Astronomy C – KEY

Bonus (+1) 3 planets

Part I – DSOs [40 pts total]

1. Mira
2. Metals in core are "dredged-up" by convection
3. [T5] It is leaving a trail of material due to its high velocity

4. NGC 2440
5. [2 pts] UV/visible, IR [must be in order]

6. Astrometry (measuring path of star across the sky)
7. Sirius B

8. HM Cnc (RX J0806.3+1527)
9. [T10] Gravitational waves

10. Henize 2-428
11. 700 Myr

12. M15 (NGC 7078)
13. Core collapse
14. Pease 1

15. J174140/J075141
16. [T4] AM CVn system do not have neutron stars (which will emit in x-ray)
17. J075141

18. Tycho's SNR
19. Radio
20. Velocity of Tycho G (for) –OR– high metallicity, possibly from material ejected in supernova (for) –OR– not near explosion center (against) –OR– no rotation as expected of companion (against)

21. SN 2011fe
22. Early detection allowed observation of composition and evolution in early stages of Type Ia SN

23. Caldwell 39
24. Fast-moving stellar wind interacts with slower-moving material ejected earlier

25. SNR G1.9+0.3
26. [T9] It is expanding (rapidly)
27. Heavily obscured by gas/dust

28. SS Cyg
29. [2 pts] Mass-transfer burst model, disk-instability model

30. NGC 1846
31. Two episodes of star formation –OR– merger of two clusters
32. Mo-17 (Morgan-17)

33. SNR 0509
34. Double-degenerate progenitor (leaving no remnant)
35. Light echo

36. Stingray Nebula
37. Youngest PN known
38. "Born-again" star

Part II – Stellar Evolution [60 pts total]

39. Mass
40. Radiation
41. Convection
42. Metallicity

43. GCs are old, so blue stars have died off, leaving only longer-lived red stars
44. Halo
45. Shapley-Sawyer
46. GCs lack significant dark matter
47. Merger of binary –OR– mass transfer in binary

48. ~0.5 $M_\odot$
49. [2 pts] Chandrasekhar Limit, 1.4 $M_\odot$
50. Electron degeneracy pressure

51. Pressure support (from gas orbiting closer to the star)
52. Angular momentum
53. Semi-detached binary

54. [T6] Most of the H is ionized (no electrons left to produce spectral lines)
55. Temperature not high enough to excite electrons to produce spectral lines
56. Metallic lines (primarily Ca II K/H)
57. Molecular lines

58. Progenitor is always the same (a WD of ~1.4 solar masses)
59. [2 pts] Nickel, cobalt [must be in order]

60. No H, complex hot emission
61. ".Ia" supernovae
62. [T3] Superhump
63. Instabilities and precession in disk

64. TP-AGB (thermal pulse AGB)
65. Binary system –OR– stellar winds –OR– stellar rotation –OR– magnetic fields
66. UV

67. [3 pts]
    - UGSS (SS Cyg type) "normal" outbursts, 2-6 mags over several days
    - UGSU (SU UMa type) brighter and longer "super-outbursts" occur rarely
    - UGZ (Z Cam type) will sometimes "pause" at medium brightness instead of decaying
68. Mass transfer rate onto WD drops

69. Energy production rate increases (due to shell burning), causing star to expand
70. [T7] Helium flash
71. He core is not degenerate in higher-mass stars

72. Neutron star readjusts itself (shrinking in size), causing period to decrease
73. TOV limit
74. [T8] Misaligned rotational and magnetic axes
75. Magnetar
76. PWN (pulsar wind nebula)

77. 17.5 days
78. 2.8
79. 8.84 $M_\odot$
80. 6.51 $M_\odot$
81. [T1] [2 pts] 7.85 $M_\odot$, 2.81 $M_\odot$

82. [2 pts] Circular orbits will have even spacing, while elliptical ones will not (due to Kepler's 2nd law)

83. [T2] $4.4 * 10^5$ kpc
84. 32,000 km/s

85. 6.38 pc
86. 5.22 $R_\odot$
87. Giant

88. Star D
89. +10.3
90. Star F
91. 5000 K
92. Star G