T1 ☐ T2 ☐ T3 ☐ T4 ☐ T5 ☐ SCORE: _____ / **150** + Bonus _____

This test is based on the 2009 rules/DSO list. The 2012 rules/DSOs may be different.

DISCLAIMER: I am not a real test-writer, so this test may or may not be representative of real tests.

Bonus: Name NASA's 6 space shuttles – 1 bonus point per 3 correct answers. (2 pts total)

_____ _____ _____

_____ _____ _____

TEAM NAME/NUMBER: _____, #_____

COMPETITORS' NAMES:

_____ _____

* Time is NOT a tiebreaker. Tiebreakers will be the individual section scores, in this order: **Ic, Ia, IIb, Ib, Id, IIa**. Some questions are designated as further tiebreakers.
* You have 50 minutes to complete this test to the best of your ability. Good luck. Go!

SECTION Ia: Identify the DSOs on the image sheet (letters on the image sheet correspond to the letters below) and answer the accompanying questions (1 pt each, 35 pts total).

A. _____

i. This DSO is the strongest source (outside of our solar system) of what kind of electromagnetic radiation? _____

B. _____

i. What is an alternate name for this DSO? (Hint: has to do with a constellation.)

_____

C. _____

i. What is this DSO's Messier catalog number? _____

ii. Which <u>other</u> DSO is likely to collide with this DSO in about 2.5 million years?

_____

D. _____

i. Approximately how old are the stars in this DSO? _____

ii. What constellation is this DSO found in? _____

E. _____

i. What object causes this DSO's x-ray emissions? _____

ii. When was the supernova that created this nebula seen from Earth? _____

F. _____

i. Why is this DSO named after a specific person? _____

_____

ii. What caused the cataclysmic event that created this DSO? _____

_____

G. _____

i. What is this DSO's Messier catalog number? _____

H. _____

i. What constellation is this DSO located in? _____

ii. What is the name of the bright orange star? **(T4)** _____

I. _____

i. What larger nebula is this DSO part of? _____

J. _____

i. What kind of nebula is this DSO? _____

ii. What constellation is this DSO found in? _____

K. _____

i. What is the supermassive black hole at the center of this galaxy designated as?

_____

L. _____

i. What is this DSO's "little companion" called? _____

ii. Why are this DSO and its "little companion" of interest? _____

_____

iii. What shape galaxy is this DSO? _____

M/N. These pictures are of the same DSO in different wavelengths. What DSO is it?

_____

i. When was the most recent confirmed supernova in this galaxy? _____

ii. What shape galaxy is it? (Spiral, elliptical, etc.) _____

Section Ib: Answer the following questions about the constellations. (22 pts total)

1. Which two constellations are <u>fully visible</u> in the image at left? (2 pts) _____

   _____

2. What star is indicated by the arrow? (1 pt)

   _____

3. What constellation is <u>outlined</u> in the image at right? (Hint: the other constellation may help.) (1 pt) _____

4. Which of the constellations on the list lie along the ecliptic? (8 pts) _____

   _____

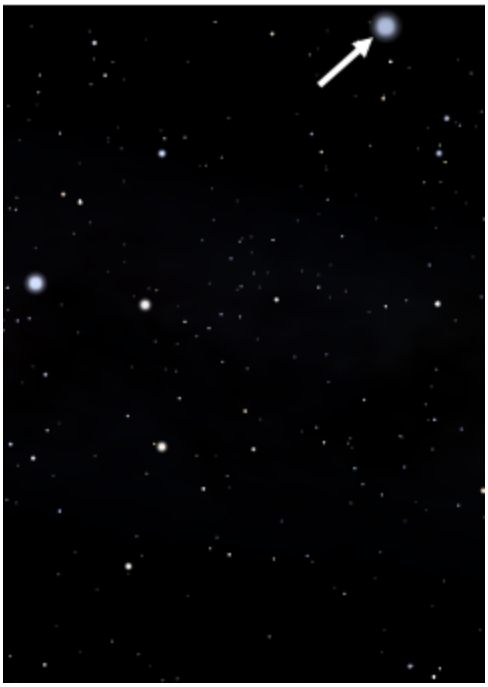
   _____

   _____

5. What constellation is visible in the lower left of the image at right? (1 pt) _____

   _____

6. What is the bright star visible left of center? (1 pt) _____



7. Which constellation is visible in the image at left? (1 pt) _____
8. What is the Bayer designation of the star indicated by an arrow? (2 pts) **(T2)** _____
9. What constellation is M51 located in? (1 pt) _____
10. Polaris will not always be the North Star. Why is this? (2 pts) **(T1)**_____ _____ _____

_____

11. Name two other (northern) pole stars. (2 pts) _____ _____

Section Ic: Answer the following questions about stars and stellar evolution. (39 pts total)

1. Which star on the list is a flare star? (1 pt) _____
2. How often does said flare star flare? (1pt) _____
3. What <u>luminosity class</u> are main sequence stars on the H-R diagram? (1 pt) _____
4. What is the general relationship between the mass of a star and its lifespan? (2 pts) _____ _____
5. Why is this the case (referring to question #4)? (2 pts) _____ _____
6. Which star is the brightest in the nighttime sky? (1 pt) _____

7. What class star is Algol A? (1 pt) O B A F G K M
8. What is (usually) the brightest star in Orion? (1 pt) _____
9. What is Alpha Orionis better known as? (1 pt) _____
10. What famous asterism is formed by the three stars Altair, Deneb, and Vega? (1 pt)

    _____
11. What is the Sun's spectral class? (1 pt) _____
12. What is the Sun's absolute magnitude? (1 pt) _____
13. At what distance are apparent and absolute magnitude the same? (1 pt) _____
14. What do the H and R stand for in "H-R diagram"? (2 pts) _____

    _____
15. Antares emits a large portion of its energy in what non-visible wavelength? (1 pt)

    _____
16. Which star on the list is a white dwarf? (1 pt) _____
17. White dwarfs can go supernova when they approach a certain mass. What is the name of this "critical mass"? (2 pts) _____
18. What type of supernova results from a white dwarf gaining too much mass and exploding? (1 pt) _____
19. Vega, Altair, and Regulus are flattened at the poles and bulging at the equator. What causes this? (2 pts) _____
20. Which star, excluding the sun, is the closest to Earth? How far is it (to .1 light years)? (2 pts) _____
21. What is the term for stars that don't have enough mass to start nuclear fusion? (1 pt)

    _____

22. What is the main difference between Population I and Population II stars? (2 pts)

_____

_____

23. Why are these two kinds of stars different (referring to question #22)? (2 pts) **(T3)**

_____

_____

_____

24. What are the evolutionary stages of a Sun-sized star? (4 pts)

a. _____

b. _____

c. Red giant

d. _____

e. _____

25. What about a much more massive star? (5 pts)

a. _____

b. _____

c. Red giant

d. _____

e. _____ or _____

Only a couple more pages to go! --->

Section Id: Answer the following questions about open and globular clusters. (10 pts total)

1. Stars in clusters are bound together by what? (1 pt) _____
2. Which type of cluster is often found in the halo of galaxies? (1 pt) _____
3. Where is the other type of cluster usually found? (1 pt) _____
4. What is the closest open cluster to Earth? (1 pt) _____
5. Which kind(s) of cluster contain(s) blue stragglers? (1 pt) _____
6. Why are blue stragglers more likely to form within clusters? (2 pts) **(T5)** _____

   _____

   _____

7. What kind(s) of cluster is/are considered "young"? (1 pt) _____
8. What kind(s) of cluster is/are considered "old"? (1 pt) _____
9. The age of globular clusters puts a bound on what important part of cosmology? (1 pt)

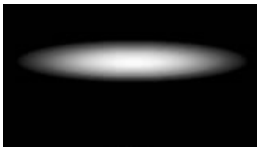
   _____

Section IIa: Classify the following galaxies based on the Hubble Sequence. Classification can be somewhat subjective, so a range of answers may be accepted. (16 pts total)

_____

_____

_____



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_____

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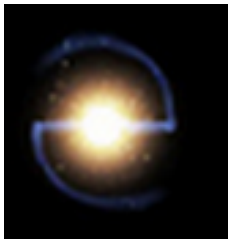
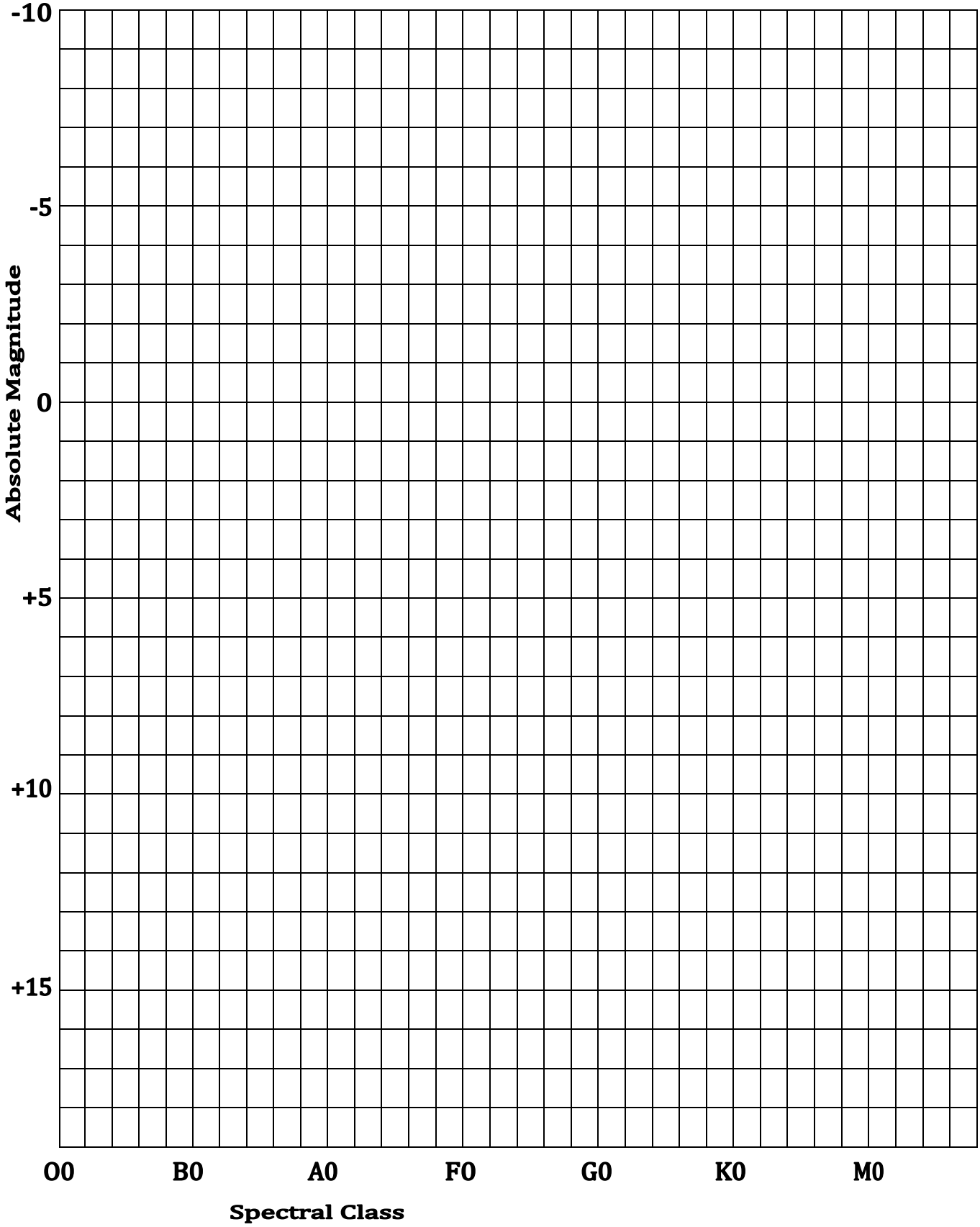


_____

_____

Section IIb: Fill in the data table and plot the stars on the H-R diagram. (28 pts total)

Star	Apparent Mag.	Distance (LY)	Spectral Class	Absolute Mag.
	0.03	25	A0V	0.6
	0.98 (var)	250	B1V	-5.4
	-0.04 (var)	36.7	K1.5III	-0.3
	1.14	34	K0III	1.1
	1.25	1550	A2I	-7.1
	1.35	79	B7V	-0.5
	2.02	430	F7I-II	-3.6
	0.85 (var)	65	K5III	-0.6
	13.5	7.8	M6V	16.6
	0.11	870	B8I	-7.0
	0.77	16.8	A7V	2.2
	0.58 (var)	640	M2I	-6.0
	-1.47	8.6	A1V	1.4
	0.34	11.4	F5IV-V	2.6


-10
-5
0
+5
+10
+15
Absolute Magnitude
O0
B0
A0
F0
G0
K0
M0
Spectral Class