









THE HUBBLE LAW**Galaxy and Spectra Overview**

NGC #	Sketch	Type	Description of Spectrum	Keep?
1357		<i>Spiral</i>	<i>Emission spike around 6600 Angstroms; other spikes also</i>	YES
1832		<i>Spiral</i>	<i>Huge spike at approx 6600 Angs; plus other spikes</i>	YES
2276				
2775		<i>Elliptical</i>	<i>Strong (deep dips) absorption; no emission really</i>	NO
2903				
3034				
3147				
3227				
3245				
3310		<i>Spiral</i>	<i>GIGANTIC emission spikes (later eliminated because awful spectrum)</i>	NO
3368				
3471				
3516				

NGC #	Sketch	Type	Description of Spectrum	Keep?
3623				
3627				
3941		<i>elliptical</i>	<i>Deep absorption lines; no emission at all.</i>	No
4472				
4631				
4775				
5248				
5548		<i>Spiral</i>	<i>Huge spike around 5100 Angs. and fat one at 6700 Angsj.</i>	Yes
5866				
6181				
6217		<i>Spiral</i>	<i>Huge spike (emission) around 6600 Angs; small one around 4900 Angs.</i>	Yes
6643				
6764				
7469		<i>Spiral</i>	<i>Emission spikes at 4900, 5100, and around 6700 Angs.</i>	Yes

THE HUBBLE LAW**Data Table**

NGC Number	SPECTRAL LINES			Average Redshift	Velocity (km/sec)	Galaxy Size <i>mrاد</i>	Distance (Mpc)
	Ca K 3933.7	Ca H 3968.5	H-alpha 6562.8				
1357	3962.0	3997.2	6608.6	0.0071	2100	0.79	28
	0.0071	0.0072	0.0070				
1832	3960.5	3994.8	6607.0	0.0066	2000	0.71	31
	0.0067	0.0066	0.0067				
2276							
2775	xxxxx	xxxxx	xxxxx	xxxxx	xxxxx	xxxxx	xxxxx
	xxxxx	xxxxx	xxxxx				
2903							
3034							
3147							
3227							
3245							
3310	xxxxx	xxxxx	xxxxx	xxxxx	xxxxx	xxxxx	xxxxx
	xxxxx	xxxxx	xxxxx				
3368							
3471							
3516							

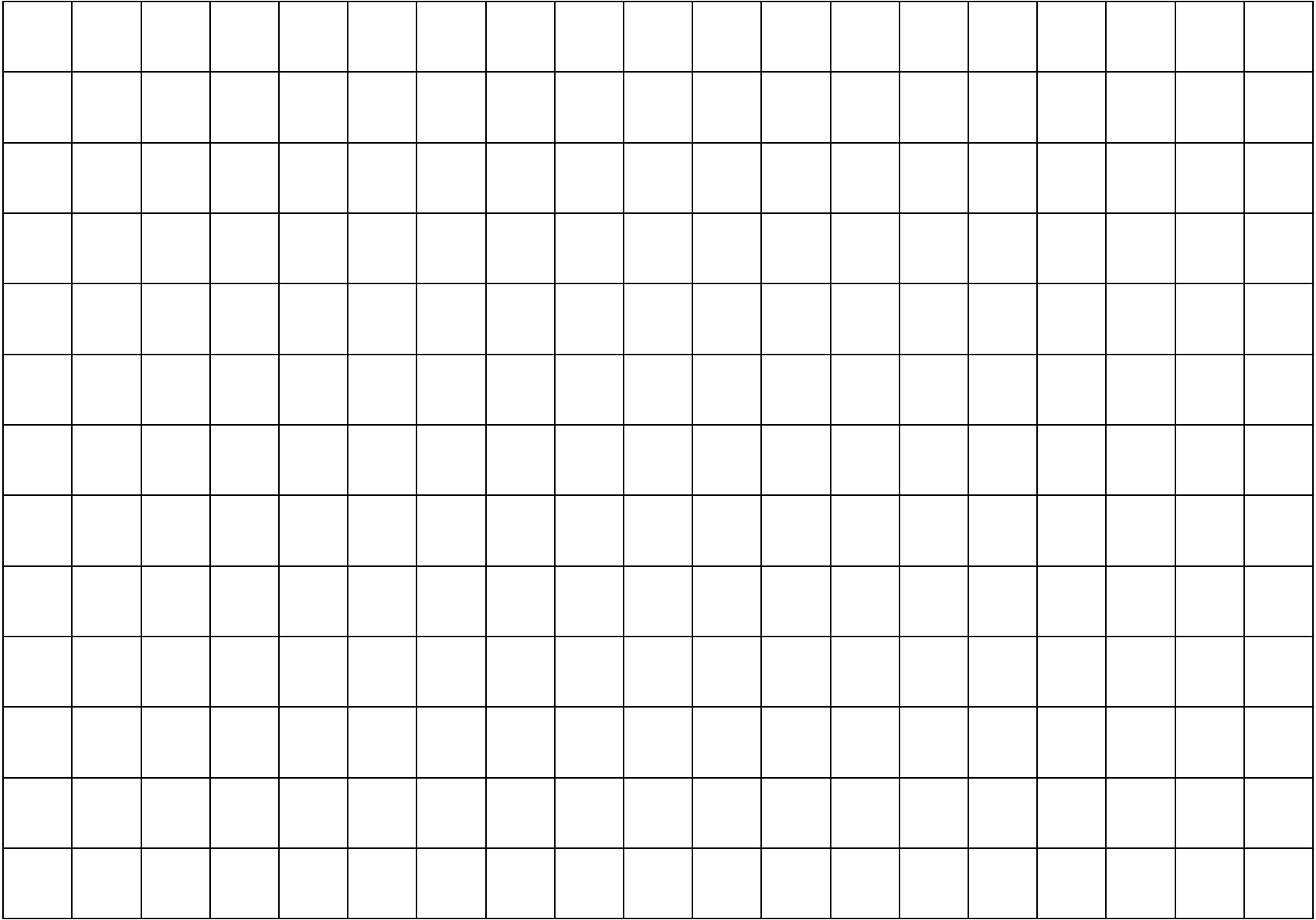
It is still entirely acceptable to eliminate additional galaxies if spectra are "ugly" and lines are hard to identify. Just make sure you have a minimum of 10 galaxies for your graph.

You should not have any negative values for redshifts! If you do, you are measuring the wrong lines.

NGC Number	SPECTRAL LINES			Average Redshift	Velocity (km/sec)	Galaxy Size <i>mrad</i>	Distance (Mpc)
	Ca K 3933.7	Ca H 3968.5	H-alpha 6562.8				
3623							
3627							
3941	xxxxx	xxxxx	xxxxx	xxxxx	xxxxx	xxxxx	xxxxx
	xxxxx	xxxxx	xxxxx				
4472							
4631							
4775							
5248							
5548	4002.6	4040.9	6675.7	0.0176	5270	0.33	67
	0.0173	0.0182	0.0172				
5866							
6181							
6217	3950.3	3985.5	6590.7	0.0042	1260	0.45	49
	0.0042	0.0043	0.0042				
6643							
6764							
7469	3990.4	4028.4	6663.2	0.0149	4470	0.34	65
	0.0144	0.0151	0.0153				

- c. You must have noted that for some galaxies you can see at least a vague spiral arm structure, while for others (the more distant?) you could not. What would be the effect on your value for the Hubble constant of your consistently **undermeasuring** or **overmeasuring** the angular diameter of the galaxies? (Hint: look at the distance formula and the Hubble Law formula, or work with your graph—this is a harder question.)
- d. A third source of error is in the measurements that you make. How precise do you believe your measurements to be for the wavelengths? For the angular sizes? Give one example of something that might affect your precision in your measurements.
5. Another consideration is the fact that galaxies are found in groups or clusters. The motion of these galaxies through space as they orbit their common center of mass is called *peculiar motion*. That is, some galaxies will be receding more slowly than others in the cluster while others will be receding more quickly. How does this *peculiar motion* affect your velocity measurements?

Distance (Mpc)



Velocity (km/sec)