Astronomy (Div C) Answer Key
CPS Invitational at Westinghouse
February 4, 2017

Part I:

(1 point unless otherwise indicated)

1) B
2) Henize 2-428
3) A planetary nebula with a binary white dwarf system at its center (2 pts)
4) Instead of having one star at the center like most planetary nebulas, it has a binary pair (2 pts)
5) Sirius B
6)
    a) X-Ray
    b) Shorter and Higher (2 pts)
7) 3.2 Solar Masses (3 pts)
8) Bottom Left Hand Corner (or a sketch of a diagram) (2 pts)
9) NGC 1846
10) Globular Cluster
11) D
12) B, D (2 pts)
13) Presence of tenuous oxygen (2 pts)
14) B

Part II:

A range of answers is accepted provided sufficient work

(2 points each)

15)
    a. 1148 ± 150 pc
    b. -7.5 ± 0.1 magnitudes
    c. Apparent Magnitude = -8 => 1819.7 ± 90 pc

16)
    a. 20 pc
    b. 4.5 ± 0.1 magnitudes
    c. $2.857 \times 10^{26} \pm 0.15 \times 10^{26}$ Watts, or 0.734 ± 0.04 Solar Luminosities
    d. 5363.8 ± 300 K
    e. 554.3 ± 30 nm

f. 6.0 ± 0.1 magnitudes OR 1.5 more than answer to part B

g. 0.025 arcseconds

17)

a. 52 ± 10 days

b. Dwarf Nova

18)

a. 44.8 ± 1 Solar Masses

b. 1.66 ± 0.1 (unitless ratio)

c. 23.8 km/s exact - the numbers are very clean

d. (system receding at ~ 31500 m/s -> main sequence star velocity ±1500 m/s ->)
White dwarf radial velocity: (±)3750 (±250) m/s

19)

a. 604.7 ± 30 m/s

b. 8.63 ± 0.3 kpc

20)

a. 14203 ± 500 m/s

b. 656.311 ± 0.1 nm

Bonus Questions (Tie Breakers):

1) Edwin Hubble

2) Arthur Stanley Eddington