

Answer Key

Astronomy C - 2018 CPS Regionals @ IIT

RAW SCORE: _____/104

1. (12 pts)
 - a. pre-main, main, giant, supergiants, white dwarf
 - f. Triple Alpha
 - g. Not enough mass
 - h. Sudden beginning of helium fusion
 - i. Red Giant Branch
 - j. variables, cepheids, etc.
 - k. 0.3-8 solar masses
 - l. Planetary nebulae
2. (8 pts)
 - a. WNh
 - b. much more massive
 - c. CNO cycle
 - d. Carbon, Oxygen
 - e. mass loss increases
 - f. Wolf-Rayet Nebula
 - g. UV
 - h. much hotter temperatures cause short wavelengths
3. (5 pts)
 - a. Delta Cephei, Cephei the king
 - b. 1908
 - c. She knew they were in the same Magellanic Cloud
 - d. radial
 - e. before, phase lag
4. (11 pts)
 - a. II-P
 - b. Yes
 - c. Beta Decay
 - d. Nickel-56
 - e. Hydrogen
 - f. Photodisintegration
5. (11 pts)
 - a. Tolman-Oppenheimer Volkoff Limit
 - b. 5-20km acceptable
 - c. Neutron Degeneracy pressure
 - d. gravitational
 - e. (short) gamma-ray burst
 - f. black hole
 - g. no
 - h. 3×10^8 m/s
 - i. 8-12 km
 - j. Decreases, gravitational redshift
 - k. slower, time dilation
- g. Gamma, no
- h. electron capture
- i. electron degeneracy pressure
- j. neutrino/v
- k. Beta decay

6. (6 pts)
 - a. viewed straight-on
 - b. limb darkening
 - c. A starting to block B
 - d. 0.548; half credit for 1.83
 - e. Roche
 - f. low
7. (5 pts)
 - a. AG Carinae
 - b. LBV
 - c. 20 kly
 - d. 15 Solar Masses
 - e. 11-15 days
8. (4 pts)
 - a. NGC 7822
 - b. 2900 ly or 800-1000pc
 - c. Cephei
 - d. 40 ly
9. (4 pts)
 - a. 2015
 - b. 16.9
 - c. Any of:
 - i. Hypernova/superluminous nova
 - ii. magnetar
 - iii. quark nova
 - iv. tidal disruption event
 - v. gravitational lensing
 - d. 1171 Mpc or 3.82 Gly
10. (6 pts)
 - a. IC 443
 - b. Jellyfish Nebula
 - c. SNR
 - d. supernova
- e. neutron star/pulsar
- f. 3k-30k years
11. (4 pts)
 - a. SN 1987A
 - b. LMC
 - c. ring has expanded
 - d. Type II Supernova
12. (4 pts)
 - a. -4.364
 - b. 5 magnitudes (for each)
13. (6 pts)
 - a. 8 years
 - b. $8/3 = 2.66$ AU
 - c. unchanged
14. (4 pts)
 - a. 36.5 km/s or 0.00122c
 - b. 7 m/s
15. (8 pts)
 - a. 2.1678 solar masses = 4.314×10^{30} kg
 - b. 1.064×10^9 m or 1.53 solar radii
 - c. 854.7 kg/m^3
 - d. more (1409 kg/m^3)
16. (6 pts)
 - a. $3.418 \times 10^{-9} \text{ W/m}^2$
 - b. 341.8 erg/s/cm^2
 - c. $1.54 \times 10^{-8} \text{ W}$