**Paper pattern**

**Mid-term exams (theory) =** 12 marks

**Final-term exams (theory) =** 30 marks

**Sessional marks =** 8 marks

**Practical exam =** 10 marks

**Total marks** = 60

**Sample Mid-term and Final-term questions (Theory)**

**Multiple Choice Questions**

1. Conversion of 1, 2-bisphosphoglycerate into glyceraldehyde-3-phosphate during gluconeogenesis is catalyzed by;
2. Aldolase (c) phosphohexose isomerase
3. Glyceraldehyde phosphate dehydrogenase (d) enolase
4. Number of carbon atoms in oleic acid is;
5. 12 (b) 16 (c) 18 (d) none of these
6. Branched chain fatty acids undergo \_\_\_\_\_\_\_\_\_ oxidation;
7. β-oxidation (b) α-oxidation (c) omega oxidation (d) none of these
8. Glucose and galactose are;
9. Anomers (b) epimers (c) enantiomers (d) All of these
10. α-D-glucose and β-D-glucose are;
11. enantiomers (b) anomers (c) epimers (d) none of the above
12. Phosphofructokinase catalyzes the conversion of;
13. Glucose 6-phosphate into fructose 6-phosphate
14. Fructose 6-phosphate into fructose 1,6-bisphosphate
15. Both a and b (d) none of the above
16. Which is correct sequence for gluconeogenesis;
17. Pyruvate--- PEP---2PG---3PG (c) pyruvate---2PG---3PG---PEP
18. Pyruvate---PEP---3PG---2PG (d) none of the above
19. Glutamate dehydrogenase catalyzes conversion of glutamic acid into;
20. Pyruvic acid (b) ketoglutaric acid (c) fumaric acid (d) oxaloacetate
21. UDP-glucose phosphorylase catalyzes conversion of G1P into;
22. UDP-glucose (b) glucose (c) glycogen (d) all of the above
23. Diastereoisomers are;
24. Mirror image isomers (b) enantiomers (c) non-mirror image isomers (d) a & b
25. During capture stage of protein purification, \_\_\_\_\_ parameters are considered;
26. Resolution and recovery (b) speed & capacity

(c) Recovery & speed (d) capacity & recovery

1. Disulfide bonds in proteins are broken down by;
2. SDS (b) mercaptoethanol (c) both a & b (d) none of these
3. During gluconeogenesis conversion of 1,2-bisphosphoglycerate into glyceraldehyde

3-phosphate is catalyzed by;

1. glyceraldehyde phosphate dehydrogenase (b) aldolase

(c) phosphohexose isomerase (d) enolase

1. Which is the correct sequence of formation intermediates in Krebs cycle?
2. citrate – succinate – fumarate - alpha ketoglutarate – OAA – malate
3. alpha ketoglutarate – succinate – fumarate – OAA – citrate – malate
4. citrate – isocitrate – alpha ketoglutarate – succinate – fumarate – malate – OAA
5. none of these

15. Pyruvic acid reacts with CO2, NADPH and H+ to form \_\_\_\_\_\_

(a) glutamic acid (b) alpha-ketoglutaric acid

(c) L-malic acid (d) oxaloacetic acid

1. Oxidation of 1g carbohydrate yields \_\_\_\_ energy;
2. 2 calories (b) 4 calories (c) 100 calories (d) none of these
3. Serine reacts with water to produce;
4. pyruvic acid, NH3 & H2O (b) alpha-ketoglutaric acid + NH3 + NADH + H+
5. For a protein with low solubility, it should be subjected to \_\_\_\_\_\_\_\_\_\_ before

chromatography;

1. SDS extraction (b) solubility agents (c) ethylene glycol (d) a, b & c
2. Which strategy can be used for purification of very dilute protein samples.
3. AC – GF/RPC (b) IEX – GF/RPC (c) IEX – HIC – GF (d) a, b & c

20. Which coenzyme is used during conversion of pyruvic acid into acetyl-CoA?

(a) thiamine pyrophosphate (b) lipoic acid

(c) CoA (d) NAD+  (d) all of the above

1. In reverse phase chromatography, the stationary phase is made
2. Non-polar (c) polar
3. Either polar or non-polar (d) None of the above
4. In Sangers method, sangers reagent reacts with amino group of terminal amino acid to form \_\_\_ derivative of amino acid;
5. 2-nitrophenyl (c) 2, 4-dinitrophenyl
6. 2, 6-dinitrophenyl (d) 2, 4-dinitro fluorobenzene
7. What properties of a protein does hydrophobic interaction chromatography exploit for purification?
8. Charged amino acid (c) Hydrophobic amino acids on proteins surface
9. Molecular weight (d) Enzyme activity
10. Which is true about ammonium sulfate precipitation?
11. Useful precipitant (c) highly soluble salt
12. Stabilize protein structure (d) All a, b & c
13. Side chains in amino acids can be;
14. Acidic (c) Neutral
15. Basic (d) Both a and b
16. Which amino acid contains a non-polar alkyl group?
17. Alanine (c) Tyrosine
18. Threonine (d) Serine
19. Sulfur containing amino acids are;
20. Cysteine and methionine (c) Cysteine and threonine
21. Methionine and threonine (d) Cysteine and serine
22. In mass chromatogram, m/z and relative abundance are plotted along;
23. Y-axis and x-axis (c) x-axis
24. X-axis and y-axis (d) y-axis
25. Peptide bond is;
26. Single bond (c) Double bond
27. Partial double bond (d) both a & b
28. Which is true about amphoteric behavior of amino acid?
29. Carboxyl group of amino acid can lose a proton
30. Amino group can accept a proton
31. Both a and b (d) None of the above

**Short questions**

1. Under which conditions non-oxidative phase of pentose-phosphate pathway takes place?
2. Discuss the energy production during metabolism of one glucose molecule.
3. Give the reaction catalyzed by phosphoglucomutase during glycogenolysis.
4. Give five steps involved in conversion of pyruvic acid into acetyl-CoA.
5. Discuss the steps involved in conversion of palmitic acid into myristoyl-CoA.
6. Draw a flow sheet to represent the strategy for purification of very dilute protein samples.
7. Give principle of SDS-PAGE.
8. Differentiate between the oxidative and preparatory phases of glycolysis.
9. Which performance parameters are considered during polishing stage of protein purification?
10. How is pyruvic acid converted into alanine?
11. How is pyruvic acid converted into acetyl-CoA?
12. Describe the energy production during metabolism of one glucose molecule.
13. Which techniques can be used for purification of proteins with low solubility?
14. Name the enzymes which catalyze conversion of glucose 1-phosphate into UDP-glucose during glycogenesis.
15. Pyruvate into phosphoenolpyruvate
16. 1,2-bisphosphoglycerate into glyceraldehyde 3-phosphate
17. How acetyl-CoA forms citric acid?
18. Give principle of FTIR technique.
19. Give the reaction for conversion of glutamic acid into ammonia.
20. Describe role of cationic and anionic detergents in cell lysis?
21. Which performance parameters are considered during intermediate stage of protein purification?
22. What is chelation?
23. How freeze-thaw cycle causes disruption of cell?
24. Give principle of NMR technique.
25. Mention two strategies used for elution in ion exchange chromatography.
26. Differentiate between gas chromatography and liquid chromatography.
27. Which performance parameters are considered during capture stage of protein purification?

**Detailed Questions**

1. Give a detailed account of fate of amino acids in cells with special emphasis on urea cycle.
2. Give a detailed account of working principle and instrumentation of mass spectrometer.
3. Describe principle of Edmans degradation.

**Sample Mid-term and Final-term questions (LAB)**

**Multiple Choice Questions**

1. Large blue tips are used in micropipettes for measuring the volume;
2. 1-10 ul (b) 10-100 ul (c) 200-1000 ul (d) none of these
3. Precision can be calculated using formulae;
4. standard deviation/mean x 100 (b) mass/mean x 100

(c) mean / standard deviation x 100 (d) none of these

1. Density of water at 25oC is;
2. 0.5 g/ml (b) 1 g/ml (c) 1.5 g/ml (d) 2 g/ml
3. Conversion of liquid into gas phase is known as;
4. distillation (b) evaporation (c) boiling (d) condensation
5. Separation of compounds on the basis of their relative [solubilities](https://en.wikipedia.org/wiki/Solubility) in two different

immiscible liquids, usually water and an organic solvent is known as;

1. liquid-liquid extraction (b) solvent extraction (c) partitioning (d) a, b & c
2. Raffinate is the feed solution that is depleted in;
3. solute (b) solvent (c) both a and b (d) none of these
4. Which technique is used for characterization of peptides;
5. GC-MS (b) LC-MS (c) Both a & b (d) none of these
6. Intensity vs m/z plot representation of a chemical analysis is known as;
7. Mass spectrum (b) mass chromatogram (c) both a & b (d) none of these
8. Mascot software is used for \_\_\_\_\_\_ of proteins using mass spectrometry data;
9. Identification (b) characterization (c) quantitation (d) All a, b & c
10. A potassium sulfate solution has a conc. of 6.5 g/dm3. What mass of potassium sulfate is present in 25 cm3 of solution?
11. 63.2 g (b) 0.1625 g (c) 0.903 g (d) none of these

**Short questions**

1. Prepare 1 molar solution of NaCl.
2. A potassium sulfate solution has a concentration of 6.5 g/dm3. (a) what mass of

potassium sulfate is present in 25 cm3 of solution? (b) what volume of solution in

cm3 contains 3 g of potassium sulfate? (c) what mass of salt is required to make 250

cm3 of a solution so it contains 3.75 g/dm3 of potassium sulfate.

1. What is molarity of a solution containing 0.32 moles of NaCl in 3.4 liters?
2. What is concentration of a salt solution if you dissolve 10 g of NaCl in 250 cm3 of water.
3. Differentiate between the accuracy and precision.
4. Differentiation between distillation and condensation.
5. Which software is used for determination of peptides using mass spectrometry data.

**Detailed questions**

1. Separate a mixture of water and n-hexane through a separating funnel.
2. Separate the mixture of ethanol and water by distillation.