protein sorting and export from golgi to different cellular compartments (6)

Q5 (a) Explain the roles of microfilaments, intermediate filaments and microtubules in cytoskeleton. (6)

(b) How the protein kinase activity of the mitotic cyclin-CDK complex (MPF) is activated to control onset of mitosis? (6)

OR

(b) What are the various phases of cell cycle? Explain checkpoints in detail. (6)

Q6 (a) What is linkage? Explain the phenomenon of linkage and crossing over using Morgan's experiment on drosophila white eyes and miniature wings genes (6)

(b) Explain with suitable examples the deviations observed by other scientists against Mendel's observations. (6)

OR

(b) Explain the following terms:

- (i) Isoallele, (ii) Dihybrid Ratio, (iii) Co-Dominance. (6)

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SEAT No. _____

No. of Printed Pages: 02

SARDAR PATEL UNIVERSITY
M. Sc. Biochemistry (I Semester) Examination
Monday, 22nd October 2018
Time: 10. 00 a. m. to 1.00 p. m.
Paper: PS01CBIC01 (Cell Biology & Genetics)

Total Marks: 70

- 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)

- (i) The function of the nucleolus in the cell is:
(a) Biogenesis of ribosomes; synthesis of RNA protein
(b) Synthesis of DNA
(c) Synthesis of ribosomes
(d) Synthesis of RNA
- (ii) Enzymes of β - oxidation of fatty acids to acetyl coenzyme A are located in which cellular organelle?
(a) Ribosomes (c) Glyoxysomes
(b) Golgi body (d) Nucleus
- (iii) Which structure of a cell is responsible for moving of chromosomes during mitosis?
(a) Nucleolus (b) nuclear membrane (c) spindle (d) cytoplasm
- (iv) Which of the following organelle functions to package and deliver proteins?
(a) lysosome (c) Endoplasmic reticulum
(b) Proteasome (d) Golgi apparatus
- (v) Which of the following ideas of Mendel had to be modified after rediscovery of his laws?
(a) That characters are controlled by a single gene
(b) The only possible relation between two alleles is dominant and recessive
(c) Only two alternative forms for each character (only two alleles) possible
(d) all of the above
- (vi) During which phase of meiosis, do chromatids separate completely?
(a) Metaphase I (b) Anaphase I (c) Telophase II (d) Anaphase II
- (vii) When coding sequence region of one gene is replaced with that of a different gene sequence, the technique is referred to as
(a) mutation (b) knock out (c) Knock in (d) none of these
- (viii) When two or more than two factors (genes) are considered together in a breeding experiment, these factors
(a) would show independent and random assortment
(b) would not show independent assortment
(c) will show independent or unimportant assortment depending upon their location
(d) none of the above

①

(P.T.O.)

Q2. Answer any SEVEN of the following questions in brief:

(7 X 2 = 14)

1. Differentiate between apoplast and symplast transport.
2. Explain the phenomenon of endocytosis and how it differs from phagocytosis?
3. Present in brief the importance of microscope in the study of cell.
4. What happens in G1 phase of the cell cycle?
5. What outcome would you expect from the cross between tall, round (TTRR) x short, wrinkled (ttrr)?
6. Give example and explain the phenomenon of co-dominance.
7. What is the function of nuclear pore?
8. Differentiate between euchromatin and heterochromatin
9. Define apoptosis

Answer the following questions in details:

(4 X 12 = 48)

- Q3. (a)** Compare the structure and organization of prokaryotic and eukaryotic cells. (6)
- (b)** Outline the main mechanisms by which material is transported across the cell membrane. (6)

OR

- (b)** Give an illustrative account of the formation of primary and secondary lysosomes and discuss the role of secondary lysosomes in the cellular digestive processes (6)
- Q4. (a)** Write an explanatory note on the chloroplast structure and its functional relationship (6)
- (b)** Give a brief account of the structure of Golgi complex and discuss how it coordinates with other organelles in transport of materials to their proper destination (6)

OR

- (b)** Explain the process of protein folding and processing from RER to Golgi apparatus. (6)
- Q5. (a)** Explain various phases of prophase I of meiosis. (6)
- (b)** What is meant by cell cycle checkpoint? How does a cell stop its progression at one of these check points? (6)

OR

- (b)** Define cytoskeleton. Describe its main components and functions. (6)
- Q6. (a)** What is linkage? How does it affect assortment of genes? (6)
- (b)** Give examples and explain the concept of multiple allelism. (6)

OR

- (b)** Find out the genotypes of the parents in following case:
'A group of people with an identical genotype residing on an isolated island over a period of 14 years produced 324 normal and 106 albino offsprings'. (6)

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SARDAR PATEL UNIVERSITY

M. Sc. Biochemistry/Industrial Biotechnology Ist Semester Examination

Friday, 26th October 2018

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

Paper: PS 01CBIC23/ PS01 CIBT23 (Cellular Metabolism)

Total Marks: 70

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

1. Which of the following enzyme releases CO₂ during fermentation of glucose?

(a) Pyruvate carboxylase	(b) Pyruvate decarboxylase
(c) Alcohol dehydrogenase	(d) Pyruvate dehydrogenase
2. Which of the following enzyme/s is involved in regulation of gluconeogenesis?

(a) Pyruvate Carboxylase	(b) Fructose 1,6 Bisphosphatase
(c) both a & b	(d) none of the above
3. PRPP is synthesized by

(a) Ribose phosphate pyrophosphate kinase	(b) Ribose phosphate pyrophosphatase
(c) Ribose phosphate pyrophospho dehydrogenase	(d) None of the above
4. Changing in concentration of which of the following controls whether glucose-6-phosphate in the cell will undergo glycolysis or pentose phosphate pathway?

(a) PUFA.	(b) Glucose	(c) NAD	(d) NADPH
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5. The conversion of Acetyl CoA to Malonyl CoA requires which of the following?

(a) Biotin	(b) NADPH	(c) Adenosine Diphosphate	(d) H ₂ O
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6. Which of the following metabolic adaptation takes place in starvation?

(a) Glycolysis is inhibited in most tissues	(b) Glucagon activates Glycogen phosphorylase in liver
(c) Lipase is activated, raising free fatty acid levels in blood	(d) All of the above
7. Which cofactor is required by Transketolase in Pentose Phosphate Pathway?

(a) Thiamine pyrophosphate	(b) FAD
(c) NAD	(d) Lipoate
8. Carbamoyl phosphate synthase I, is allosterically activated by

(a) Carbamoyl phosphate	(b) Glutamate
(c) Acetyl CoA	(d) N-acetylglutamate

①

(P.T.O.)

Q2. Answer any SEVEN of the following:

(7 X 2 = 14 Marks)

1. Why the reaction catalyzed by PFK-1 is considered to be the first committed step to Glycolysis?
2. Explain: In active skeletal muscles and in submerged plant tissues, pyruvate is not oxidized to acetate but reduced to lactate. Why?
3. What are the effects of Insulin and Glucagon on Lipase?
4. What enzymes and coenzymes constitute pyruvate dehydrogenase complex?
5. Which coenzyme/s are used by different isozymes of acyl CoA dehydrogenases? How many ATPs are produced by oxidation of this coenzyme/s?
6. Which enzyme/s are regulatory in fatty acid anabolism & catabolism?
7. Which amino acids are found in higher concentration in blood? Why?
8. Discuss in brief the usefulness of allopurinol.
9. What are synthases and synthetases? Are they the same or different? How?

Q3.(a) Explain the reciprocal regulation of glycolysis and gluconeogenesis. (06)

(b) Explain the chemiosmotic hypothesis and production of ATP by ATP synthetase. (06)

OR

Q3. (b) Explain the oxidative phase of pentose phosphate pathway. (06)

Q4. (a) How fatty acids are activated for oxidation? Explain the complete oxidative metabolism of Palmitoyl CoA and discuss its energetics. (06)

(b) Give an account on structure of Fatty acid synthase complex and narrate the functions of each of the seven proteins in the complex. (06)

OR

Q4 (b) What are ketone bodies? Write sites & reactions of ketone bodies' formation and utilization. (06)

Q5 (a) Explain the site, reactions and importance of urea cycle. (06)

(b) Explain the toxicity of ammonia and role of glutamine synthase to make nontoxic carrier of ammonia. (06)

OR

Q5 (b) Give any two examples and explain transamination reactions. (06)

Q6 (a) Explain the regulation of purine nucleotide biosynthesis. (06)

(b) Write the reactions involved in pyrimidine biosynthesis. (06)

OR

Q6 (b) Write the steps of de novo biosynthesis of purine nucleotides. (06)

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(2)

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SEAT No. _____ SARDAR PATEL UNIVERSITY

M. Sc. (Ist Semester) (under CBCS) ExaminationMonday, 29th October 2018

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

Paper: PS 01EBIC22 (Biomolecules and Bioenergetics)

No. of Printed Pages : 2

Max marks: 70

Q-1. Choose the most appropriate answer for multiple choice questions.

(8 Marks)

- Which of the following mucopolysaccharides is non sulfated and most abundant in tissues?
 (a) Hyaluronic acid (b) keratin sulphate (c) Heparin (d) Dermatan sulphate
- Chitin is
 (a) Homopolymer of ($\beta 1 \rightarrow 4$) GlcNAc (c) Homopolymer of ($\beta 1 \rightarrow 6$) GlcNAc
 (b) Heteropolymer of ($\beta 1 \rightarrow 4$) GlcNAc (d) Heteropolymer of ($\beta 1 \rightarrow 6$) GlcNAc
- Chymotrypsin cleave polypeptide chain at point of
 (a) Phe, Trp, Try (C) (c) Asp, Glu (N)
 (b) Asp, Glu (C) (d) Both b & c
- Which of the following options show all the matching of amino acids correct (at pH=7)?
 (a) (i)Nonpolar – Glycine, Isoleucine (c) (i)Nonpolar – Glycine, Isoleucine
 (ii)Polar – Proline, threonine (ii)Polar – Cysteine, threonine
 (iii)Aromatic – Tyrosine, Tryptophan (iii)Aromatic – Tyrosine, Tryptophan
 (iv)Negatively charged – Aspartate, lysine (iv)Negatively charged – Aspartate, Glutamate
 (b) (i)Nonpolar – Glycine, Isoleucine (d) (i) Nonpolar – Glycine, Serine
 (ii)Polar – Cysteine, proline (ii)Polar – Cysteine, threonine
 (iii)Aromatic – Tyrosine, Tryptophan (iii)Aromatic – Tyrosine, Tryptophan
 (iv)Negatively charged – Asparagine, lysine (iv)Negatively charged – Aspartate, lysine
- What is the isoelectric point of glycine, when the pK_1 value is 2.34 and pK_2 value is 9.60?
 (a) 4.10 (b) 7.26 (c) 5.97 (d) 11.94
- The electrons flows from complex 3 to complex 4 is through
 (a) Cytochrome C (c) Succinate Dehydrogenase
 (b) Ubiquinone (d) Both A & C
- Although according to laws of thermodynamics, entropy of the all reactions should increase, we do not normally observe increase in entropy or disorder in the biological cells because
 (a) living cells produce heat and entropy outside the system (cells) to preserve their internal order
 (b) chemical reactions in the living cells are an exception to thermodynamic laws
 (c) all energy related reactions takes place only in mitochondria
 (d) bioenergetics allows reactions to occur without increase in entropy
- Which of the following is a component of Succinate dehydrogenase in Electron transport chain?
 (a) Niacin (b) FMN (c) FAD (d) Lipoic acid

(P.T.O.)

Q-2 Answer any seven from the following

(14 Marks)

1. Explain by suitable example that biological free-energy changes are additive.
2. Explain in brief: Glycoconjugates.
3. Explain epimeric compounds with suitable examples.
4. Describe the biological importance of leukotrienes.
5. Calculate the ratio of conjugate base to acid for an acetic acid of pK_a of 6.0 and pH of 5.0.
6. List out amino acids that frequently get modified in post translational modification of protein.
7. Draw a labelled diagram of the Electron transport chain of mitochondria.
8. Explain in brief with example: Oxygenases.
9. Write the role of Prostaglandins as signaling compound.

Q.3 (a) Describe: Carbohydrate as informational molecules.

(06)

(b) Draw structure of each & describe the common structural features and the differences in each pair: (06)

- (i) Cellulose and glycogen
- (ii) D-glucose and D-fructose
- (iii) Maltose and sucrose

OR

(b) Narrate the industrial importance of any two polysaccharides.

(06)

Q.4 (a) Explain in detail: Phospholipid and glycolipids

(06)

- (b) (i) Describe the structural characteristics of mRNA
- (ii) Comment on role of miRNA in regulation of gene.

(03)

(03)

OR

(b) Explain in detail - "Lipids as signaling molecules"

(06)

Q.5 (a) Explain important characteristics of peptide bond; and describe Ramachandran plot.

(06)

(b) What is buffer? How do they resist change in pH? Derive Henderson and Hasselbalch equation.

(06)

OR

(b) What is pI value? Describe titration curve for either glycine or histidine.

(06)

Q.6 (a) Explain structure and function of ATP synthase (complex V) with suitable diagram.

(06)

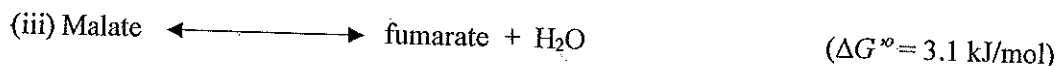
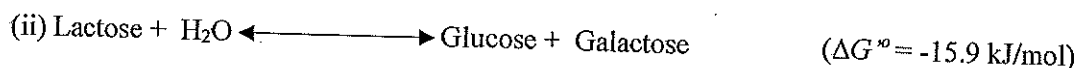
(b) Explain chemiosmotic model proposed by Peter Mitchell.

(06)

OR

(b) Calculate the equilibrium constant K'_{eq} for each of the following reactions at pH 7.0 and 25° C, using the $\Delta G'^{\circ}$ values. At 25° C, $RT = 2.48$ kJ/mol.

(06)



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