Expansion of the Universe

Turn in one copy of this lab with each group member's printed name and signature. By signing, you certify that you have actively participated in the exercise and have put forth effort in equal share to your fellow group members.

Printed Name   **Signature**

_____   _____

_____   _____

_____   _____

_____   _____

1. Compare the galaxies using Table 1. Which one do you think is the farthest? Which one is the nearest? Why do you think this is the case?

2. Which galaxies took a longer time to reach a signal-to-noise of 50? Why?

3. Take a look at the $\lambda_{observed}$ from your galaxies in Table 2. Are the wavelengths longer (redder) or shorter (bluer) than the rest wavelength? Does this mean they are moving toward or away from us?

4. Take a look at your graph. Do you see a trend in the data? Is it something you would expect to see? Why or why not?

5. Why must your best fit line go through (0, 0)?

6. Slope of Best Fit line: _____ (Mpc/Gyr/Mpc)

   Average H from table: _____ (Mpc/Gyr/Mpc)

7. The accepted value for H is 0.070 with an error of 10%. What are the maximum and minimum values for H? (be sure to use the *accepted* value to find these, not yours!)

8. Do your two values lie within the maximum and minimum range above? What does this say about your results?

9. Use **your average** value of H to find the current age of the Universe in *Giga Years*. Hint: H = 1/time. Solve for time – the time it has been since all the galaxies were in one place: in other words the Big Bang!   ** Show your work **

Table 1

List #	Galaxy Name	Apparent Magnitude (V)	Length of observation (seconds)	S/N	Comment on Appearance

Table 2

Galaxy	$\lambda_{observed}$ (Å)	Distance (Mpc)	$\Delta\lambda$ (Å)	Velocity (km/s)	Velocity (Mpc/Gyr)	H (Mpc/Gyr/Mpc)