

The HR Diagram - Review

Name _____

Purpose:

- To provide you with necessary skills to understand the HR diagram and how to use it
- To give you practice performing simple mathematical calculations using spectroscopic parallax

Estimated Completion Time: 1 hour

Resources needed:

- Calculator (preferably scientific)
- Textbook
- Web access is highly desirable
- Stellarium

Questions

1. Complete the table below: (10 marks)

Star	Spectral Type	Absolute Magnitude	Apparent Magnitude	Parallax	Distance	Distance Modulus
Procyon	F5IV	2.58	0.34	0.28"	3.57	-2.24
Castor	A1V	0.96	1.93	0.064	15.6 pc	0.97
Antares	M1 lab	-5.28	0.96	0.006	177	6.27
Altair	A7V	2.21	0.77	0.19	5.2	-1.44
Regulus	B7V	-0.52	1.41	0.041	24.3 pc	1.93
Capella	G8III	0.35	0.91	0.077	12.9	0.56
Mizar	A2V	0.33	2.23	0.042	24.0	1.90
Sirius B	DA2	11.2	8.30	0.38"	2.63	-2.9

2. Place each of the stars in the table from question 1 on the HR diagram that is attached to this exercise. (5 marks)
3. A Cepheid Variable star has a spectral type of F6 Ia and an apparent magnitude of 8.3. What is the distance modulus for this star? How far away is this star in light years? (Hint – use the HR diagram to find M for this star). (5 marks)

From the HR diagram you can estimate that $M = -7.5$
 using $m = 8.3$, the distance modulus is
 $m - M = 8.3 - (-7.5) = 15.8$

Using the applet then gives a distance of 14.5 kpc or
14 500 pc or $(14.5)(3.26) = \underline{47 000 \text{ ly}}$!

4. Explain why knowing both the absolute and apparent magnitudes of objects is an important part of determining the size of our galaxy. (3 marks)

Knowing this allows you to determine the distance modulus which is directly related to distance. So - this tells us how far away things are in the galaxy.

5. If a supernova were to occur in our galaxy it could conceivably be bright enough to be seen during the day. Suppose a Type Ia supernovae ($M = -19$) were to occur 3000 pcs from earth. Do you think it would be visible during the day? Find the distance modulus for this distance and from this determine the apparent magnitude of the supernova. Discuss your answer. (5 marks)

Use the applet to get the distance modulus that corresponds to $d = 3000$ pc

\therefore This gives a distance modulus of 12.39

\therefore $(m - M) = 12.39$; Since $M = -19$

def. of the distance modulus

you get $m - M = 12.39$

$$m - (-19) = 12.39$$

$$\therefore m = \underline{\underline{-6.6}}$$

This would be visible ~~under~~ in the day under a clear blue sky!