

Nuclear Magnetic Resonance 1	
1	precession
2	Larmor frequency
3	resonant excitation
4	the real and imaginary components of response
5	the energy level splitting for spin 1/2
6	the number of spins (protons) in 1 mL of water at 300 K
7	the number of excess spins in 1 mL of water at 300 K and 2 kGauss
8	the proton spin crisis
9	the quark composition of the proton
10	the quark composition of the neutron
11	the magnetic moment of the proton
12	the magnetic moment of the electron
13	the magnetic moment of the neutron
14	the magnetic moment of F-19
15	the nuclear shell structure of F-19

Physics is about much more than equations---it is about ideas !!! Mathematics is the language that allows us to express those ideas in a compact, precise form. Some ideas require both the language of mathematics and the language of people to express them---quantum mechanics certainly does. Other ideas can be expressed using only words and pictures---because people intuitively understand the math.

I want you to understand the physics of the experiments, which to me means being able to express it in words, in pictures, and in equations. Rutherford said that if you really understand something you should be able to explain it to your grandmother. I am not asking you to explain the physics in a way that your grandmother would understand it. Just explain it so that I know that you understand it.

For each of the topics on the next page, write clear, concise, physical descriptions that demonstrate you really understand the important the physics of the experiments. You should be able to do this in a few sentences to a paragraph for each topic.

Explain the physics for each topic in your own words. You do not have to write a perfect essay on each topic, but do write enough to convince me that you really do understand the topic. Make sure to include any important pictures, graphs, and equations.

Try to write down, or draw, three or four important things for each topic.

All I want is for you to understand the physics. I am asking you to write things down because I know you will learn more that way.

If you would rather make a video or a video game, or to write a play, a poem, or a song, No Problem!
Just make sure that your opera magna show me that you understand the physics.