Team # :_____ School:_____ Competitors:_____

Section A: [2 points]

1) _Antennae Galaxies

2) _30

3) _11

4) _Corvus (the crow)

5) _2

6) _24

7) _Bug Nebula (NGC 6302)

8) _Planetary Nebula, White Dwarf

9) _10

10) _Open Cluster

11) _13, 21

12) _Trifid Nebula

13) _16

14) _5

15) _Elliptical Galaxy

16) _28

17) _4

Section B: [2 points]

18) _A

19) _S

20) _5

21) _D

Section B (cont):

22) _Supernova

23) _J

24) _N

25) _Mira Variable

26) _V

Section C: [1 point]

27) _c

28) _a

29) _c

30) _d

31) _a

32) _c & d

33) _b

34) _d

35) _b & d

36) _b

For Use By Judges Only		
Score Section A: _____	___	Total Score:
Score Section B: _____	___	_____
Score Section C: _____	___	Team Number
Score Section D: _____	___	_____
Score Section E: _____	___	

Team # :_____ School:_____ Competitors:_____

Section D: [2 points]

37)_____500_____ (in pcs)

38)_____760_____ (in pcs)

39)_____354_____ (in pcs)

40) _____Star E_____ (Star D or Star E)

41) _____10_____ (How many magnitudes)

42) _____Star E_____ (Star D or Star E)

43) _____Star E_____ (Star D or Star E)

44) _____39_____ (how many times)

45) _____Star E_____ (Star D or Star E)

46) _____100_____ (how many times)

47) _____70.4_____ (in traditional units)

48) _____13.9_____ (billions of years, 3 significant figures)

49) ____2.1 x 10^{11}_____ (in W/s)

50) _____2.0_____ (in Mpc)

51) _____141_____ (in km/s)

52) ____39500_____ (in km./s)

53) _____1000_____ (in Mpc)

56)___ii____ (i,ii,iii,iv, or v)

57)___v____ (i,ii,iii,iv, or v)

58)___iii____ (i,ii,iii,iv, or v)

59)___iv____ (i,ii,iii,iv, or v)

60)___i____ (i,ii,iii,iv, or v)

61) ___1.8___ (solar masses, 2 significant figures)

62) __Neutron Star_____ (type of object)

63)

X-Ray Binary, Cataclysmic Variable

64) ___1.2____ (solar masses, 2 significant figures)

65)___White Dwarf_____ (type of object)

66)

Type Ia Supernova, Recurrent Nova

54)

Closed-Cyclic-Universe

55)

Opposite. Currently believed to be Open Universe, Accelerating

Section E: [5 points]

67)
Planetary nebula have ~same initial luminosity are as luminous as the distance galaxies they are in; they emit strong lines at 501 nm (double ionized oxygen – O III); this is correlated with the surface brightness fluctuation method which is sensitive to AGB stars before they eject their envelopes.

68) Turnoff Point indicates age (More to right = older, left = younger), Presence of White Dwarfs and Giants.

69)
   In stars that are hotter, more of the Hydrogen is ionized, and which do not produce absorption lines.
   In stars that are cooler, there is less energy to excite Hydrogen atoms, so there are more H atoms in the ground state, which also do not produce absorption lines
   A-class stars have the title "A" because in older classifications systems, stars were ranked according to the strength of their hydrogen lines

70)   Population II = older -> more time for fusion of H to He, metal-poor (not formed from SNR)
   Population I = younger -> less time for fusion of H to He, metal-rich (formed from SNR with heavy elements)

[2 points]
71)_Type II Supernova
72)_Neutron Star & Black Hole