


Name:			
Enrolment No:			
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES End Semester Examination, May - 2023			
Course: Unit Operations Program: B. Tech (Biotechnology) Course Code: HSCC2023		Semester: IV Time: 03 hrs. Max. Marks: 100	
Instructions: <ol style="list-style-type: none"> 1. This is a closed book examination. Please write your answers with detailed information, wherever required. 2. In case of any missing data or information, make necessary assumptions with proper reason. 			
SECTION A			
S. No.		Marks	CO
Q 1	What is particulate system? Give four examples that we encounter in our daily life.	4	CO1
Q 2	Draw a schematic diagram of an open circuit crushing containing at-least two number of size reduction equipment and two screens.	4	CO2
Q 3	What is drag coefficient? What is its importance?	4	CO3
Q 4	Draw a labelled schematic diagram of a fluidized bed.	4	CO4
Q 5	Why does a colloidal solution of gold nanoparticles display different color?	4	CO5
SECTION B			
Q 6	<p>A powder material of average size of ~0.55 inch needs to be size reduced to about ~10 μm in size. Select suitable size reduction equipment for the purpose with proper reasons. Describe in details about the working of the equipment (s) that you suggest which should be used to make the size reduction.</p> <p style="text-align: center;">OR</p> <p>With the help of a labelled diagram, explain the working of two industrial screening equipment along with their limitations.</p>	10 10	CO2
Q 7	Derive the expression of terminal settling velocity and mention all necessary assumptions.	10	CO3
Q 8	<p>How can you transform a fixed bed into a pneumatic transport? Elaborate the detailed steps in point wise.</p> <p style="text-align: center;">OR</p> <p>Discuss in detailed on the working of a ball mill with a labelled diagram. Mention the advantage and limitations of the mill.</p>	10 10	CO4
Q 9	Give at-least five unique properties of a nanoparticle when compared to its bulk size particle of the same material. How have these properties been utilized in various application of science and technology?	10	CO5

SECTION C

Q 10	<p>The data of the particle size distribution of three cuts obtained from a double-deck vibrating screen (35 and 48 mesh) is provided in Table 1 of APPENDIX- 1. The mass ratio of oversize: intermediate: undersize is 5:3:2. Calculate the effectiveness of double deck vibrating screen system as a whole, taking undersize as the desired product.</p> <p style="text-align: center;">OR</p> <p>A screen analysis for a sample containing catalyst powder was made. How can you determine the particle size distribution of the fractions that are collected in the pan.</p>	20	CO4
Q 11	<p>A particle of square shape having $2.3 \text{ mm} \times 2.3 \text{ mm}$ face with a thickness of $b \text{ mm}$ falling in an oil (See Fig. 1). Compute the terminal settling velocity (V_t).</p> <p>Given data: $\rho_p = 3500 \text{ kg/m}^3$, $\rho_f = 850 \text{ kg/m}^3$,</p> <p>Viscosity, $\mu_f = 10 \text{ poise}$, Acceleration due to gravity, $g = 9.8 \text{ m s}^{-2}$</p>	20	CO3

APPENDIX- 1 (This page has to be submitted along with the answer script)

Name of student:

Roll no.:

Invigilator's signature:

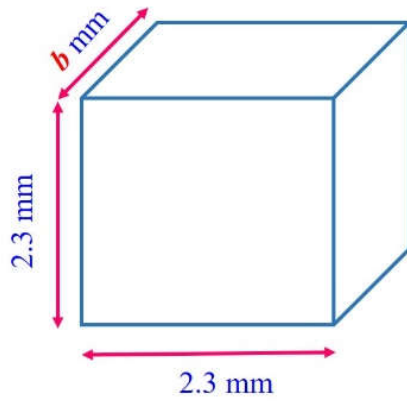


Fig. 1: Dimensions of the particle. Here, the breadth of the particle, b = (last digit of your roll number + 0.1) mm

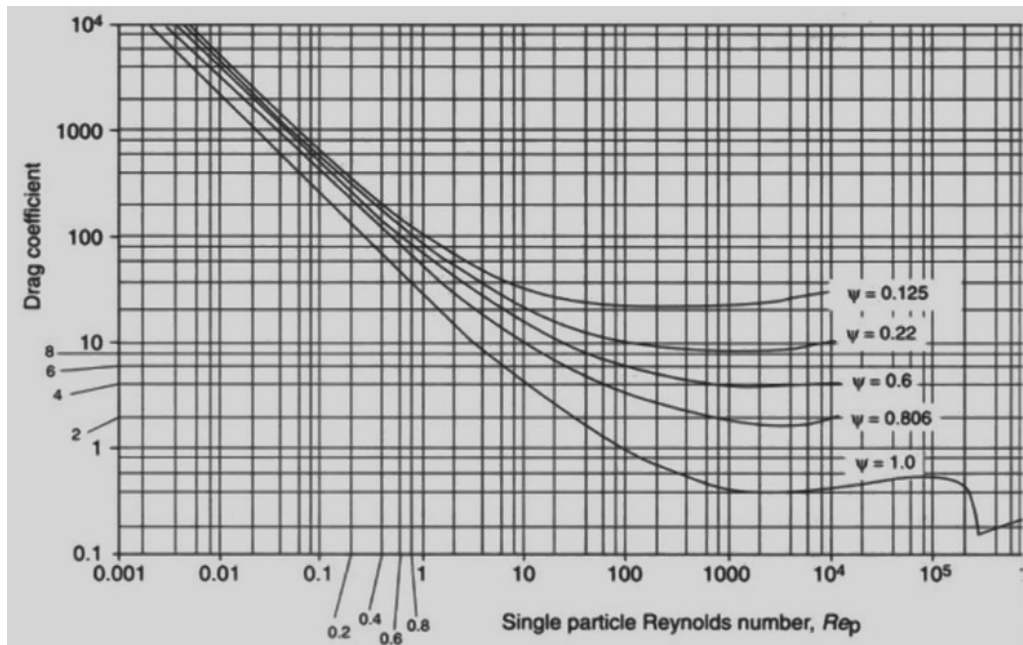


Fig. 2: Drag coefficient curve for various particles of sphericity, ψ .

Table 1: The particle size distribution of the double-deck vibrating screen.

Mesh no.	Screen opening (mm)	Oversize mass fraction retained	Intermediate mass fraction retained	Undersize mass fraction retained				
28	0.589	0.197	0.020	0				
35	0.417	0.3890	0.039	0.001				
48	0.295	0.3370	0.322	0.003				
65	0.208	0.0660	0.526	0.344				
150	0.104	0.011	0.093	0.652				