Prince of Songkla University
Faculty of Engineering

Final Test
4 October 2009
215-657 Aerosol Science and Engineering

Semester 1/2552
9:00-12:00
Room : The Robot Head Room

Name _____ ID _____

Direction:
1. Open book exam. Everything is allowed.
2. There are total of 5 problems.

Problem	Full score	Your score
1	30	
2	15	
3	15	
4	20	
5	10	
Total	90	

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Instructor

215-657 Aerosol Science and Engineering

Final Test (Total 90 Points)

Name _____ ID _____

1. Answer all questions as clear as possible. (30 Points)
   1.1 What is the difference between *aerosol concentration* and *particle density*? (2 Points)

   1.2 Explain, in detail, how an *Andersen Impactor* works. (4 Points)

   1.3 Describe Davies' criteria in sampling aerosol from still air. (4 Points)

1.4 What is the major difference between *fibrous filter* and *membrane filter*? (2 Points)

1.5 How does *single-fiber efficiency* affect the *overall efficiency* of a filter? (3 Points)

1.6 What are main parameters in considering filter performance? Also describe the filter figure of merit. (4 Points)

1.7 How many modes of particles constituted in atmospheric aerosol? Describe. (3 Points)

1.8 Give 5 examples of each *desirable* and *undesirable* aerosol. (5 Points)

Desirable:

1.

2.

3.

4.

5.

Undesirable:

1.

2.

3.

4.

5.

1.9 How light scattering is used to measure size of aerosol particles? Explain. (3 Points)

2. Design a single-stage impactor with a cutoff diameter of 0.25 micron that operates at a flow rate of 5 lpm. Assume the particles are water droplets (density 1000 kg/m^3) and viscosity of air is 1.81×10^{-5} Pa.sec. (15 Points)

3. Suppose you want to sample an aerosol from a still air. If the particle (density 900 kg/m^3) size does not exceed 20 micron and the sampling flow rate in 3 lpm. What should the size of the probe be if we align the probe vertically upward? Is it possible? If not, how would you solve the problem? (15 Points)

4. Determine the relative importance of single-fiber efficiency due to diffusion, interception, and impaction in collecting 0.5-micron-diameter particles. The filter has an effective fiber diameter of 1.0 micron and a solidity of 0.02. $U_0 = 0.5$ m/s. (20 Points)

5. For a 0.15-micron-diameter spherical particle (ρ_p = 2500 kg/m^3), determine the Cunningham correction factor and terminal settling velocity at standard conditions. (10 Points)