

Example of possible exam questions

1. If you would drop some water on the table in front of you it would most probably form a drop with some curvature.
 - a. Why?
 - b. What would be important characteristics of the surface for the water droplet to form a thin film on the surface?

2. Explain the following terms
 - a. Lyophilic colloid
 - b. Lyophobic colloid
 - c. Cohesion
 - d. Adhesion
 - e. Contact angle hysteresis
 - f. Surfactant
 - g. Coagulation
 - h. Debye length
 - i. ...

3. What is critical micelle concentration?
 - a. Discuss the effect of chain length on the critical micelle concentration.
 - b. Why do non-ionic surfactants in general have lower CMC values compared to ionic ones?
 - c. How does addition of electrolytes affect CMC of charged surfactants?

4. Cationic polyelectrolytes are used as retention aids during papermaking, i.e. to bind fines and fillers to the cellulose fibers. Anionic dissolved colloid substances may decrease the efficiency of the retention aids. Why? How can this be avoided?

5. Explain briefly the DLVO theory. Give two examples of forces between particles or surfaces that are not explained by the DLVO theory.

6. Describe the main differences between Bacterial cellulose (BC), cellulose nanocrystals (CNC) and cellulose nanofibrils (CNF).

7. The size of the random formed coil from polymer depends on the solvent. Define "good, bad and theta solvent" and explain the behavior of polymer in them.

8. Two commonly used methods for depositing monolayers on solid substrates are called Langmuir-Blodgett deposition and Langmuir-Schaefer deposition. Explain the basic principle of both methods and how they differ from each other.

9. What are polyelectrolytes? Which factors affect polymer adsorption at surfaces?

0. In the production of cellulose nanofibrils (CNF) the fibers are often pre-treated before fibrillation in high shear fluidizer or Masuko type supercollider.

- a. What are the main objectives with the pretreatments?
- b. Give two examples of common pretreatments
- c. What is the risk doing pretreatment?

1. Surfaces are often modified in order to change their wetting properties or affinity of various compounds to them. List some typical surface modification methods. Describe two methods in more detail and give some advantages and disadvantages with the chosen methods.

2. There are several different ways to modify a surface in order to introduce properties such as superhydrophobic or anti-fogging. Name and briefly describe 2 methods

3. Hyaluronic acid was attached to cellulose nanofibrils with the point of producing durable lubricating layer. Based on the figure below explain the effect of pH on friction forces.

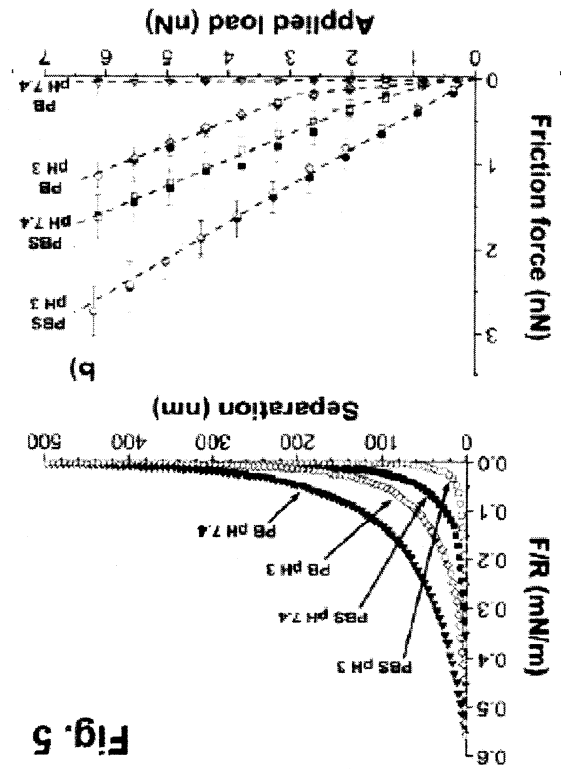
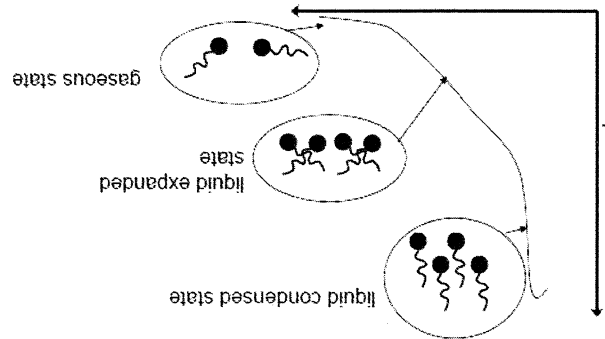


Fig. 5

14. Add the axis titles to the picture, and explain the shape of the curve.



15. A dispersion of silica nanoparticles is reasonable stable at low electrolyte concentration. What are the forces contributing to the stability of the dispersion? Adding salt to the dispersion induces flocculation. Why? What forces dominate now? Suggest how the stability of the dispersion can be made less salt-dependent.

16. Explain the foam formation process and Marangoni effect and its effect in the process.