

1. Discuss why bottom-up based nanomaterials are noteworthy recently. The limitation of conventional top-down method and practical application of nanomaterials should be included. (10)

2. Discuss the size-dependent properties of nanoscale materials system in terms of the following parameters. (20)
 - (1) Energy band
 - (2) Conductivity
 - (3) Melting points
 - (4) Magnetism

3. You synthesized 5.5 nm sized CdSe nanoparticles. When you irradiated UV light, you could observe red fluorescence from nanoparticles.
 - (1) If you want to observe green fluorescence, then what do you have to do? And provide scientific principle for the color change of the CdSe nanoparticles. (10)
 - (2) While you synthesized nanoparticles, you found that size of nanoparticles was not easy to control due to Ostwald ripening or coalescence. Explain the phenomena and suggest the way you can avoid it. (10)

4. Contrast the features of emulsion and microemulsion systems, including the thermodynamic features of both systems. (20)

5. In a microemulsion system, explain the scientific principles involved in the three possible ways for the morphology transformation from spherical micelles to cylindrical (rod-type) micelles. (20)

6. You were asked to fabricate polystyrene hollow nanospheres. Based on the knowledge of microemulsion, describe strategies in detail to achieve the goal. Make sure that scientific explanations are provided in each step. (20)

7. If you have any good idea or comments for improving the quality of this lecture, please feel free to suggest your idea or to comment. (10)