Old (pre 2009/10) exam questions for PHYS30201 revision

Operator Methods

PC340 *1999* qu 3 (wave function in **p** space)
PC340 *1998* qu 2 *(*Ehrenfest's theorem)
PC340 *1997* qu 2 (wave function in **p** space)

Variational methods
PHYS 30602 *2008* qu 4a
PHYS 30602 *2007* qu 3
PC3602 *2000* qu 1

Time-independent perturbation theory
PHYS 30602 *2009* qu 2, 4
PHYS 30602 *2008* qu 2b
PHYS 30602 *2007* qu 2
PC3602 *2004* qu 3 (last part involves time, but not perturbatively)

Atomic structure
PHYS 30602 *2009* qu 1a
PC3602 *2004* qu 1, 2a (not 2b)
PC3602 *2003* qu 1 (not 1b)✝
PC3602 *2000* qu 3

Time-dependent solutions and time-dependent perturbation theory
PHYS 30602 *2008* qu 4b,c
PC3602 *2004* qu 2c
PC3602 *2003* qu 2
PC3602 *2000* qu 2 (note their c(t) is our d(t))
PC360 *1998* qu 2

Scattering theory
PC3602 *2003* qu 3

✝There are a number of questions like this, which you can in fact do if you note that the parity of a multi-electron state is the product of the parities of the single particle states, eg $1s^2 2s^2 2p^2$ is even, $1s^2 2s 2p^3$ is odd).   Hund's rules, which give the lowest energy term $^{2S+1}L_J$ for a given configuration of a multi-electron atom, will not be examined.

Comments

This summary was produced in 2009 when the course was given for the first time. Now there are three past papers, so this list is less relevant than it was and it has not been checked recently.

In the first year of the course creation and annihilation operators were taught explicitly in PHYS30201. This year they will not be examined for their own sake, but they do crop up frequently in eg perturbation theory questions. Similarly coupling of angular momenta and product spaces will not be examined explicitly, but may be used eg in questions relating to hydrogen.

Those parts of examples sheet 1 which are purely revision, and anything marked "challenge" question, are not good models for likely exam questions or question parts.

The short questions from the recent PHYS 30602 papers are not a good guide to the PHYS 30201 exam.   Also, PHYS 30602 contained molecular physics; you can safely ignore anything with "molecule" or "Born-Oppenheimer" in it.

For the past few years all useful questions have been listed. Going further back, only those which are particularly useful (eg expand the coverage or are closer in form to this course) are included.

There is less on the fine structure of hydrogen in pre 2009 past papers than in this course, and nothing on WKB.   Phase shifts in scattering theory are also not covered. Ex 3 qu 15-18 are good examples for WKB, and Ex 5 qu 37-39 for phase shifts.