**CE213A- Introduction to Environmental Science**

**Problem Set 3**

Q1: Calculate Reynold’s number for particle of diameter 1X10-6m, setting velocity 2.4m/s, air density 1.2kg/m3 and viscosity1.8X10-5kg/(m.s)

Ans: Re = (1 X 10-6 X 2.4 X 1.2)/(1.8 X 10-5) = **0.16**

Q2: Calculate drag coefficient for above calculated Reynold’s number.

Ans: CD = 24/Re (Since Re=0.16 i.e. <0.3)

CD = 24/0.16 = **150**

Q3: What kind of atmospheric stability will be there for following temperature of atmosphere w.r.t altitude

|  |  |
| --- | --- |
| Temperature (℉) | Altitude (m) |
| 86 | 0 |
| 81.05 | 150 |

Ans: Celsius = (Fahrenheit – 32) X 5 / 32

Environment lapse rate = (30-27.75)/0.150 = 15 K/Km or C/Km

ADR = 10K/Km

Since ELR>ADR

Hence **Atmospheric condition is super adiabatic lapse rate (unstable)**. This is preferable for pollutant dispersion.

Q4: A plant emits 20g/s of SO2 at height 50m. Wind speed = 3m/s, σy=30m and σz=20m. Calculate concentration of SO2 at centreline of the plume.

Ans: At centreline y=0 and z=50m

Gaussian equation becomes

Concentration at centreline= Q/(2πUσyσz)= 20/(2π\*3\*20\*30) = **1770ug/m3**