RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. FIRST SEMESTER EXAMINATION, SEPTEMBER 2020
FIRST YEAR [BATCH 2019-22]
MICROBIOLOGY [Honours]

Date : 25/09/2020

Time : 11.00 am – 7.00 pm

Paper : III [CC3] & IV [CC4]

Full Marks : 50+50

Paper : III [CC3]

Answer **all** the following questions : [10×5]

1. a) Write down the structure of any Phospholipid. (1×10)

   b) Write down the structure of Cardiolipin.

   c) Will methyl α-D-glucoside undergo mutarotation?

   d) What is meant by the anomeric effect?

   e) Draw the Haworth projection formula for β-D-ribofuranose.

   f) Mannose and Galactose are epimers of each other. Justify or criticize.

   g) Define half life of a radioactive substance.

   h) What do you mean by 'true acidity' and 'titrable acidity'?

   i) What is isoelectric point?

   j) Name a basic amino acid.

2. a) What do you mean by Transition temperature of lipids ? (2)

   b) How do transition temperature help in animals in severe winter climates? (4)

   c) How do we separate lipids from others biomolecules? (2)

   d) What do mean by Enthalpy ? (2)

3. a) Why is the furanose form of fructose more dominant than that of glucose? (3)

   b) Sucrose is a non-reducing sugar whereas maltose is a reducing sugar. Explain the significance of the statement. (3)

   c) L-Fucose is an important sugar found in nature. Chemically it is 6-deoxy-L-galactose. Draw thechair conformation for this sugar. Also draw the boat conformation for D-allose. (4)

4. a) What is buffer? What are different types of buffer? Explain each type with proper example. (1+1+3)

   b) What are the concentrations of HOAc and OAc- in a 0.2 M 'acetate' buffer, pH 5.0? The K_a for acetic acid is 1.70×10^{-5}. (2)

c) Mention the advantages and disadvantages of liquid scintillation counter. (1.5+1.5)

5. a) Proline is a secondary amino acid – Explain. (1.5)

b) Write a short note on hydropathy plot. (1.5)

c) How a simple polypeptide chain is folded into a complex and functional protein molecule? (2)

d) You are given with 4 mg/mL albumin solution and a HepG2 cell lysate. How can you determine the protein concentration of the unknown cell lysate using Folin's reagent? (2)

e) Write a short note on torsional angle and Ramachandran plot. (1.5)

f) Write down the differences between hemoglobin and myoglobin. (1.5)

Paper : IV [CC4]

Answer **all** the following questions : [10×5]

6. Answer all the questions are compulsory [2×5]

   a) What is the major component of humus and why?

   b) What areplasmodesmata made up of?

   c) What happens to mitochondria if Drp proteinsare mutated?

   d) What are the molecular components of nuclear pore complex?

   e) Write down the important role of thylakoid membrane.

7. (a) Write an advantage of using human embryonic stem cells over adult stem cells for therapeutic purpose.

   (b) What will happen to a tadpole if the CDE-3 gene in the zygote is mutated?

   (c) A population of dividing cells has just passed the "S" phase of the cell divisional cycle. What measures would be taken by the cells if these are irradiated?

   (d) How can you induce human embryonic stem cells to differentiate into specific cell types? How can you conclude that desired types of cells have been produced?

   (e) The probability that an entering college student will be a graduate is 0.4. Determine the probability that out of 5 entering students, i) none ii) one ii) at least one will be graduate.

   [1+2+2+2+3]

8. (a) Cite examples of two genes whose functions are antagonistic in relation to apoptosis.

   (b) Design a cell-fusion experiment by which you can prove that dividing "S" phase cells contain a diffusible activator of DNA replication.

   (c) How does the complementary action between the death ligand and the death receptor work to initiate apoptosis?

(d) Design an experiment to prove the totipotency property of any skin cell (ex., udder cell in sheep).

(e) "Variance is additive"- Explain this with a suitable mathematical example.   [1+2+2+2+3]

9. (a) What is N-linked glycosylation within ER lumen? Mention the significance of such glycosylation.

(b) Justify the following statements: Coat proteins are important for protein sorting.

(c) Describe some unique features of lysosomal enzymes and its boundary membrane.

(d) What are KDEL/KKXX sequences?

(e) What are the possible factors which influence signal amplification?   [(1+2)+2+1.5+1+2.5]

10. (a) What is G protein?

(b) How cAMP involve in signal transduction pathway?

(c) What do you mean by sampling and sampling error?

(d) What is standard deviation?

(e) Define chi square.

(f) What is null hypothesis?   [1+4+2+1+1+1]

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