Exercise 2

Total Points = 12 (+1 for attempting the bonus)/20. Feel free to clarify things with me (via email/in person)

Question 1 : Code

7/10
I have given you points for getting the idea right, and defining the right functions. However, most of your results (physical quantities) are wrong.
Also, the way a sweep is defined (in the assignment), is to consider every spin in the lattice and do the accept-reject, but it's okay.
Redefining the sweep, and making a few changes in the Hamiltonian function actually made your results a bit more "better". You should do that.

Question 2 : Energy(S) scaling with Λ

Correct, **(1/1)**

Question 3 : ΔS scaling with Λ

Correct, **(1/1)**

Question 4 : Significance of J_c

Although, you are right about the magnetization becoming 0, you don't mention how $J_c \equiv \beta J_c$ and hence is actually a ratio (which depends on T as well)**(0.5/1)**

Question 5.1 : $\langle m \rangle$ vs h

Correct plots, however, you have only shown the dependence on N =20, the question asks to show the plot for a few values of $N \in [4, 20]$ **(1.5/2)**

Question 5.2 : $\langle \epsilon \rangle$ vs J

Both the simulation results and the theoretical curve are wrong. **(0/2)**

Question 5.3 : $\langle |m| \rangle$ vs J

Wrong curves **(1/3)**,
Your results would have been correct, but I saw that you just summed up np.abs(lattice[i,j]) instead of taking the absolute value of the magnetization.

Question 5.4 : Specific Heat

You're supposed to observe a sharp peak (theoretical) or some kind of peak at the phase transition. I give you 1 point for attempting. (1/4)