Exercises FYS-KJM4480, Fall semester 2009

Exercise 18

Consider the following diagrams: (i) Set up the expressions for diagrams (a)-(e).
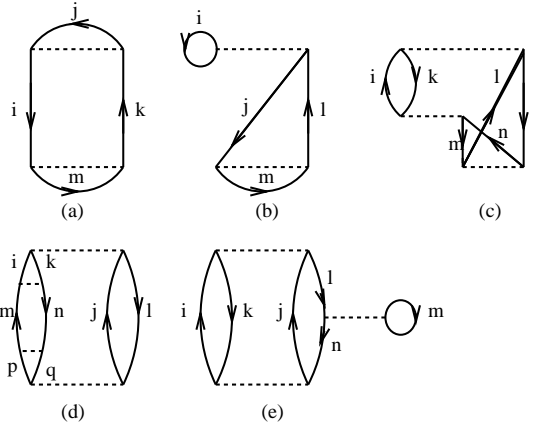
(ii) Diagram (b) does not give a contribution for a uniform and degenerate electron gas (or any uniform degenerate infinite system). Explain why. What about diagram (a)?

(iii) Diagram (c) is a so-called exchange diagram. Can you find the corresponding direct diagram?

(iv) Can you find the exchange diagram of diagram (e) under the assumption that the exchange takes place at the middle vertex?
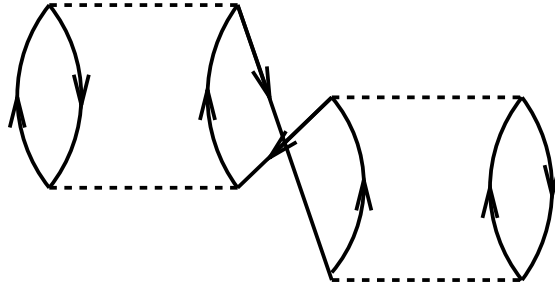
Exercise 19

Explain how the Hartree-Fock approximation can be used to cancel the diagrams of (a) in the figure. Set up their corresponding expressions. Find thereafter the expression for the diagram in (b).

(a)

(b)
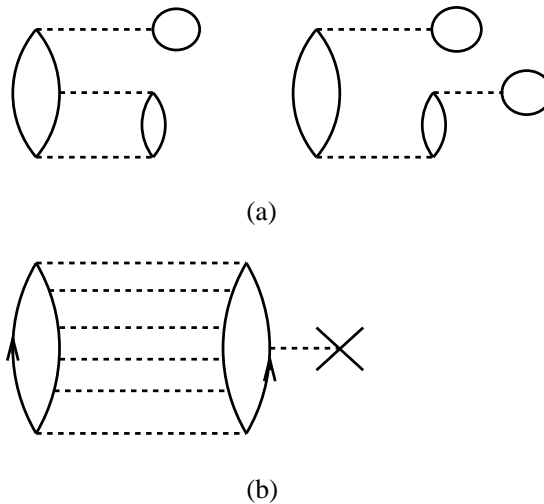
Exercise 20

Compute the contribution to ΔE_0 for the diagram shown here. Can the crossing hole lines have the same quantum

numbers?