Answer Sheet

Section A (___/36)

1. An AGN is a region at the center of a galaxy that has an extremely higher than normal luminosity. The higher than normal luminosity may be due to the black hole at the center of the galaxy accreting matter. (4)

2. __Super Luminal Motion___ (1)

3.__Messier Catalog_____(1)

4.__Sc_____(1)

5a. __Diffuse_____(1), __Emission_____(1) **5b.**__O or B_____(1)

6.__6.92 Mpc_____(2)

7a. __Halo_____(1) **7b.** __Population 2___(1) **7c.** __Oosterhoff groups___(1)

8.__z= .003_____(3)

9a.__Low-Ionization nuclear emission-line region__(1) **9b.** _AGN w/ SMBH_(1), __Star formation region__(1)

10a. __Starburst region- a region with very rapid star formation_____(2)

10b.__The lifetime of the galaxy is shortened_____(1)

11. __1.383 arcseconds_____(4)

12. __Elliptical Galaxy_____ (1)

13. __Wet Merger_____ (1)

14. __Dry Merger_____ (1)

15.__Redder_____(2)

16.__Ultraviolet (UV)_____(1)

17.__Ultraviolet (UV)_____(1)

18.__Synchrotron_____(1)

19.__Milky Way, Andromeda_____(+1)

Section B (___ /29)

1. __C_____(1) **2**. __D_____(1) **3**. __C_____(1) **4**. __A_____(1)

5. __Bluer_____(1)

6a. __High_____(1)

6b. __Population 1_____(1)

7. __Ni-56_____(2)

8. Objects w/ constant absolute mag. can be used as standard candles to measure distances (4)

9. Scenario 1: "Single Degenerate"- a binary system of a white dwarf and a companion star. The white dwarf accretes mass from its companion star and reaches the Chandrasekhar limit.

Scenario 2: "Double Degenerate"- a binary system of two white dwarfs spiral close together, eventually collide, and pass the Chandrasekhar limit. (4)

10. A planetary nebula is an ejected shell of hot ionized gas. The gas is ionized by the central star (white dwarf). The planetary nebula fades as the central star cools down, and the gas is ejected further into space. (4)

11. Neutron stars are extremely faint and hot, thus making impractical to place them on the HR Diagram (4)

12. The fusion of iron is endothermic-- the required energy input is higher than the energy output. (4)

Section C (___/49)

1. _ 50 km/s ___(2) **2**. _ 6.3 days (+/- 0 .2) _(1) **3**. _ 23.7 M⊙ (+/- 3) _(3)

4. _ Star A is more massive because it is moving slower than star B (star b experiences a high acceleration due to the high gravitational pull from star A)_____(3)

5a._ As the radius from the center of the galaxy increases, the orbital velocity should continuously decrease._____(3)

5b._ The relatively constant orbital velocity with increasing radius on the graph indicates that mass is not concentrated within the center of galaxies. Thus, extra mass known as dark matter is thought to be spread throughout galaxies.(3)

6. _ 168.9 km/s (+/- 5 km) _(5)

7._ 5.4 (+/- 0.2) (2) **8**. _3.9 (+/-0.4) _(1) **9**. _199.5 (+/- 5%) (3) **10**. _Henrietta Leavitt ___ (1)

11._1.22 * 10^{37} kg OR 2.54 * 10^{36} kg (depending on which relation is used) (3)

12._1.81 * 10^{10} m OR 3.78 * 10^{9} m ___(3)

13._8.73 * 10^{36} m/s^2 OR 3.79 * 10^{35} m/s^2 _(3)

14._ Faber-Jackson Relation _____(3)

15._200 km/s (+/- 10 km) _____(1)

16. 2.88 * 10^{47} J (+/- 10%) (3)

17. .2342 (1)

18. 70268.8 km/s (2)

19. 1081.1 Mpc (2)

20. 1.51 x 10^{10} years (1)