BROWNIAN MOTION IN CELLS EXPERIMENT

Watch the video on this experiment

Student's Name

Partner's Name

Pre-lab Discussion Questions and Staff Sign Off

Before you make observations with the microscope, you will

Run the Simulating Brownian Motion in Matlab exercise and be prepared to discuss the ways of visualizing and analyzing particle motion.. A sample simulation script is provided. Show your simulation results and the answers to the following questions to a GSI or professor before you start. Copy the folders "Brownian Motion Software" and "BMC Code" from the Advanced Lab Share to your directory. Located on the share drive to your own 'My Documents' folder. Run the 'Brownian Motion in Matlab' exercise.

1. What are the masses of the various nanoparticles you will be observing in the lab? How many atoms are in a single particle? What is the uncertainty in these numbers? Data sheets for the nanoparticles are available in the 'BMC' experiment folder on the network drive **U:\Advanced Lab Share\Experiment Folders\BMC\BMC Reprints.**
2. For your experiment on Brownian motion of synthetic beads, you should choose a couple of different size particles and at least three different viscosity solvents. Choose the conditions you plan to observe and simulate them in Matlab. Use your simulated data to calculate the diffusion coefficient, *D* in each case. Explain how you arrived at your answer.
3. Using the microscope, you will observe a minimum of two different size particles in at least four different viscosity solvents. Choose the conditions you plan to observe and simulate them in Matlab. (You should choose at least one particle 1 μm or larger and one smaller.)
4. Use your simulated data to calculate the diffusion coefficient, *D* in each case. Explain how you arrived at your answer.
5. What is the uncertainty of your estimate of *D*? How does it vary with the number of simulated data points? Explain your strategy for making observations in the lab. What additional sources of error (these are significant) will come in to play? How will you account for them?

Staff Signature Date

Completed before the *first* day of lab? (circle) Yes/No

Mid-lab Questions I Staff Sign Off

1. Using a slide with a combination of 10μm and 0.44μm polystyrene spheres, show how to set up Köhler illumination.
2. How many nanometers per pixel are captured at 10x, 20x, and 40x?
3. Draw diagram of darkfield illumination. Explain how it is possible to see 40 nm objects with visible light (400-750 nm wavelengths).
4. Set up dark-field illumination.

Staff Signature _____ Date _____

Completed on the *second* day of lab? (circle) Yes/No

Mid-lab Questions II Staff Sign Off

1. By day three of this lab, you should have collected some particle tracks and made several movies. Show one of the particle tracks to an instructor. What value of ***D*** did you calculate from the track? How close is this to the theoretical value? You can do this either with the BMC application or with the Matlab scripts.
2. Show and explain your averaging and centroiding code. How do they work?

Staff Signature _____ Date _____

Completed on the *third* day of lab? (circle) Yes / No

INCLUDE THESE SHEETS AS THE FIRST PAGES OF YOUR REPORT

Physics 111 Advanced Lab ***Student Evaluation of Experiment***

Now that you have completed this experiment, we would appreciate your comments. Please take a few moments to answer the questions below, and feel free to add any other comments. Since you have just finished the experiment it is *your* critique that will be the most helpful. Your thoughts and suggestions will help to change the lab and improve the experiments.
Please be as specific as possible, using both sides of the paper as needed, and turn this in with your report. Thank you!

Experiment name:_____ Date:_____

How was the write-up for this experiment? How could it be improved?

How easily did you get started with the experiment? What sources of information were most/least helpful in getting started? Were the reprints appropriate? Did the Pre-lab discussion help? Did you need to go outside the course materials for assistance? What additional materials could you have used?

What did you like and/or dislike about the experiment?

Would you recommend this lab to fellow student? Why or why not?

What advice would you give to a friend just starting this experiment?

Please circle the abbreviations of the other labs you have done.	Overall quality of this experiment
ATM BMC BRA COM CO_2 GMA HAL HOL JOS LIF LLS MNO MOT MUO NLD NMR OPT OTZ RUT SHE XRA	1 2 3 4 5 Poor Average Good

