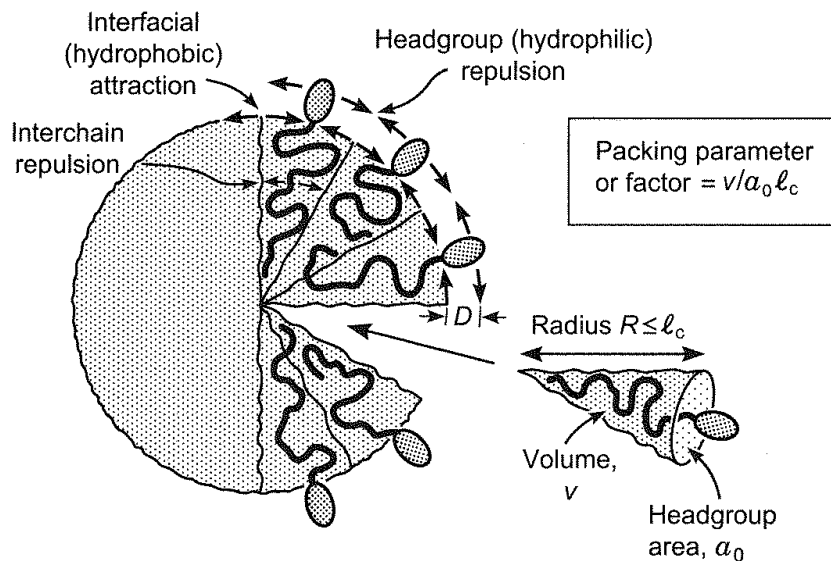


1 Question 1:



Below what aggregation number will SDS micelles in water be spherical and how could this be achieved in practice?

What happens in Chloroform?

2 Question 2:

In cells both phosphatidylcholine and phosphatidylethanolamine are common lipid types that are observed to be present. Discuss how this difference in head group identity is important in the cellular membranes. You may use the intracellular distribution to support the importance of the chemical difference or the chemical difference resulting from the two head groups to infer an intracellular distribution.

3 Question 3

Diffusion of lipids and protein inclusions in the membranes is critical for the Singer & Nicolson model of cell membranes. Using the newly synthesized fluorescent cholesterol analogue, cholestatrienol (fC), you have decided to study the size distribution of membrane rafts as reported by the measured diffusion constant of cholesterol in membranes. You are going to be able to measure D_{fC} by fluorescence correlation spectroscopy and estimate the molecular size of rafts using the Saffman-Delbruck relation.

$$D_{fC} = \frac{k_B T}{4\pi\mu h} \left(\log \frac{\mu h}{\mu' a} - 0.5772 \right) \quad (1)$$

- $\mu = 0.1$ pascal (kg/ms),
- $\mu' = 10$ pascal
- $h \equiv$ membrane thickness,
- $a \equiv$ particle diameter,

- $k_B = 1.39 \times 10^{23} \text{ kg/m}^2 \text{ s}^s$,
- $T \equiv \text{temperature}$

The $D_f C$ was estimated in DOPC giant vesicles and in cell plasma membranes and found to be 1 and $10 \mu^2\text{sec}$ respectively. Calculate the apparent radius of the fC particle in both circumstances. Propose an explanation for this change in diffusion coefficient in these two membrane systems. Suggest two additional experimental manipulations further analysis that could be used to support your explanation.