PENNSYLVANIA SCIENCE OLYMPIAD STATE FINALS 2015 ASTRONOMY C EXAM

ANSWER KEY SECTION 1 SCHOOL_____

1. Kepler-7B
2. Scattered light from thick clouds
3. Image 9
4. Infrared brightness or temperature T4
5. Image 25
6. N159
7. PAH Polycyclic aromatic hydrocarbons
8. Image 17
9. Sharpless 30
10. Image 8
11. Image 18
12. LP876-10 is Fomalhaut C
13. Beta Pictoris
14. Image 7
15. Image 15
16. Delta Scuti
17. Image 1
18. T dwarf
19. Image 11
20. Image 14
21. Color-color infrared
22. Image 5
23. Image 22
24. HR 8799
25. Image 16
26. Warm and cool dust rings
27. Image 4
28. Low-mass planet far away from low-mass star
29. Image 24
30. 1937
31. It never faded
32. FU is the variable star in order of discovery
33. Luyten Palomar survey
34. 87.84^{o}
35. Gliese 229b

total score

place

page score

ANSWER KEY SECTION 2 **SCHOOL**_____

36. 8 solar masses

37. By the time they are visible, they are on the main sequence

38. albedo

39. conservation of angular momentum

T1 40. 13-80 Jupiter masses

41. magenta or deep red

42. transit timing variation

43. polarimetry

44. Goldilocks planet

45. C

46. A

47. D

48. The planet faces the observer before secondary eclipse; we see the dayside of the planet

49. Planets are cooler than stars so their emission becomes relatively stronger at longer λ

T5 50. gravitational microlensing

51. An exoplanet is orbiting the lensing mass

52. Lensing events are not repeatable

53. Less than 10Myr implies young disk, which means it is protoplanetary

54. Protoplanetary disks are optically thick and dusty; debris disks are optically thin with little gas

55. Hot Juipiters migrate inward after they form; moons would be stripped away by the star

56. Brown dwarfs form like stars from collapse of a gas cloud; planets form from accretion in the disk

page score ☐

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ANSWER KEY SECTION 3/4 SCHOOL_____

57. 0.716 AU

58. 0.511

59. -5.35E36 J

60. -2.19E37 J

61. 1.65E37 J

62. 7.07E4 m/s

63. 1.69E43 kgm^2/s

64. 445 K

65. -7.09E36 J

66. 1.73E36 J

67. 2.29E4 m/s

68. 1.69E43 kgm^2/s

69. 253 K

70. 0.50 – 0.93 AU

T2 71. 0.03 or 3%

72. 6

73. 144 parsecs

74. 11.833

75. 0.116 AU

76. 78.8 km/s

77. 211 m/s

78. 2.28 M_J

79. 1.39 R_J

80. The planet's transit is on the equator of the star

81. Limb darkening

82. 0.0423 AU

T3 83. 400-450 m/s

84. 172 km/s

85. 3.66 M_J

86. 0.65-0.7

87. 0.9-0.95

88. 0.4-0.45

89. 0.9-0.95

90. Tidal locking

91. Rossiter-McLaughlin Effect

92. Sudarsky Class

93. Circularization

94. Lambda Bootis

95. Chthonian planet

96. Kozai resonance (Kozai mechanism)

97. Hill sphere

98. Poynting-Robertson Effect

99. Oligarchic growth

100. Victor Safronov

BONUS Guillermo Haro

page score