Magnetic Circuits

Reading assignment
Ulaby, 6-3, 6-5
Connor and Salon, Appendix VI

Problem 1 - transformer, magnetic circuits

a. Evaluate $\oint \mathbf{H} \bullet \mathbf{dl}$ around the dashed line in the figure on the left below. Then, determine $|\mathbf{H}|$ and $|\mathbf{B}|$ in the iron core. Make reasonable approximations.

b. What is the inductance, L?

c. For the figure on the left, what are the reluctance, $\Re$, and magnetomotive force, *MMF*? Draw a magnetic circuit equivalent and show how to solve for the inductance using the circuit.

d. Analyze the situation on the right using magnetic circuits. Determine the flux through the iron core. What is the inductance? What is **H** in the core and in the gap?

e. Calculate numerical values for L, $|\mathbf{H}|_{gap}$ and $|\mathbf{H}|_{core}$ when N = 1000, I = 1 A, w = 5 cm, g = 1 cm, l = 20 cm, and μ_r = 5000.