1. Given a magnetic field strength of 9.4 T and temperature of 300 K, get an estimate of the population difference between the two levels of an isolated spin-$\frac{1}{2}$.

2. For the dipole-dipole Hamiltonian, why only A term is taken for the heteronuclear case, and both (A+B) terms for the homonulcear case.

3. Convincee for yourself that a general rank-2 tensor can be split into a rank-0, rank-1, and rank-2 terms.

4. Try working out the spin-echo scheme for homonuclear interactions.

5. Plot the Fourier transform of an NMR signal that has a cosine shape and that has a sine shape. Do you see any perceptible issues here. If so, how to rectify them.

6. How would you go about deriving the form of the dipolar alphabet.

7. Derive the Pauli matrices for spin-1 and then spin-3/2 systems.

8. Prof. Griesinger mentioned pulsed field gradients. How would you select the conditions on the gradients to select out a double-quantum coherence in a two-dimensional NMR double-quantum-filtered COSY experiments. Here, you may have to think of an appropriate pulse scheme before worrying about the gradient part.

9. Prof. Griesinger also mentioned phase cycling. List out the phase cycle required for the pulse in a single 90^0 pulse experiment.