SEAT No._____ No. of Printed Pages: 02

[237]

**SARDAR PATEL UNIVERSITY**
**M. Sc. (I Semester) Biochemistry Examination**
**Wednesday, 1st November 2017**
**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) 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.

**(ii) 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

**(iii) 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.

**(iv) 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)** mitochondrion
**(c)** nucleus **(d)** chloroplast

**(v) During which phase of the cell cycle are normal components of the cell are synthesized?**
**(a)** M Phase **(b)** G1 Phase **(c)** S Phase **(d)** G2 phase

**(vi) 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

**(vii) Cyclins are degraded by**
**(a)** Proteases **(b)** Phosphatases **(c)** Cyclases **(d)** Cyclins are not degraded

**(viii) Blood group AB is a phenomenon of**
**(a)** Co-dominance **(b)** Incomplete dominance
**(c)** Complete dominance **(d)** None of the above

**(Contd....2)**

**Q2. Answer <u>any SEVEN</u> of the following questions in brief:** **(7 X 2 = 14)**

**(i)** Why is the evolution of photosynthesis thought to have favoured the subsequent evolution of oxidative metabolism?

**(ii)** 'Some of the eukaryotic organelles evolved through a symbiotic relationship' Explain.

**(iii)** 'Analysis of the details of the cell structure requires the use of more powerful microscopic techniques'. Explain.

**(iv)** Briefly describe the components of Endomembrane system of eukaryotic cells

**(v)** Differentiate between euchromatin and heterochromatin

**(vi)** Define apoptosis

**(vii)** What is the function of p53 gene?

**(viii)** State the two laws of Mendel

**(ix)** Give example and explain the phenomenon of co-dominance

**Answer the following questions in details:** **(4 X 12 = 48)**

**Q3. (a)** Giving an over view of structure of plasma membrane and briefly discuss the types of membrane proteins and their functions **(6)**

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

**<u>OR</u>**

**(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 secretion and transport of materials to their proper destination**(6)**

**<u>OR</u>**

**(b)** Giving a brief over view of ribosomes, present their structure based on asymmetrical model. **(6)**

**Q5. (a)** Giving an overview of the composition and organization of cytoskeletal elements, discuss in brief their role in cell division, wall formation and transport. **(6)**

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

**<u>OR</u>**

**(b)** Explain in detail the activation of cyclin dependent kinase. Also explain its function. **(6)**

**Q6. (a)** Write the two Mendel's laws and deviations of these laws. **(6)**

**(b)** Give examples and explain the concept of multiple allelism. **(6)**

**<u>OR</u>**

**(b)** State the law of segregation. For a following dihybrid cross write the number of possible gametes:

A tall pea plant bearing purple flowers is crossed with pure strain of similar phenotype. (for height of plant- dominant allele T; recessive allele t) (for color of flower - dominant allele P; recessive allele p) **(6)**

@#@#@#@#@#@#@#@#@

[78] SEAT No._____ No. of Printed Pages : 2 SC

# SARDAR PATEL UNIVERSITY

**M. Sc. (I Semester) Biochemistry (under CBCS) Examination**

**Tuesday, 7th November 2017**

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

**Paper: PS01CBIC03 (Cellular Metabolism)**

**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 conversion of pyruvate to lactate by Lactate Dehydrogenase (LDH) is accompanied by the consumption of
(a) GTP
(b) ATP
(c) NADH
(d) NAD+

**(ii)** During anaerobic conditions, the rate of glycolysis, is called
(a) Warburg effect
(b) Pasteur effect
(c) Hill reaction
(d) Compensation point

**(iii)** Malonyl CoA, ACP and NADPH are involved in
(a) fatty acid oxidation
(b) Glycogenesis
(c) Pentose phosphate pathway
(d) fatty acid biosynthesis

**(iv)** How many times β-oxidation is required to transform C20 fatty acid into acetyl-CoA?
(a) 7
(b) 8
(c) 9
(d) 10

**(v)** Which of the following enzymes act in pentose phosphate pathway?
(a) 6-phospho gluconate dehydrogenase
(b) Glycogen phosphorylase
(c) Aldolase
(d) none

**(vi)** Acetyl-CoA can be produced in cell from
(a) Pyruvate
(b) carbon skeleton of amino acids
(c) Palmitoyl-CoA
(d) All of the above

**(vii)** Tyrosine is biosynthesized from_____.
(a) Tryptophan (b) Alanine (c) Phenylalanine (d) None of above

**(viii)** Glutamine is synthesized in the liver by the action of enzyme
(a) Transaminase
(b) Glutamine synthetase
(c) α- ketoglutarate dehydrogenase
(d) none of the above

**Q2. Answer <u>any SEVEN</u> of the following questions briefly:** **(7 X 2 = 14 Marks)**

**(i)** As glucose-6-phosphate is used in many pathways besides glycolysis, which is the first committed step of glycolysis?
**(ii)** Differentiate between the Hexokinase and Glucokinase.
**(iii)** What are the intracellular sites of carbamoyl phosphate synthase 1 and 2 reaction?
**(iv)** How pyruvate is converted into phosphoenol pyruvate (PEP) in gluconeogenesis?
**(v)** What are essential fatty acids? Give examples.
**(vi)** Differentiate between free energy change and standard free energy change.
**(vii)** An amino acid that yields acetoacetyl-CoA during catabolism is glucogenic or ketogenic?
**(viii)** In which cells glucose -6- phosphatase enzyme is found? What is its subcellular location?
**(ix)** Why Ketone bodies are synthesized in prolonged starvation when blood glucose is very low & also in diabetes when blood glucose is very high?

**Q3.** **(a)** Explain the reactions of three steps of gluconeogenesis that are different from glycolysis. Justify that gluconeogenesis is energetically expensive but essential. **(6)**

**(b)** Explain coordinated regulation of glycolysis and TCA cycle. **(6)**

**<u>OR</u>**

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

**Q 4.** **(a)** Write a detailed note on the carriers involved in electron transport chain. **(6)**

**(b)** Explain the regulation of ETC. **(6)**

**<u>OR</u>**

**(b)** Give a detailed account on glycogen breakdown. **(6)**

**Q 5.** **(a)** What are ketone bodies? Write reactions of ketone bodies' formation. **(6)**

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

**<u>OR</u>**

**(b)** Explain enzymes and reactions involved in Fatty acid synthase complex. **(6)**

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

**(b)** Write a detailed note on regulation of purine biosynthesis. **(6)**

**<u>OR</u>**

**(b)** What is salvage pathway? Write the salvage pathway reactions for pyrimidine biosynthesis. **(6)**

#$#$#$#$#$#$#

— X —

S/L

No. of Printed Pages: 02

SEAT No._____

[247]

SARDAR PATEL UNIVERSITY

M. Sc. (I Semester) Biochemistry Examination

Wednesday, 1st November 2017

Time: 10. 00 a. m. to 1.00 p. m.

Paper: PS01CBIC21 (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) 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.

**(ii) 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

**(iii) 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.

**(iv) 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) mitochondrion
(c) nucleus (d) chloroplast

**(v) A proteinaceous, button like, structure at the outer surface of the centromere of each chromatid, to which spindle fibers attach are**

(a) microtubules (b) MAP (c) centre proteins (d) Kinetochore

**(vi) 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

**(vii) High cyclin concentration is found during**

(a) M phase (b) interphase
(c) $G_0$ phase (d) Cyclins concentration remains same in all phases of cell cycle

**(viii) Blood group AB is a phenomenon of**

(a) Co-dominance (b) Incomplete dominance
(c) Complete dominance (d) None of the above

**Q2. Answer <u>any SEVEN</u> of the following questions in brief:** **(7 X 2 = 14)**

(i) Why is the evolution of photosynthesis thought to have favoured the subsequent evolution of oxidative metabolism?

(ii) 'Some of the eukaryotic organelles evolved through a symbiotic relationship' Explain.

(iii) 'Analysis of the details of the cell structure requires the use of more powerful microscopic techniques'. Explain.

(iv) Briefly describe the components of Endomembrane system of eukaryotic cells.

(v) Differentiate between euchromatin and heterochromatin.

(vi) Contrast the events that occur during cytokinesis in typical plant and animal cells.

(vi) What is the effect of fusing a cell in G1 with one in S and of fusing a G1 phase cell with M phase cell?

(viii) State the two laws of Mendel.

(ix) Give example and explain the phenomenon of co-dominance.

**Answer the following questions in details:** **(4 X 12 = 48)**

**Q3.** (a) Giving an over view of structure of plasma membrane and briefly discuss the types of membrane proteins and their functions. (6)

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

<u>OR</u>

(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 secretion and transport of materials to their proper destination. (6)

<u>OR</u>

(b) Giving a brief over view of ribosomes, present their structure based on asymmetrical model. (6)

**Q5.** (a) Describe the events that occur in a cell during prophase, prometaphase and metaphase of mitosis. (6)

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

<u>OR</u>

(b) Explain in brief the functions of Cyclins, CAK, wee1 & cdc 25. (6)

**Q6.** (a) Write the two Mendel's laws and deviations of these laws. (6)

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

<u>OR</u>

(b) In humans the eye color is governed by a pair of gene-alleles. Brown eye is due to dominant allele (B) and blue to the recessive allele (b). What proportion of children will be blue-eyed and brown eyed in the following case? (6)

A brown-eyed man whose father was blue-eyed married a brown-eyed woman whose mother was also blue-eyed.

#@#@#@#@#@#@#@#@

Sc

[791]

No. of Printed Pages : 2

**SARDAR PATEL UNIVERSITY**

**M. Sc. (I Semester) Biochemistry (under CBCS) Examination**

**Tuesday, 7th November 2017**

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

**Paper: PS01CBIC23 (Cellular Metabolism)**

**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)**

1. Pyruvate dehydrogenase is a multienzyme complex that catalyzes a series of reactions. Which of the following is not carried out by pyruvate dehydrogenase complex?
   (a) combining the acetyl group with a cofactor (c) the production of ATP
   (b) producing an acetyl group from pyruvate (d) a decarboxylation reaction
2. How many molecules of $CO_2$ are produced for each molecule of glucose that passes through glycolysis and krebs cycle?
   (a) 2 (c) 3
   (b) 6 (d) 7
3. The proper sequence of stages in glycolysis is
   (a) Glucose priming, cleavage and rearrangement, oxidation, ATP generation
   (b) Cleavage and rearrangement, glucose priming, ATP generation, oxidation
   (c) Glucose priming, oxidation, oxidation, cleavage and rearrangement, ATP generation
   (d) Glucose priming, cleavage and rearrangement, ATP generation
4. The rate of fatty acid oxidation can be increased by increasing _____ in the diet.
   (a) PUFA (c) MUFA
   (b) Carnitine (d) Creatinine
5. Which of the following is a positive modulator of Carbamoyl phosphate synthase I reaction?
   (a) Bicarbonate ion (c) N-acetyl Glutamine
   (b) Glutamine (d) None of the above
6. Which of the following inhibits 'glutamine –PRPP amidotransferase', an enzyme involved in biosynthesis of AMP and GMP?
   (a) Only AMP (c) only IMP
   (b) Only GMP (d) All of the above
7. How much energy is released upon hydrolysis of terminal phosphate from ATP molecule?
   (a) 30.5 KJ/mol (b) 7.3 KJ/mol (c) 13.5 KJ/mol (d) 25 KJ/mol
8. Which of the following is an activator of acetyl-CoA carboxylase?
   (a) Citrate (b) Palmitoyl-CoA (c) AMP (d) None of the above

**Q2. Answer <u>any SEVEN</u> of the following questions briefly:** **(7 X 2 = 14 Marks)**

1. Give reason - even a six carbon fatty acid, the same number of carbons as glucose, generates more energy than glucose.
2. Why $NADH+H^+$ produces more ATP than $FADH_2$?
3. Which reaction is catalyzed by ribose phosphate pyrophosphokinase?
4. Write a reaction that converts malate to pyruvate. Also name the enzyme responsible.
5. Give any two examples of analploretic reactions of TCA cycle.
6. What are essential and nonessential fatty acids? Give examples.
7. What could be the fate of Glucose -6-phosphate in a liver cell?
8. What is the effect of Insulin and Glucagon on Acetyl CoA Carboxylase?
9. Write the reaction catalyzed by Aspartate amino transferase. Which is the coenzyme required?

**Q3.** **(a)** Explain in detail the reactions involved in production of Acetyl-CoA by PDH complex.**(6)**

**(b)** Describe the regulation of glycolysis. **(6)**

**<u>OR</u>**

**(b)** Explain the regulation of electron transport chain (ETC). **(6)**

**Q 4.** **(a)** Write the reactions involved in oxidation of saturated fatty acids. What is the fate of the product of this pathway in aerobic conditions? **(6)**

**(b)** Explain the regulation of Fatty acid synthesis. **(6)**

**<u>OR</u>**

**(b)** Write the reactions involved in ketone bodies production. Also explain the physiological conditions during which production of ketone bodies is favored. **(6)**

**Q 5.** **(a)** Write the reactions involved in release of ammonia by Glutamate and Glutamine in liver. **(6)**

**(b)** Explain reactions involved in Urea cycle. **(6)**

**<u>OR</u>**

**(b)** Explain catabolic pathway for glutamate, glutamine and proline. **(6)**

**Q 6.** **(a)** Write the reactions involved in catabolism of purine nucleotides. **(6)**

**(b)** Explain the regulation of biosynthesis of adenine and guanine nucleotides. **(6)**

**<u>OR</u>**

**(b)** Explain the role of TCA cycle in integration of metabolism. **(6)**

---

2X

(2)

(88) SEAT No._____ No. of Printed Pages : 2

**SARDAR PATEL UNIVERSITY**

M.Sc. (I-SEMESTER) Examination (CBCS)

Saturday, 11th November, 2017

M.Sc. Biochemistry

**PS01EBIC22: BIOMOLECULES AND BIOENERGETICS**

**TIME: 10:00 AM to 01:00 PM** **TOTAL MARK: 70**

**Q.1 Choose the correct answer of the following question in your answer sheet** **[08]**

1. Type –I reaction centre (Fe-S centre) is found as photosynthetic machinery in
   a. *E-Coil* c. Green sulfur bacteria
   b. Purple bacteria d. Halophilic bacteria
2. The naturally occurring form of amino acid in protein is
   a. L- amino acids only c. D- amino acids only
   b. Both L & D amino acids d. None of above
3. The following eicosanoid is produce by platelets and act in the formation of blood clots
   a. Prostaglandins c. Thromboxanes,
   b. Leukotrienes d. Arachidonic acid
4. Which amino acid can form disulphide bonds?
   a. Glycine c. Proline
   b. Glutamate d. Cysteine
5. Which of the following molecule gives maximum energy upon oxidation?
   a. Glucose c. Palmitoyl-coA
   b. Alanine d. Maltose
6. Ribose a pentose sugar found in
   a. NAD c. FAD
   b. RNA d. all of these
7. What is the isoelectric point for phenylalanine given the $pK_a$ for the COOH group is 1.83 and the $NH_3^+$ group is 9.13?
   a. 2.43 c. 5.48
   b. 10.96 d. 7.30
8. All the following are monosaccharides except
   a. Glucose c. Fructose
   b. Maltose d. Galactose

**Q.2 Answer any SEVEN of following question briefly.** **[14]**

1. Define the following terms : a. Mutarotation b. Reducing sugar
2. Justify the following statement "Carbohydrate is informational molecules."
3. Mention in brief: How buffer resist change in pH?
4. Justify the following statement "Peptide bond has partial double bond character."
5. What are essential fatty acids? Give examples.
6. Write down the biological importance of waxes.
7. Write down the regulatory points of oxidative phosphorylation.
8. Do living organisms obey second law of thermodynamics?
9. List the electron carriers of electron transport chain in order.

(P.T.O.)

Q.3 a. Describe the process of oxidative phosphorylation by type I & II reaction centre in photosynthetic green sulfur and purple bacteria. 6

b. What is standard free-energy? Explain the free energy change during phosphorly group transfer with appropriate example. 6

**OR**

b. What is chemiosmotic model? Describe the structure of ATP synthase complex with its function. 6

Q.4 a. List out strategy for protein sequencing. Explain the various methods employed in determination of protein sequence. 6

b. Describe the structure and importance of various structural lipids present in plasma membrane. 6

**OR**

b. What is Eicosanoids? Describe the biological importance of main three classes of eicosanoids. 6

Q.5 a. Derive Henderson and Hassebach equation. Can we find the exact ratio of weak acid and its conjugate base for preparation of buffer using HH equation? 6

b. Define pI value of amino acid. Explain the titration curve of glycin and histidine amino acid. 6

**OR**

b. Explain the structure and function of transfer RNA. 6

Q.6 a. Explain the role of lectin-ligand interactions in the biological processes. 6

b. Describe the structural role of heteropolysaccharides in living organism. 6

**OR**

b. Draw structure of proteoglycans. Explain various type of protein interaction with heparin sulfate. 6

**********