Lecture 1
Introduction of MRI Device

Third stage

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principle work of MRI

- From now on, we will only consider the ***1H nucleus***; this may also be called ***the proton*** or ***a spin***.
- When an external magnetic field is applied, all the protons of the hydrogen atom are arranged in the direction or opposite of the field, and there can be no other arrangement.

principle work of MRI

- Large number of these protons their magnetic moments cancel each other out, leaving only a few as in the figure below, as there is no other proton that cancels its magnetic moment, see figure 1.
- These individual protons, although few in number, are sufficient to form the required images with high accuracy.

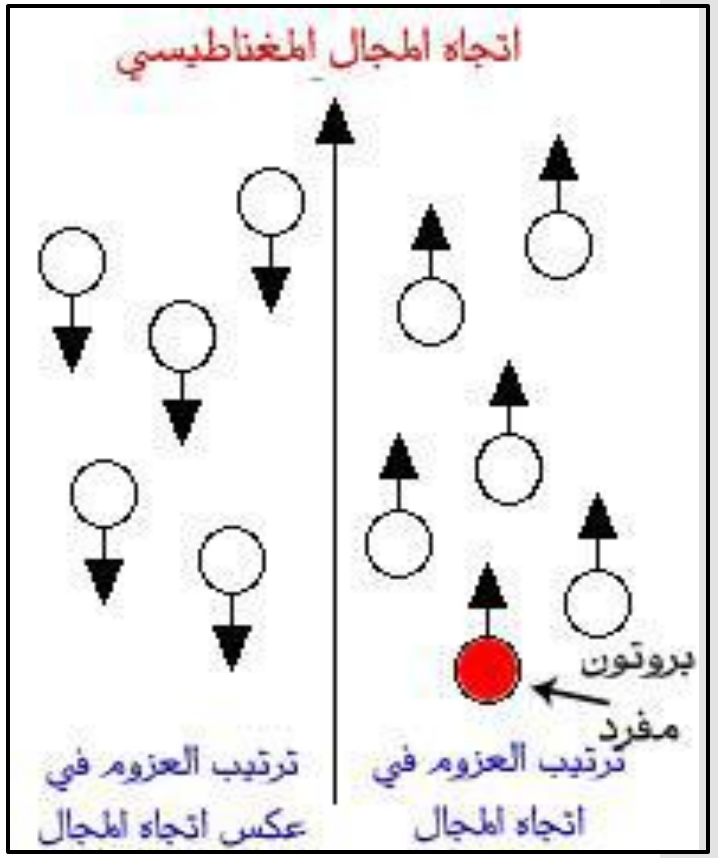

Figure 1: magnetic moment with external applied magnetic field

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- ***Procession***: when external magnetic field is applied. The direction of the spin axis tilts and rotates around the external magnetic field, with fixed frequency. This precession occurs at an angular frequency (ω_o) that is proportional to magnetic field strength (Bo).

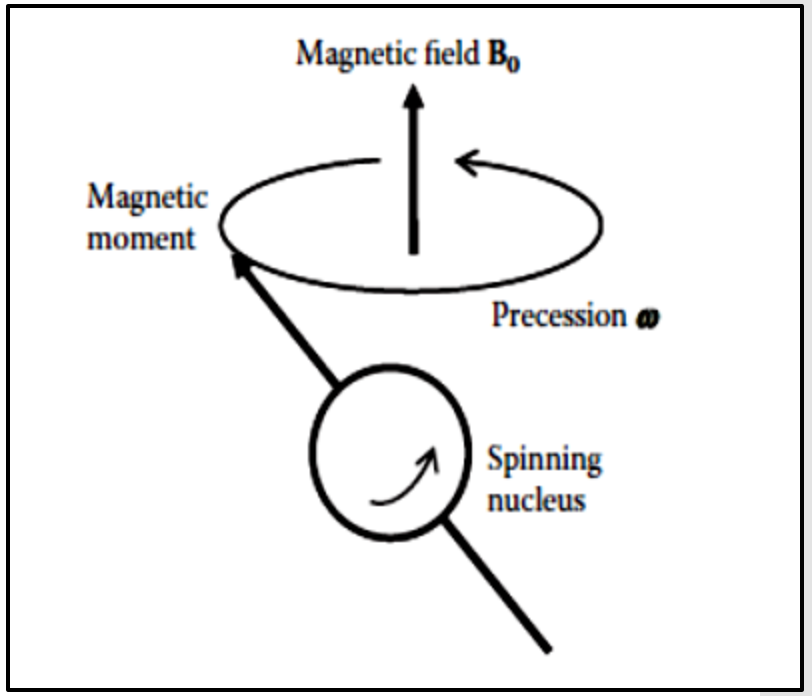


Figure 2: the 1H nucleus processes in an External magnetic field (right).

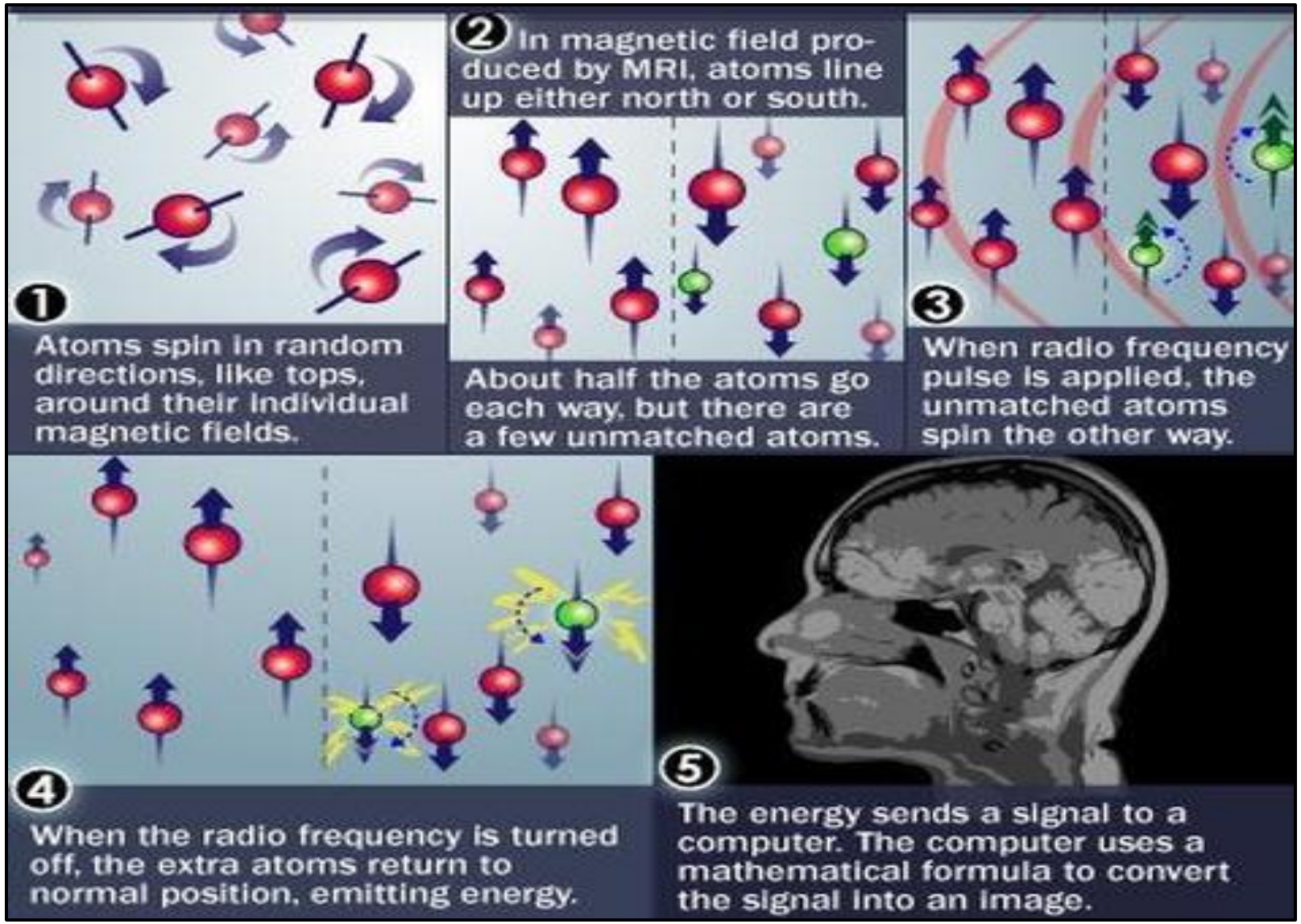
principle work of MRI

- If a radiofrequency (RF) pulse having frequency equal to ***Larmor frequency*** of tissue is applied perpendicular to the magnetic field, then it is absorbed by the proton nuclei and change the direction of spinning in the opposite direction to which they were previously spinning. This process called ***resonance***.
- When the RF pulse is finally turned off, the unmatched hydrogen atoms gradually return to their original position and emit a certain kind of energy.

principle work of MRI

- This energy is then detected by the highly sensitive antenna, which feeds the data into the computer system in the form of waves or signals.
- Finally, the computer system interprets this data and converts the signal into a visible and understandable image that can be read and studied by the doctors and scientists. See figure 5 below:

Steps of MRI scanning



what is happening in the body when it undergoes an MRI.

Magnetic Resonance Imaging (MRI)

Discussion

Q1: Why sometimes using dye in MRI experiment?

Q2: why it’s not safe to have MRI with some medical devices such as pacemaker?

Q3: why you should remove all the metal objects before MRI?

Q4: what are the types of MRI device and which one is the best?