

Passive and active Project in FYS4715 2022

The first weeks we have discussed biological relevance of diffusion, both on the molecular scale and on the micro-organism scale. We have seen that our models of molecular motion, diffusion and low Reynolds number drag are relevant on several scales. We have studied both passive, Brownian particles and discussed active E-coli bacteria.

The last part of the project focuses on generalization of physics models to active particle systems and new types of "diffusive" behaviour and other collective phenomena creating long range order.

Deadline: 22 Sept.

I. SOME ELEMENTS THAT SHOULD BE INCLUDED

You are free to emphasize what you like and add other elements.

- Motion and forces at low Reynolds number
- Different models
 - Random walk
 - Brownian motion
 - Active Brownian motion
 - Vicsek model
- Biological relevance
 - Nutrient diffusion
 - Run and tumble for seeking food
 - ...

Appendix A: Objective of reports

One objective of the report is to document your understanding, knowledge and skills in the subject. On the reports you will get pass or fail plus comments in the reports.

The reports have another objective as well: Aiding your learning. By presenting your work in a report you are forced to be stringent and logical in combining the different pieces of text, figures, equations, etc. The process of doing this is intensive learning.

Appendix B: Structure of reports

The point is not that you spend a lot of time on formatting and typesetting, but that you spend time thinking, discussing and doing physics and that you present this process in a report as efficiently as possible.

1. Requirements

Document your answer to questions, calculations, analyses, discussions, conclusions, etc. in one single, coherent "report" with the following requirements

- include both experiments, analytical and numerical work in the same report
- the report should have the following parts
 - "Introduction"

- Main body. This includes (methods,) results and discussion, but you may subdivide the text in any way you find best.
- "Summary" or "Conclusions"
- there should be a red thread through the report connecting the different parts. This should be established in the Introduction. The results should be discussed in relation to the red thread and in the end you should summarise the relations between the different parts of the study and how they relate to the red thread.
- you may write by hand or use any typesetting system you like, but the report and all figures and labels should be easily readable.
- the report should be a single PDF file.

2. Details that matter

- do not copy text, lists of equipment and units and procedures and method descriptions from the texts given to you.
- All symbols must be defined in the text unless they have been defined in the text given to you.
- All equations, figures and tables must be described in the text.
- All figures must use fonts and symbols that are large enough to be legible (minimum 9pt fonts).
- All but dimensionless numbers must be given with the right units.