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. What were some challenges in classifying the Calcium K spectral line? Were some galaxies easier or harder? Why/why not?

2. Compare the galaxies in your spreadsheet. Which one do you think is the farthest? Which one is the nearest? Do you notice any trends just by looking at the data?

3. Which of the data in the spreadsheet did your measurements of the Calcium K line provide you with?

4. Look at the **lambda**$_{av}$ from your galaxies in the spreadsheet. Are the wavelengths longer (redder) or shorter (bluer) than the rest wavelength? Does this mean they are moving toward or away from us?

5. Now that you have graphed the data, do you see a trends or patterns in the plotted data?

6. How do velocity and distance relate to each other?

7. Is this trend something you would expect to see? Why or why not?

8. Does all the data fit within this trend? If not, what could this mean?

9. Does your best fit line go through (0, 0)? Should it? Why/why not? (Hint: *where* is (0,0)?

10. Slope of Best Fit line: _____ (= H_0)

11. What are the *units* of the slope of the trend line? (Remember how you find the slope of a line)

12. What are the maximum and minimum accepted values for H_0? How does your value for H_0 value compare with the currently accepted value?

13. Write your value of H_0 in your new units:

14. Use **your** value of H_0 to find the current age of the Universe in *Gigayears*. Hint: $H_0 = 1/time$. 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 **