Unit 3 - Week 2

Course outline

How does an NPTEL online course work?

Week 1

Week 2

- Characterisation of colloidal particles - II
- Introduction to forces acting on an individual colloidal particle
- Introduction to interaction between colloidal particles
- Application of Brownian force: Measument of diffusivity and size
- Origin of scattering
- Radiation used to study colloidal systems
- Quiz : Assignment 2
- Weekly Feedback 2 : Colloids and Surfaces

Week 3

Week 4

Week 5

Week 6

Week 7

Week 8

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Assignment 2

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-09-30, 23:59 IST.

Answer the Questions 1 and 2 based on the data given below :

Consider two spherical particles of radius R_1=1 nm and R_2=1000 nm. Assume that other physic-chemical properties of the particles are identical [Hint: The particles of same density]. Calculate

1) Ratio of surface area of smaller particle (SA_1) to that of larger particle (SA_2) ***2 points***

- 0.00001 or 1E-5
- 0.000001 or 1E-6
- 0.0001 or 1E-4

No, the answer is incorrect.
Score: 0
Accepted Answers:
0.000001 or 1E-6

2) Ratio of specific surface area of smaller particle (SSA_1) to that of larger particle (SSA_2) ***2 points***

- 100 or 1E1
- 10000 or 1E2
- 1000 or 1E3

No, the answer is incorrect.
Score: 0
Accepted Answers:
1000 or 1E3

Answer the Questions 3 to 8 based on the data given below :

A Brownian motion experiment is conducted with an intension to measure the Avagadro's number. The experiment involves video-microscopy wherein a camera attached to a microscope is used to visualize and record the motion of particles of well-defined size and shape. The mean square displacement as a function of time for spherical particles of three different diameters is shown in Figure 1.

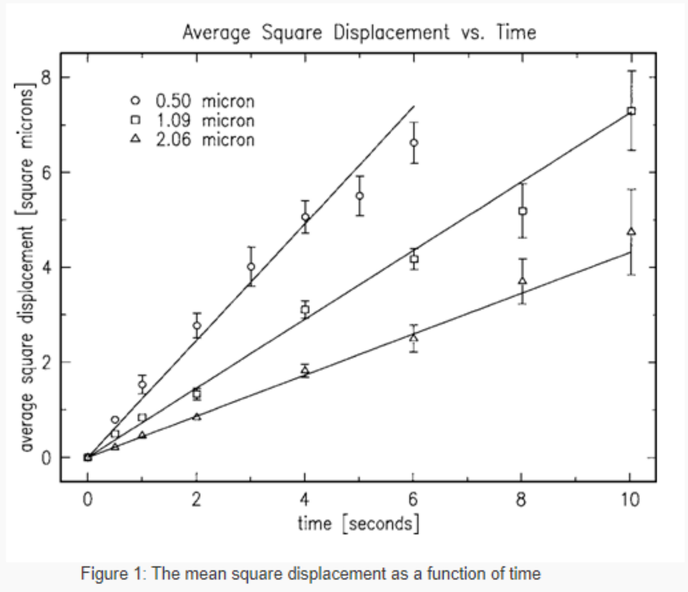

Figure 1: The mean square displacement as a function of time

3) Calculate the diffusion constant D (in m^2/s) from the data corresponding to particles of size 0.5 micron ***2 points***

- 7.30E-13
- 1.23E-12
- 4.30E-13

No, the answer is incorrect.
Score: 0
Accepted Answers:
1.23E-12

4) Calculate the diffusion constant D (in m^2/s) from the data corresponding to particles of size 1.09 micron ***2 points***

- 4.30E-13
- 1.23E-12
- 7.30E-13

No, the answer is incorrect.
Score: 0
Accepted Answers:
7.30E-13

5) Calculate the diffusion constant D (in m^2/s) from the data corresponding to particles of size 2.06 micron ***2 points***

- 1.23E-12
- 7.30E-13
- 4.30E-13

No, the answer is incorrect.
Score: 0
Accepted Answers:
4.30E-13

6) Calculate the Avagadro's number N_{AV} from the data corresponding to particles of size 0.5 micron ***2 points***

- 6.40E+23
- 5.70E+23
- 8.20E+23

No, the answer is incorrect.
Score: 0
Accepted Answers:
8.20E+23

7) Calculate the Avagadro's number N_{AV} from the data corresponding to particles of size 1.09 micron ***2 points***

- 6.40E+23
- 5.70E+23
- 8.20E+23

No, the answer is incorrect.
Score: 0
Accepted Answers:
6.40E+23

8) Calculate the Avagadro's number N_{AV} from the data corresponding to particles of size 2.06 micron ***2 points***

- 8.20E+23
- 6.40E+23
- 5.70E+23

No, the answer is incorrect.
Score: 0
Accepted Answers:
5.70E+23

9) From the dynamic light scattering technique diffusion coefficient of an enzyme in water (of 0.001kg/m.s viscosity) at 293 K is found to be 2.88×10^{-11} m^2/s. Calculate the radius of the particles. The Boltzmann's constant (kB) is 1.3807×10^{-23} $J\,K^{-1}$

Note : Report your value in nanometer (nm)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 6.8,8.4

2 points

10) Consider a dilute dispersion of colloids. Following table provides a list of forces acting on individual colloids (Column A). In Column B, expressions for each of the forces are provided. Match the force in Column A with the correct expression in Column B. ***2 points***

Column A	Column B
a) Brownian Force	(i) $6\pi\eta_m aV$
b) Hydrodynamic Force	(ii) $\Delta\rho V_p g$
c) Gravitational Force	(iii) nk_BT
d)Osmotic Pressure	(iv) k_BT/a

The notations in column B have the usual meanings.

- (a)-(ii), (b)-(iv), (c)-(iii) and (d)-(i)
- (a)-(i), (b)-(ii), (c)-(iv) and (d)-(iii)
- (a)-(iv), (b)-(i), (c)-(ii) and (d)-(iii)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(a)-(iv), (b)-(i), (c)-(ii) and (d)-(iii)