Lesson 1: General intro.

1. Enquire on background of audience (EQ1, CMΦ, others...?)

2. General menu:

Field of CMΦ, generally speaking, deals with the precise manipulation of individual q. states. In early days, method to assume that this means dealing with objects such as: (1) properties on exactly and uniquely specified atoms (e.g., one Ca atom is identified to any other). (3) initial (reference) state is uniquely specified (e.g., Ca atom is in C3). At first sight, this means atomic-level entities (atoms, phonons, trapped ions...)

By contrast, systems aimed at subject-matter of CMΦ are very messy:

(1) 2 blocks of e.g. Nb metal an no identified, but in detail properties in p-detailed (exact chemical comp., distortions, exact shape of surface...)

(2) Don't have initial state exactly, even under "optimal" conditions.

(3) Don't have exact QM states of system.

So, how can CM systems be useful for CMΦ? In last 10-15 years main:

(a) Many of the unknowns may not matter, or should be much less the main result.

(b) CM quant systems may be much easier to engineer and/or scale up than

(c) At least one or more systems to avoid destruction in QC

TSC and of its major questions for its implementation in our MB.

Nevertheless, in matching considerations from CMΦ and CMΦ, CMΦ must be very careful. The whole aim of the two fields has been historically quite different: CMΦ has tried to compute macroscopic averages of quantities such as specific heat, transport, proton, or conductivity. Since these quantities are typically O(N), dependence of O(N^2) are quite terrible. So one is quite content to move from CMΦ to an idealized BM Z-exp - βK. On the other hand, CMΦ typically
This is a letter discussing the development of a single quantum state with certain precision. So, if our description of the system is incomplete, these incompletenesses must not affect the state development, i.e., should "fuzz out." (Ex: e− spin in NV complex — one hopes lattice vib will "fuzz out"!)

Generally speaking, when analyzing a QInf problem, one must consider "environment" of S+E. (S = quantum system one would ideally like to have (Ex: qubit), E = everything else, viz., can consistently interact with S). In a CMF context, one distinguishes from Q0, S−E environment is almost always "strong". So, why can one sometimes treat system as "isolated"?

Partial answer: field decaysure! (Ex: SB problem, neutron int.)* (Ex: FLB)

Note: entanglement ubiquitous (and long known) in CMF! (Ex: CB)

Second per column: "topological protection" (Ex: *Ke in e-nano ref, Theorem 3.3 in QHE).

However, sometimes too "easy" a mistake on part! CMF methods can be dangerous. Ex: initial-state dependence of int? Also: reliance on "derivatives" methods (GF, BdC ...): may be OK for entirely or'd non-smear behavior, fail badly for QInf applics.*

The C-H-QM technique.

[Ask for suggestions of topics]

Generalities: the Dirac Hamiltonian + its NK form, SO coupling, typical strength relation to NK effects. P, T, twist in? Conform in ref of TSE.

Gases, liquids, solids: crystalline + amorphous solids, liquid metals.

SBS : HMW 0’m etc. *Dimensionality*

*O. of mag. of characteristic energies (solid/liquid)

Superconductivity + superfluidity: superobids, superwmd. liquids?