

1. Please design a sampling method to assess workers' exposures to toluene. Please give your rationales regarding your selection of the above sampling method. (20%)
2. Please design a sampling method to assess workers' exposures to free silica. Please give your rationales regarding your selection of the above sampling method. (20%)
3. An organic solvent is being exposed to workers via both inhalation and dermal contact. Their mean inhalable and dermal exposure concentrations are 100 ppm and 50 mg/100cm², respectively. Assuming their mean breathing rate is 20L/min, mean body surface is 10,000 cm², mean lifespan is 75 years, and lifetime occupational exposure period is 25 years, what are their lifetime daily average exposure concentrations? Assuming the absorption rates for the given solvent via inhalation route and skin contact route are 50% and 75%, respectively, what are their mean lifetime daily average doses? (20%)
4. We conducted particle size segregating samplings (sampling time = 8 hrs; sampling flowrate = 2 L/min) and found out that workers were exposed to spherical particles (density = 1g/cm³) with the following mean particle size distribution:

d_{ae} (μm)	1	3	5	10	15	20	40
Mass (mg)	0.2	0.3	0.5	1.0	2.5	1.2	1.0

Please calculate their mean mass, surface area, and number exposure concentrations. (20%)

5. Please define and compare following paired terminologies:
 - a. Static sampling vs. Personal sampling (4%)
 - b. Similar exposure group vs. Maximum exposure group (4%)
 - c. Activated carbon vs. Silica gel (4%)
 - d. Filtration vs. Sedimentation (4%)
 - e. Biological exposure index vs. Threshold limit value (4%)