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 PARTNERS Aimee
 CSULA Astronomy 1520 Lab 7

SPECTRAL CLASSIFICATION AND THE HERTZSPRUNG-RUSSELL DIAGRAM

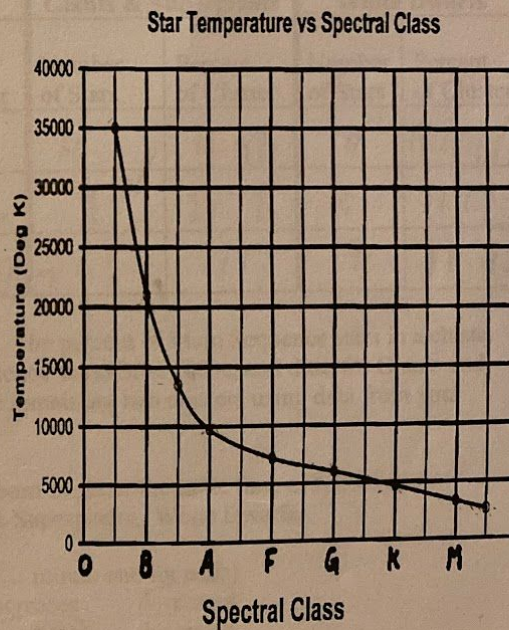
Please remember to bring to the lab the following materials which can be purchased at the bookstore: *Laboratory Exercises in Astronomy: Spectral Classification*, and calculator. Part I and Part II may be done in either order.

PART I: SPECTRAL CLASSIFICATION

PROCEDURE:

1. Try classifying the following 5 spectra from your handout: 2, 4, 5, 6, 19. When you are finished, the instructor will give you the correct answers. (Note the handout's discussion of 1 through 5).
2. After you have corrected any difficulties you may have had, classify the following ten spectra: 11, 12, 14, 16, 18, 20, 22, 26, 28, 29.
3. Estimate the temperatures of the stars you have classified using the graph on the right. Consider Class O as O5 for temperature purposes.

Star #	Est. Class	Est. Temp.
11	G8	5500
12	M2	2300
14	O	35000
16	B5	10000
18	F8	7000
20	F0	16000
22	M2	4000
26	K0	5000
28	A3	3000
29	A0	10000



PART II: THE HERTZSPRUNG-RUSSELL DIAGRAM

As discussed in Astronomy 151, the H-R diagram is of fundamental importance in showing the relationship between the physical properties of stars, the ages of star clusters, stellar evolution, and determining the distances of stars and clusters.

Star clusters are particularly valuable for investigations using the H-R diagram since all of the stars in a cluster are believed to have been formed at about the same time from the same kind of dust and gas. The only basic difference between one star and another in a cluster is the mass of the material that formed it. Also, all of the stars in a cluster are at about the same distance from Earth. Inspection of a cluster on the H-R diagram can reveal which stars age the most rapidly and it gives an indication of the absolute age of the cluster.

PROCEDURE:

1. Table 1 lists the apparent magnitude and spectral class for three different open clusters. On the graph at the end of the exercise, each student will plot the H-R diagram of his or her assigned cluster. Be sure that all three clusters are represented in your group. Share your plots with other members of your group and answer the following questions:
2. On the H-R diagram of each cluster, identify and label the Main Sequence, Giants and Supergiants, and White Dwarfs. Tabulate their numbers as follows:

	Main Sequence		Giants & Supergiants		White Dwarfs	
	Number of Stars	Percent of Cluster	Number of Stars	Percent of Cluster	Number of Stars	Percent of Cluster
Star Cluster A	27	77.1%	4	11.9%	9	11.479%
Star Cluster B	20	58.2%	9	25.7%	5	17.1%
Star Cluster C	27	77.1%	3	7.1%	4	11.42%

Note that each cluster has 35 stars total. The percent of Main Sequence stars in a cluster is calculated by (Number of Main Sequence stars)/35 x 100%, and ditto for Giants and White Dwarfs. Fill-in the values for the remaining two clusters using data from your group members.

3. All stars in a given open cluster are born in about the same time as (circle one):
Main Sequence stars, Giants & Supergiants, White Dwarfs
4. As a cluster ages, the percentage of ... (circle one for each)

Main Sequence stars	increases	decreases
Giants & Supergiants	<u>increases</u>	decreases
White Dwarfs	increases	<u>decreases</u>

TABLE 1: Apparent Magnitude (m) and Spectral Class (S.C.) of 3 Star Clusters

CLUSTER A

m	S.C.	m	S.C.	m	S.C.	m	S.C.
10.0	F1	17.0	A7	22.5	F8	8.1	A0
13.0	K0	4.2	B5	11.8	F6	0.9	B6
8.6	A3	7.3	B7	13.8	K2	11.2	G2
1.8	B7	1.8	M3	9.4	A2	0.0	B9
5.0	B4	20.0	F8	2.9	B3	6.0	B7
16.0	A1	13.0	G4	9.4	A8	2.9	M7
12.0	G0	11.6	F8	13.4	K2	9.2	A5
15.0	K4	11.1	F3	11.0	F5	12.8	G7
10.3	A9	4.0	B2	15.3	K6		

CLUSTER B

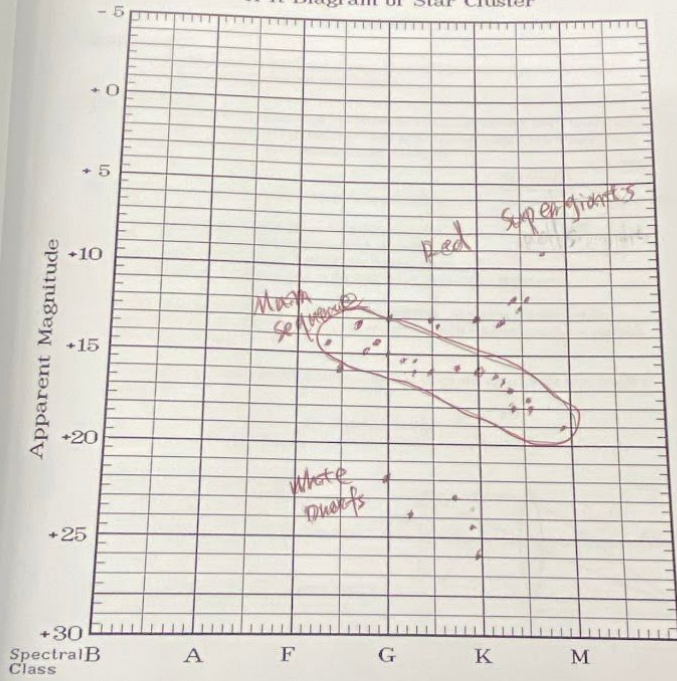
m	S.C.	m	S.C.	m	S.C.	m	S.C.
19.3	K6	14.6	F8	11.6	K4	24.5	G8
13.2	F7	20.0	K9	15.5	G2	16.4	K2
11.4	K5	13.0	G0	24.0	G2	12.3	K4
17.0	K3	22.0	M1	15.8	G7	9.0	K7
13.0	G9	14.1	F3	18.0	K4	16.8	K2
15.0	G0	22.0	F9	23.0	G6	26.0	G9
16.0	K0	16.0	G4	15.6	G3	14.0	F5
16.3	G5	19.0	K6	13.1	K2	13.2	G5
18.3	K6	13.0	G3	14.8	F6		

CLUSTER C

m	S.C.	m	S.C.	m	S.C.	m	S.C.
1.0	A0	7.4	K2	3.4	A2	4.0	F1
6.0	G0	12.5	F5	6.5	G2	2.6	A1
0.0	A9	0.2	K6	14.0	G6	0.0	A4
9.3	K6	0.0	F2	0.4	A1	7.0	G4
3.2	A5	1.0	B8	5.8	F6	13.0	G4
5.0	F2	5.6	F8	9.0	K4	7.8	K2
4.3	A9	6.8	G7	5.0	F5	2.6	A3
5.1	F3	7.0	K0	0.2	A5	3.8	A6
2.1	A0	6.4	G3	3.4	A8		

My star cluster is (circle one):
A B C

H-R Diagram of Star Cluster



Spectral Class A F G K M
Color Blue-white White Yellow Red
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Sp
B/L/W

