

Phys635, MBQM I-Semester 2019/20, Tutorial 3, Thu 17.10.

Please sit in your assignment teams, two or three teams to a table (behave like Bosons, not like Fermions). Do the “Stages” in the order below. When all teams finished a stage, elect a student to present and explain on the board.

Stage 1 Let’s try to sort out some questions about the material so far.

- (i) List the main points of the material covered since the last tutorial [i.e. week 6,7] try to agree on your table on what the essentials are.
- (ii) Among those, each list three items you think you understood best, and three that you understood least.
- (iii) Pair up, such that each of you explains to another student on the table one of those concepts, then swap. Ask us if unsure.

Stage 2 Mean-field theory: Discuss:

- (i) What is “mean-field” about mean-field theory?
- (ii) What are the most important assumptions about the atomic gas?
- (iii) What is the interpretation of the condensate wavefunction ϕ ?
- (iv) If you want to theoretically study a certain Bose-Einstein condensate experiment (after condensation has happened), which equations can you use? What do they tell you? What input information do you need?

Stage 3 Bogoliubov-excitations:

- (i) What are “Bogoliubov-excitations”?
- (ii) What can we learn from them?
- (iii) Under which conditions can you learn about their time-evolution from the GPE?
- (iv) How would you create any?