

SEAT No. \_\_\_\_\_

[30]

Sardar Patel University  
M. Sc. Genetics, First Semester Examination  
Wednesday, 01<sup>st</sup> November, 2017  
10:00 a.m. – 01:00 p.m.  
**PS01CGEN21: Molecular Biology**

SIC

Total Marks: 70

- Q1. Multiple Choice Questions (Attempt all questions) [8X1=8]**
- (i) The topological problem of DNA replication refers to which of the following:  
 (a) The blockage of DNA replication sites by nucleosomes.  
 (b) The difficulty of synthesizing DNA on the lagging strand.  
 (c) The unwinding of the double helix and the rotation of the DNA.  
 (d) The synchronization of DNA replication with cell division.
- (ii) What types of DNA molecules are copied using the rolling circle replication process?  
 (a) Bacterial chromosomes (b) Bacteriophage genomes  
 (c) Mitochondrial genomes (d) Yeast chromosomes
- (iii) Approximately how many base pairs form the attachment between the DNA template and RNA transcript during transcription in prokaryotes?  
 (a) 8 (b) 12-14  
 (c) 30 (d) 100
- (iv) In bacteria, which of the following enzymes removes the RNA primers present at the start of each Okazaki fragment on the lagging strand?  
 (a) DNA polymerase I (b) DNA polymerase II  
 (c) DNA ligase (d) RNase H
- (v) Codon-anticodon interactions occur by  
 (a) Covalent bonds (b) Electrostatic interactions  
 (c) Hydrogen bonds (d) Hydrophobic interaction
- (vi) Which of the following statements about telomerase is TRUE?  
 (a) Telomerase is an RNA-dependent DNA polymerase.  
 (b) Telomerase is an RNA-dependent RNA polymerase.  
 (c) Telomerase is a DNA-dependent DNA polymerase.  
 (d) Telomerase is a DNA-dependent RNA polymerase.
- (vii) Approximately how many base pairs form the attachment between the DNA template and RNA transcript during transcription in prokaryotes?  
 (a) 8 (b) 12-14  
 (c) 30 (d) 50
- (viii) Which of the following is an example of RNA editing?  
 (a) Removal of introns from an RNA transcript.  
 (b) Degradation of an RNA molecule by nucleases.  
 (c) Alteration of the nucleotide sequence of an RNA molecule.  
 (d) Capping of the 5'-end of an RNA transcript.

**Q2. Answer any seven questions from following:**

[7X2=14]

- (i) Define Helix pitch.
- (ii) Define Hyperchromicity.
- (iii) What is the significance of Shine Dalgarno sequence?
- (iv) Explain the role of SSB in replication.
- (v) What is the function of primase?
- (vi) Name the scientists who gave Operon concept.
- (vii) What are exteins?
- (viii) What is proteasome?
- (ix) Give function of Topoisomerase I

Q3(A) Explain the structure of B-form DNA. [6]

Q3(B) Mention the physical properties of ds DNA. Explain any two in detail. [6]

**OR**

Q3(B) Give helix parameters of Z-form of DNA. [6]

Q4(A) Enlist 5 enzymes that modify DNA structure. Explain the function of any two. [6]

Q4(B) Explain schematically the two models for completion of lagging strand replication in eukaryotes. [6]

**OR**

Q4(B) Explain Meselson-Stahl experiment and its significance in establishing the type of replication. [6]

Q5(A) Explain the cloverleaf structure of a tRNA. [6]

Q5(B) What is RNA editing? Explain its types. [6]

**OR**

Q5(B) Describe the process of Rho-dependent termination of transcript synthesis in *E.coli*. [6]

Q6(A) Explain the structural organization of *Lac* operon with a neat labeled diagram. Mention function of each gene involved in the operon. [6]

Q6(B) Describe briefly the two step reaction that results in the attachment of an amino acid to a tRNA molecule. [6]

**OR**

Q6(B) Explain the structural organization of *Trp* operon with a neat labeled diagram. Mention function of each gene involved in the operon [6]

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**Sardar Patel University**  
 M. Sc. Genetics, First Semester Examination  
 Friday, 03<sup>rd</sup> November 2017  
 10:00 am to 01:00 pm  
 PS01CGEN22: Bioinstrumentation

Maximum Marks: 70

Note: 1) All the Questions are compulsory.  
 2) Figures on the right indicate marks.

Q.1. Choose the correct option

01 x 8 = 08

- i) The intensity of light entering the microscopy can be controlled by
  - a) Numerical aperture      b) Magnification      c) Resolution      d) Contrast
- ii) Which of the following is commonly used source of radiation in visible region in spectrophotometer
  - a) Deuterium lamp      b) Tungsten lamp      c) Electron gun      d) Globar
- iii) Which dye is used in staining the protein in SDS-PAGE
  - a) Ethyidium bromide      b) Bromophenol blue
  - c) Acridine orange      d) Coomassie Blue
- iv) The half life of <sup>32</sup>P phosphate is approximately 14 days. Forty two days after the purchase of a batch of <sup>32</sup>P, the radioactivity is present was 1.25 mCi. The radioactivity on the date of purchase would be
  - a) 5 mCi      b) 0.625 mCi      c) 2.5 mCi      d) 10 mCi
- v) In chromatography, when components are separated of a color is separated, the component that rises fastest and highest is
  - a) The one that is least soluble in solvent
  - b) The one that is most soluble in solvent
  - c) The one which is present in more quantity
  - d) Any one which is brightest all
- vi) The non-integral m/z value indicates the presence of
  - a) Fragment ions      b) Metastable ions      c) Molecular ions      d) Impurities ions
- vii) Which of the transition is not possible in UV spectroscopy
  - a) n → σ\*      b) σ → σ\*      c) π → σ\*      d) π\* → σ\*
- viii) Electron gun of electron microscope
  - a) is a triode      b) has two cathodes and one anode
  - c) has two anodes and one cathode      d) only a & b

Q.2. Attempt any seven of the following [02 x 7 = 14]

- (a) What is the function of Phase plate?
- (b) What is stock's shift?
- (c) Define half life of radio-isotopes.
- (d) What are the vibrations in IR spectroscopy?
- (e) Explain Bragg's law.
- (f) Define zwitterions and its role in IEF.
- (g) Explain the term electroendoosmosis.
- (h) Write a brief on electron impact ionization.
- (i) What is background in autoradiography?

Q. 3. [A] Give a brief introduction and principle involved in Transmission Electron Microscopy. [6]  
[B] Explain the principle, technique and applications of flow cytometry in detail. [6]

OR

Q. 3. [B] Write a brief account on specialized components of phase contrast microscopy [6]

Q. 4. [A] Write a short note isopycnic centrifugation. [6]  
[B] Describe the process of polymerization in PAGE, state various application of PAGE [6]

OR

Q. 4. [B] Schematically explain the working principle of GC. [6]

Q. 5. [A] Discuss the principle of a UV-Vis spectrophotometer with its applications. [6]  
[B] Write a note on fluorescence spectroscopy [6]

OR

Q. 5. [B] Explain in brief [6]  
i) Quadrupole in Mass  
ii) Spin-Spin Coupling in NMR

Q. 6. [A] Describe the excitation based methods for quantification of radioactivity. [6]  
[B] What are the steps involved in x-ray diffraction analysis. Explain any one method used for X-ray production. [6]

OR

Q. 6. [B] Explain in brief: [6]  
i) GM counter ii) Radiation dosimetry

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**SARDAR PATEL UNIVERSITY**  
**M. Sc. Genetics I<sup>st</sup> Semester Examination**  
**PS01CGEN23: Cell Biology**  
**Tuesday, 07/11/2017**

Time: 10:00 am to 1:00 pm

Max Marks: 70

Note: Figures on the right indicate marks

Q.1 Choose the most appropriate answer (08)

- i Most cell membranes are electrically polarized such that inside is  
 a) -20 mV                      b) +40 mV                      c) -60 mV                      d) +80 mV
- ii Which phospholipid is negatively charged?  
 a) phosphatidylcholine                      b) phosphatidylserine  
 c) phosphatidylethanolamine                      d) sphingomyelin
- iii The oligosaccharide synthesized in a lipid carrier anchored in ER membrane is called \_\_\_\_  
 a) Diacylglycerol                      b) phosphatidylcholine                      c) Dolichol                      d) Ceramide
- iv KDEL is a signal on resident proteins of  
 a) nucleus                      b) ER                      c) Lysosomes                      d) Mitochondria
- v Which of this polymer is abundant inside nucleus?  
 a) Intermediate filaments                      b) Actin filaments                      c) Microtubules                      d) All of these
- vi Which of the signalling receptors are/is generally activated by dimerization induced by binding to two sites on their ligand?  
 a) Gated ion channels                      b) G protein coupled receptors  
 c) Receptor tyrosine kinases                      d) Steroid hormone
- vii \_\_\_\_\_ is useful for isolation of cells in G<sub>1</sub>, S, G<sub>2</sub> and M phases of the cell cycle.  
 a) Electron microscope                      b) Flow cytometer  
 c) Light microscope                      d) Phase contrast microscope
- viii The triggering of the intrinsic pathway of apoptosis involves a balance between pro-apoptotic and anti-apoptotic proteins. Which of the following is anti-apoptotic?  
 a) Bax                      b) Bad                      c) Bcl-2                      d) Cytochrome C

Q.2 Attempt any **Seven** of the following: (14)

- a) What are sphingolipids? Explain their types.  
 b) Write in brief on plasmodesmata.  
 c) Differentiate between Tim complex and Tom complex.  
 d) What are peroxisomes? Write its functions.  
 e) What are P-type ATPases?  
 f) Write on the role of intermediate filaments present in muscle and nerve cells.  
 g) Write a note on Secondary messengers.  
 h) Explain briefly about nuclear lamina.  
 i) Differentiate between apoptosis and necrosis.

- Q.3 a) Discuss the level of organization of Gap junctions and its functions. (06)  
b) Describe structure of Gram positive and Gram negative bacterial cell wall. (06)  
OR  
b) Explain the structure of cell membrane with their functions. (06)
- Q.4 a) Describe structural organization and functions of Golgi apparatus. (06)  
b) Discuss structural organization and functions of chloroplast. (06)  
OR  
b) Write on nuclear pore complex in detail. (06)
- Q.5 a) Explain in detail the cytoskeleton of a cell including their functions. (06)  
b) Explain any one signal transduction process involving G-protein coupled receptors. (06)  
OR  
b) What are Receptor Tyrosine Kinases and what role do they play in signal transduction? Elaborate the signal transduction process after insulin binding involving MAP kinases. (06)
- Q.6 a) Write a note on: Cyclins and Cyclin dependent kinases (06)  
b) Discuss different ways by which proto-oncogenes may get activated to oncogenes giving examples. (06)  
OR  
b) Write a note on: Apoptosis. (06)

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(101)

SEAT No. \_\_\_\_\_

No. of Printed Pages : 2

SARDAR PATEL UNIVERSITY  
M. Sc. GENETICS, FIRST SEMESTER EXAMINATION  
PS01EGEN21 -BIOCHEMISTRY  
09<sup>th</sup> November, 2017, Thursday 10.00 am to 1.00 am

- Note: (i) All the questions are Compulsory.  
(ii) Figures on the right indicate marks

Maximum Marks: 70

Q.1 Select the most appropriate answer from the given choices

1x8  
= 8

- (i) Thermodynamically equilibrium constant of reaction is \_\_\_\_\_.  
a. Additive  
b. Multiplicative  
c. Equivalent to reactant & product ratio  
d. b & c
- (ii) Anaplerotic reaction of TCA cycle replenished \_\_\_\_\_.  
a. Energy yielding compound  
b. Biosynthetic precursors  
c. Citric acid  
d. ATP
- (iii) In prokaryotes, the complete oxidation of a molecule of glucose results in net gain of -----.  
a. 20 molecules of ATP  
b. 36 molecules of ATP  
c. 18 molecules of ATP  
d. 4 molecules of ATP
- (iv) The genetic deficiency of adenosine deaminase leads to  
a. Immunodeficiency disorders  
b. Gout  
c. Lesch-Nyhan syndrome  
d. AIDS
- (v) The catabolic end products of nucleotides are  
a. Urea & Creatinine  
b. Urea & Uric acid  
c. Uric acid  
d. None
- (vi) PRPP is synthesized by catalyzed activity of  
a. Phosphoribosyl pyrophosphate kinase  
b. Phosphoribosyl pyrophosphatase  
c. Phosphoribosyl pyrophosphate synthase  
d. None of the above
- (vii) Glutamine synthetase is allosterically inhibited by  
a. Glycine  
b. Tryptophan  
c. Both 'a' and 'b'  
d. None of the above
- (viii) The characteristic that all lipids have in common is  
a. they are all made of fatty acids and glycerol  
b. none of them is very high in energy content  
c. they are all acidic when mixed with water  
d. none of them dissolves in water

(P.T.O.)

(1)

- Q.2. Attempt any seven of the following 2x7  
=14
1. Specify the steps of TCA cycle which demonstrates substrate level phosphorylation.
  2. Give the examples of oxaloacetate based amino acids.
  3. Explain glyoxylate cycle & its importance.
  4. What is salvage pathway of nucleic acid synthesis?
  5. Justify: Water is an excellent solvent for ionic as well as low molecular weight non-ionic compounds.
  6. Give four examples of membrane lipids.
  7. Define: Enthalpy & Entropy.
  8. What is the fate of pyruvate under aerobic & anaerobic condition?
  9. What is maple syrup urine disease?
- Q.3 (A) Discuss TCA cycle and its regulation. 6  
 (B) Gluconeogenesis is not completely reversible of glycolysis: Justify. 6
- OR**
- (B) Enlist different physiological buffers and discuss any two in detail. 6
- Q.4. (A) Discuss enzyme complexes involved in electron flow during oxidative phosphorylation in mitochondrial membrane. 6  
 (B) Write the following 6
- (1) Standard free energy is additive in nature explain with suitable example.
  - (2) Draw neat labeled diagram of ATPase & how it coordinates its function.
- OR**
- (B) Write a note on electron carriers involved in ETC cycle. 6
- Q.5. (A) Discuss fatty acid synthesis & its regulation in detail. 6  
 (B) Describe the steps involved in  $\beta$ -oxidation of fatty acids. 6
- OR**
- (B) Enlist fat soluble vitamins and discuss vitamin A in detail. 6
- Q.6 (A) Discuss the de novo pathway of purine synthesis. 6  
 (B) Discuss transamination and deamination steps of amino acid catabolism. 6
- OR**
- (B) Define aromatic amino acids. Explain their synthesis pathway in detail. 6

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 (2)