3.3. The static magnetic field $\vec{B}_0$ is the main magnetic field. $\vec{B}_0$ aligns the magnetic moments of hydrogen protons with the direction of the field. When $\vec{B}_0$ is applied, the tranverse components cancel out. since there are many protons in the low energy level, the longitudinal magnetic component is in the same direction of $\vec{B}_0$. Besides $\vec{B}_0$ determines the Larmor frequency, which is the resonant frequency at which protons precess in the magnetic field. It provides conditions for the subsequent RF pulse excitation under appropriate conditions, leading to the generation of MR signals.

3.6. The oscillating $\vec{B}_1(t)$ field is also the RF field. The resonance condition based on classical physics is that $\vec{B}_1(t)$ rotates in the same manner as the precessing spins. $\vec{B}_1$ field is used to deliver RF pulses at the resonant Larmor frequency of the target nuclei. It's manipulate and control atomic nuclei's spin. It can cause low-energy protons to jump to high-energy protons and generate a resonance.

3.7. $W_f = W_0$ $\vec{B}_1$ rotates at the same resonance frequency as the spins precess.

3.8. There are different types of nuclei in the molecule. as well as being in different chemical environments. which is called a chemical skshift.

When I place a cup of water, according to the formula $\omega_0 = \gamma \cdot B_0$, the value γ is a constant. so you would not expect to detect more than one resonance frequency from the the protons. In a perfectly uniform magnetic field, all protons in the water experience the same magnetic field strength, so they are in a single resonance frequency.