UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2024

MSc-I Semester (BT)

Course Code (Credits): 20MS1BT112 (3) Max. Marks: 15

Course Name: Cell and Molecular Biology

Course Instructors: Dr. Abhishek Max. Time: 1 Hour

Note: (a)*All questions are compulsory.*

(b)Marks are indicated against each question in square brackets.

(c) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

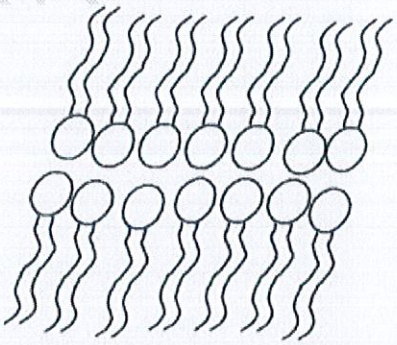
1. One of your classmates, Rahul, is working on a new science fiction novel. He approaches you with questions regarding cell membranes.

Explain the following to Rahul?

a) Why are saturated fatty acids more likely to be solid at room temperature than unsaturated fatty acids. Give the name of any two fatty acid [2]

b) Why does the structure of the phospholipid molecule favor the formation of bilayers or membranes? Illustrate with suitable example [2]

c) Rahul proposes the following structure for the membranes of an alien life form. What conditions would need to exist to make this arrangement possible? [2]



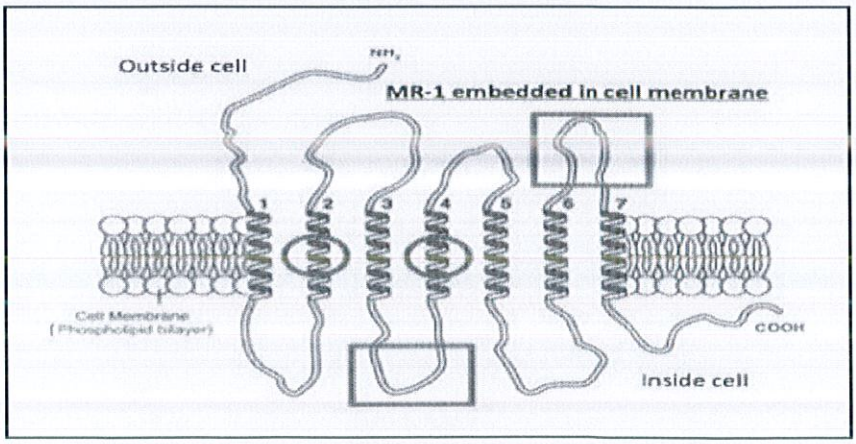
Portion of alien membrane

2. The schematic below shows MR-1 receptor (Melanocortin receptor) embedded in the cell membrane. This receptor has 7 transmembrane domains labeled 1-7 in the schematic.

a) Does the nature/ characteristics of amino acids inside the circled region of MR-1 differ from the nature of amino acids inside the boxed regions? If so, why? [2]

b) Would the sequence of amino acids in both circled regions ALWAYS be the same? Why or why not? [2]

c) What do you understand by Hydropathy Index and elaborate its significance in protein engineering using MR-1 as an example [2]



3. Melanocortin receptor (MR-1) catalyzes the conversion of dopaquinone to eumelanin as shown below. **Note:** Each circled interaction is critical for dopaquinone-MR-1 binding. For each position (i)–(iv), name the **non-covalent interactions** between MR-1 receptor and dopaquinone? And also explain the significance of all the interactive forces in cell biology [3]