Measuring Galactic Distances Exercise

Student Name: _____

Step 1.

1. Using the data in Table 1, calculate the $\log_{10} P$ for each Cepheid variable and record the values in Table 1.

Step 2.

2. Using the P/L line in Figure 1, estimate the absolute magnitude (M_v) for each Cepheid variable in Table 1 and record their values there.

Step 3.

3. Using Equation 1, calculate the distance (d) to each Cepheid variable star, in Mpc, and record in Table 1.

Step 4.

4. Calculate the average distance value for the Cepheid variables within each galaxy and record this as your estimate of the galaxy's distance.

Step 5.

5. Calculate the % Error from the Accepted distance values given in Table 1.

- **Question 1:** Do your calculations match closely to the accepted values of each galaxy's distance? If not, state which one(s) and what you might need to do to minimize your % Error.

  _____

- **Question 2:** Knowing the relationship between the distance of a galaxy and it's recessional velocity, which galaxy would you predict would be moving at the highest velocity relative to us? _____

- **Question 3:** Which galaxy would you predict would be moving at the lowest velocity relative to us? _____

2. ***Exercise Materials***

$$d = 10^{(mv - Mv + 5)/5} \quad \text{in pc (parsecs)}$$

[Divide by 10^6 to get Mpc]

Equation 1.

$$\%\text{ERROR} = \frac{(\text{Measured} - \text{Accepted})}{\text{Accepted}} \times 100\%$$

Equation 2.

Extra Galactic Cepheid Variable Data

Galaxy	ID	P (days)	Log_{10} P	m_v	M_v	d (Mpc)	Avg. d	Accepted	% Error
M101	C1	58.54		23.82					
	C8	41.00		23.87					
	C24	23.50		24.20					
	C29	14.00		24.99				8.00	
M81	C11	47.20		22.46					
	C18	36.70		22.47					
	C1	20.50		23.67					
	C24	11.50		23.42				3.60	
M95	C01	43.00		24.42					
	C08	32.00		24.44					
	C20	19.50		25.00					
	C47	10.60		25.75				10.00	
M100	C4	54.00		25.16					
	C21	40.70		25.34					
	C59	19.00		25.50					
	C66	15.70		26.38				16.00	

Table 1.

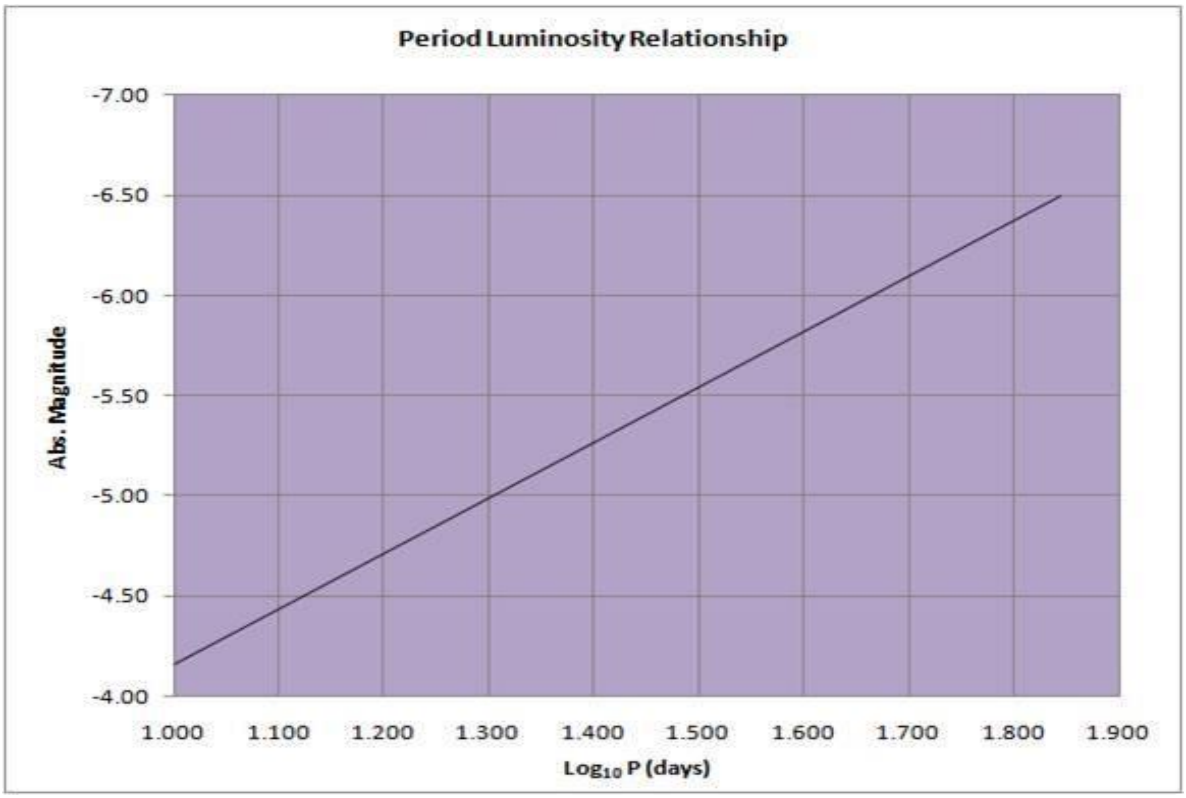
Period Luminosity Relationship
-7.00
-6.50
-6.00
-5.50
-5.00
-4.50
-4.00
Abs. Magnitude
1.000
1.100
1.200
1.300
1.400
1.500
1.600
1.700
1.800
1.900
Log10 P (days)

Figure 1.