

SEAT No. _____

No. of Printed Pages : 02

[21734]

Sardar Patel University

M. Sc. Biotechnology/Microbiology, First Semester Examination

Friday, 03rd November 2017

10:00 am to 01:00 pm

PS01CBIT22/PS01MIC22: Bioinstrumentation

Maximum Marks: 70

1. Choose the correct answer

(1 x 8 = 8)

- i) Which one of the following lamp is not used in bright field microscope?
- a. Mercury arc lamp
 - b. Tungsten lamp
 - c. Light emitting diodes
 - d. Halogen lamp
- ii) Piezoelectric tube is a component of _____
- a. Fluorescence microscope
 - b. Scanning tunnelling microscope
 - c. Phase contrast microscope
 - d. Electron microscope
- iii) Which one the following is known as tracking dye
- a. Methylene blue
 - b. Commassie brilliant blue
 - c. Bromophenol blue
 - d. Toluidine blue
- iv) Which one of the following technique is used to separate cell organelles based on their densities?
- a. Rate zonal centrifugation
 - b. Continuous centrifugation
 - c. Isopycnic centrifugation
 - d. None of these
- v) Which of the following radiation source is used in atomic absorption spectroscopy?
- a. Hollow cathode lamp
 - b. Deuterium lamp
 - c. Mercury lamp
 - d. None of these
- vi) Which of the following techniques may be employed for determination of molecular mass of an analyte?
- a. AAS
 - b. MALDI-TOF
 - c. IEF
 - d. IR
- vii) After emitting a radioactive particle, an isotope shows an increase in atomic number by 1 and no change in mass number. The radioactive process is known as
- a. Negatron emission
 - b. Alpha particle emission
 - c. Positron emission
 - d. Decay by electron capture
- viii) A biosensor consists of all of the following components except
- a. Biocatalyst
 - b. Quadrupole analyzer
 - c. Transducer
 - d. Electronic processor

2. Attempt any seven seven:

(7x2=14)

- a. What is the function of phase plate?
- b. Define: Stock's shift.
- c. Define: half life of radioisotopes
- d. Write briefly on Mull technique.
- e. Beer's and Lambert's law
- f. Explain Bragg's law.
- g. Explain the term Electroendosmosis.
- h. Write a brief note on Electron Impact Ionization
- i. Differentiate normal and reverse phase chromatography.

3. a. Differentiate scanning electron microscope and transmission electron microscope. (6)
- b. Explain the principle, technique and applications of flow cytometry in detail. (6)

OR

- b. Write a brief note on specialized components of phase contrast microscopy. (6)

4. a. Write a note on isopycnic centrifugation. (6)
- b. Write a brief note on instrumentation of GC. (6)

OR

- b. Describe the process of polymerization in PAGE and add a note on applications of PAGE. (6)

5. a. Write a brief note on different components of UV-Vis spectrophotometer and discuss its applications in detail. (6)
- b. Write a note on fluorescence spectroscopy. (6)

OR

- b. Explain in brief with respect to NMR. i. Chemical shift. (6)
- ii) Spin-Spin coupling

6. a. Explain the basic principle of liquid scintillation counting with a note on the energy transfer process. What are its limitations? (6)

- b. Write notes on: i) Crystallization of samples for x ray diffraction analysis. (6)
- ii) Applications of autoradiography

OR

- b. Write a note on: Mass analysers. (6)

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SARDAR PATEL UNIVERSITY

M. Sc. Microbiology/Biotechnology Ist Semester Examination

PS01CMIC02/PS01CBIT02: Bioinstrumentation

Friday, 03/11/2017

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 Which one of the following lamp is not used in bright field microscope?

- a) Mercury arc lamp b) Light emitting diodes
c) Tungsten lamp d) Halogen lamp

ii Piezoelectric tube is a component of _____

- a) Fluorescence microscope b) Phase contrast microscope
c) Scanning tunnelling microscope d) Electron microscope

iii Electrophoresis of any analyte depends upon

- a) its size b) its charge c) viscosity of medium d) All

iv In reverse phase chromatography, the stationary phase is

- a) non polar b) polar c) amphipathic d) gas

v The cuvette used for reading absorbance of an analyte solution in UV region is made of

- a) glass b) fused NaCl c) quartz d) polycarbonate

vi In IR spectroscopy, which region is considered as finger print region?

- a) 4000 to 400 cm^{-1} b) 1000 to 600 cm^{-1}
c) 1450 to 500 cm^{-1} d) 3500 to 2000 cm^{-1}

vii Solid scintillation is most suitable for

- a) alpha particles b) beta particles c) gamma rays d) none

viii Which of the following is most soft ionization technique?

- a) chemical ionization b) electron impact c) MALDI d) all are equally soft

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

- a) Write in brief on: Chemical Shift in NMR.
- b) Write on: Molar Extinction Coefficient.
- c) Discuss the importance of slit width in Absorption spectroscopy.
- d) State Bragg's law.
- e) Explain Isopycnic density gradient centrifugation.
- f) Explain the term: Electroendosmosis.
- g) Define: Long pass filter
- h) Write in brief on conjugate foci
- i) Explain the principle of autoradiography in brief.

- Q.3 a) Differentiate between scanning electron microscope and transmission electron microscope. (06)
- b) Explain flow cytometry in detail. (06)
- OR
- b) Write a brief note on specialized components of phase contrast microscopy. (06)
- Q.4 a) Briefly explain PAGE. (06)
- b) Write a brief note on instrumentation of GC. (06)
- OR
- b) Explain the types of detectors used in HPLC (06)
- Q.5 a) Write a note on: Monochromators used in UV-Visible spectroscopy (06)
- b) Write a note on: Fluorescence Spectroscopy (06)
- OR
- b) Write a note on: AAS (06)
- Q.6 a) Describe the construction and working of any one Biosensor. Enlist applications of biosensors. (06)
- b) Discuss in detail the factors influencing sedimentation of a particle in centrifugal field. (06)
- OR
- b) Write a note on: Excitation based detection of radioactivity. (06)

-X-X-X-X-X-X-

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SARDAR PATEL UNIVERSITY
M. Sc. Microbiology/Biotechnology Ist Semester Examination
PS01CMIC21/PS01CBIT21: Molecular Biology
Wednesday, 01/11/2017

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 DNA renaturation follows _____ order reaction kinetics
a) 1st b) 2nd c) 3rd d) Zero
- ii In B-form of DNA helix, the deoxyribose sugar is _____ puckered.
a) 2' endo b) 2' exo c) 3' endo d) 3' exo
- iii CENP-A is a histone variant present in centromeric DNA nucleosomes. It replaces _____ histone subunit in these nucleosomes.
a) H2A b) H2B c) H3 d) H4
- iv Which of the following functions as eukaryotic sliding clamp?
a) MCM2-7 b) RPA c) PCNA dimer d) PCNA trimer
- v Which of the following translational factor in eukaryotes shows RNA helicase activity?
a) eIF2 b) eIF2B c) eIF4A d) eIF5
- vi The active site in bacterial RNA polymerase is constituted by
a) σ subunit b) α subunit c) β subunit d) both β and β' subunits
- vii A nonsense mutation in *lacZ* gene of *lac* operon is polar. As a result
a) only lactose permease will not be expressed.
b) only transacetylase will not be expressed.
c) only β galactosidase will be expressed
d) none of the proteins encoded by *lac* operon genes will be synthesized.
- viii Which of the following are catabolite sensitive operons?
a) *lac* b) *ara* c) *gal* d) all of these

Q.2 Attempt any seven of the following. (14)

- a) Explain the terms: i) helical pitch ii) propeller twist
b) Write in brief on: base stacking interactions in DNA
c) Describe licensing of origins of replication in eukaryotes?
d) Explain the term: Processivity of DNA polymerase
e) '*lacO^c* mutations result in constitutive expression of *lac* operon'. Explain
f) Write in brief on: *E. coli* RNA polymerase holoenzyme.
g) Write on: Rho independent transcription terminators.
h) Write on: Position effect variegation.
i) Explain the term: Regulon

Q.3 a) DNA denaturation studies have revealed the significance of non-covalent interactions in stability of native DNA structure. Explain giving examples. (06)

b) What is DNA supercoiling? Explain how topoisomerases alter the topological state of DNA. (06)

OR

b) Write a note on: Cot curves (06)

Q.4 a) Write on: Chromatin modification and assembly of nucleosomes upon replication. (06)

b) Discuss the mechanism of DNA polymerase catalyzed synthesis of DNA. (06)

OR

b) Give comparison of DNA replication in prokaryotes versus eukaryotes. (06)

Q.5 a) Write on salient features of Genetic code. (06)

b) Discuss the salient features of promoters recognized by eukaryotic RNA polymerase II and describe initiation of mRNA synthesis in eukaryotes. (06)

OR

b) Describe processing of transcript during elongation by RNA polymerase II in eukaryotes. (06)

Q.6 a) Write a note on: Regulation of Nitrogen assimilation pathways by Ntr System. (06)

b) Discuss the regulation of *lac*-operon in detail (06)

OR

b) Describe regulation of *araBAD* operon. (06)

-X-X-X-X-X-

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SARDAR PATEL UNIVERSITY
M. Sc. Microbiology/Biotechnology Ist Semester Examination
PS01CMIC23/PS01CBIT23: 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 G1, S, G2 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)

-X-X-X-X-X-X-

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(94)

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No. of Printed Pages : 2

SARDAR PATEL UNIVERSITY

M. Sc. (I Semester) Biotechnology (under CBCS) Examination

Thursday, 9th November 2017

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

Paper: PS01EBIT01 (Biochemistry)

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)

- Which of the following is NOT a high energy molecule?
(a) PEP (b) Phosphocreatine (c) ATP (d) none of the above
- Which of the following is the possible site of pentose phosphate pathway?
(a) Liver (b) Adrenal Gland (c) Mammary gland (d) all of the above
- Which of the following is the positive modulator of glycolysis enzyme PFK
(a) ATP (b) Fructose 2,6- bis phosphate (c) Citrate (d) none
- The main source of energy for hepatocyte during normal metabolism is
(a) Glucose (b) FFA (c) Ketone bodies (d) Amino acids
- The main reason for hydrophobic bond formation in aqueous medium is
(a) Decrease in entropy (c) Increase in entropy
(b) Increase in potential energy (d) none of the above
- Which of the following fatty acids can not be synthesized in mammals?
(a) α -linolenic acid (18:3 $\Delta^{9,12,15}$) (c) linolate (18:2, $\Delta^{9,12}$)
(b) Oleate (18:1, Δ^9) (d) both a & c
- ETC has a potential to produce highly reactive free radicals that can damage the cells. Which of the following is useful to prevent oxidative damage in cells?
(a) superoxide molecule (b) glutathione peroxidase (c) AntimycinA (d) Rotenone
- During prolonged fasting conditions, which enzyme of glycolysis is inhibited by FFAs?
(a) Glucokinase (b) Fructose 1,6-bisphosphatase (c) PFK (d) PK

(1)

(P.T.O)

Q2. Answer any SEVEN of the following questions briefly: (7 X 2 = 14 Marks)

1. Differentiate between glucokinase and hexokinase.
2. Differentiate between PFK-1 and PFK-2.
3. Differentiate between Free energy change and Standard free energy change.
4. Write the reaction catalyzed by glyceraldehyde 3- phosphate dehydrogenase and explain importance of this reaction in glycolysis.
5. Give reason - even a six carbon fatty acid, the same number of carbons as glucose, generates more energy than glucose.
6. Why $\text{NADH} + \text{H}^+$ produces more ATP than FADH_2 ?
7. Which reaction is catalyzed by ribose phosphate pyrophosphokinase
8. What are uncouplers? Give examples
9. List the regulatory enzymes of TCA cycle.

Q3. (a) Explain the reactions of glycogen breakdown. (06)

(b) Explain the different fates of pyruvate in the cell in different conditions. (06)

OR

Q3. (b) Explain substrate level phosphorylation reaction and its importance in glycolysis. (06)

Q4. (a) Explain regulation of electron transport chain. (06)

(b) 'Standard free energy is additive in nature' - explain with suitable examples. (06)

OR

Q4 (b) Explain structure, function and mechanism of ATP synthase. (06)

Q5 (a) Explain the oxidation of Palmitoyl-coA and calculate the energy production by β - oxidation. (06)

(b) How do Acetyl-coA produced in mitochondria come to cytosol for fatty acid biosynthesis? (06)

OR

Q5 (b) Explain the regulation of fatty acid biosynthesis. (06)

Q6 (a) Explain the site, reactions and importance of urea cycle. (06)

(b) Explain catabolic pathway for glutamate, glutamine and proline. (06)

OR

Q6 (b) Write a detailed note on purine catabolism. (06)

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(2)

(95)

SC
No. of Printed Pages :

SARDAR PATEL UNIVERSITY
M.Sc., First Semester Examination
PSO1EBIT21- Biochemistry
09-11-2017, Thursday
Time: 10.00a m to 01.00P m

Max. Marks 70

1. Choose the correct answer

(1x8=8)

(i) How many ATPs are utilized in preparative stage of glycolysis?

- a. One b. Two c. Three 4. Ten

(ii) Which is the correct combination for TCA cycle.

- a. 3 NADH, 1 FADH₂, 1 ATP c. 3 NADH, 2 FADH₂, 1 ATP
b. 3 NADH, 2 FADH₂, 1 ATP d. 2 NADH, 1 FADH₂, 1 ATP

(iii) Pernicious anemia occurs in absence of

- a. Vitamin C c. Vitamin K
b. Vitamin B₆ d. Vitamin B₁₂

(iv) In the reversible reaction A → B, in which direction reaction will proceed if the Concentration of A is increased?

- a. Depends on standard free energy b. depends on free energy
c. Forward d. Reverse

(v) Where ω - oxidation of fatty acid occurs in vertebrate cells?

- a. Peroxisomes c. Endoplasmic reticulum
b. Glyoxisomes d. Mitochondria

(vi) If K_{eq} = less than one, then the value of ΔG will be?

- a. Zero c. Positive
b. Negative d. None of the above.

(vii) Which of the following amino acid is known as 21st protein amino acid?

- a. Selenocysteine c. Desmosine
b. Methyllysine d. None of the above

(viii) Which one of the following amino acids has a single hydrogen as its side chain?

- a. Glycine b. Canavanine c. Cysteine d. Proline.

(P.T.O)

①

2. Attempt any seven

(2x7=14)

- a. Define. Gluconeogenesis.
- b. Write a brief on Lesch – Nyhan syndrome.
- c. What are Anaplerotic reactions?
- d. What is the concentration of the H^+ in a solution of 0.1 M NaOH?
- e. Enlists the functions of lipid.
- f. Define standard free energy and Actual free energy.
- g. Enlist the significance of pentose phosphate pathway.
- h. Define: Primary structure of protein.
- i. Write a brief note on Aromatic amino acids.

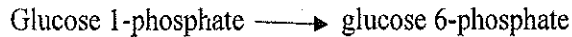
3. a. Write a note on glycolysis and its regulation (6)
b. Write a note on: TCA cycle. (6)

OR

- b. Discuss Glycogen storage disease in detail. (6)

4. a. Discuss enzyme complex involved in electron flow during oxidative phosphorylation in mitochondria? (6)

- b. Define standard free energy and calculate the standard free-energy change of the reaction catalyzed by the enzyme phosphoglucomutase



Given that, starting with 20 mM glucose 1-phosphate and no glucose 6-phosphate, the final equilibrium mixture at 25°C and pH 7.0 contains 1.0 mM glucose 1-phosphate and 19 mM glucose 6-phosphate. Does the reaction in the direction of glucose 6-phosphate formation proceed with a loss or a gain of free energy? ($RT = 2.47 \text{ kJ/mole}$) (6)

OR

- b. Explain structure function and mechanism of ATP synthase. (6)

5. a. Explain β oxidation of palmitoyl CoA. (6)
b. Write a note on ketone body formation. (6)

OR

- b. Write a brief note on fatty acids. (6)

6. a. Explain *de novo* synthesis of pyrimidine nucleotide. (6)
b. Explain regulatory mechanism in the biosynthesis of purine. (6)

OR

- b. Write a note on secondary structures of proteins. (6)