PA STATE FINALS ASTRONOMY ANSWER SHEET 1

SCORE TOTAL	PLACE

	1	Henize 3-1357 or Stingray Nebula		13	RX J0806.3+1527		25	Image 21
T13	2	image 6		14	they will spiral inward and collide, Type Ia or .1a supernova		26	PK234+02.1 OR 157
	3	3C 10		15	Image 7	T14	27	Image 11
	4	Image 17		16	LMC Large Magellanic Cloud		28	700 million years
	5	SNR 0509-67.5		17	Planetary nebula, chalenged the idea of single stellar population in globular clusters		29	UG or UGSS, U Geminorum
	6	Image 3		18	Pease 1		30	SS Cygni
	7	Unseen companion star		19	M15		31	Thermal instability in the accretion disk
	8	SN 2011fe	T3	20	The first planetary nebula found in a globular cluster	T4	32	Image 13
T9	9	M 101		21	Image 14		33	AM CVn system
	10	Image 4		22	Image 9		34	Image 20
	11	Hβ 4-2 transition, Balmer series		23	Double degenerate model for Type Ia sn		35	Henize 3-1357
	12	Image 19		24	Image 2			

TEAM NUMBER	SCHOOL	PAGE SCORE	

PA STATE FINALS ASTRONOMY ANSWER SHEET 2

36 AGB, Asymptotic Giant Branch	48 Main sequence turnoff or subgiant branch	60 43000 K
37 Color, V - I magnitude	49 Formation of the planetary nebula	T8 61 Conservation of angular momentum
38 16	50 3	62 Magnetic torque
39 Globular cluster	51 It happens very quickly	63 Pulsar
40 F or G	52 Horizontal branch	64 A pulsar glitch
41 12-13 billion years	53 Fusing Helium in its core	65 Spin up due to accretion
42 Peculiar velocities due to local gravitational effects	54 Formation of the white dwarf star	BONUS Jocelyn Bell
43 They are composed of helium	55 Main sequence (ZAMS)	
T15 44 Loss of energy and angular momentum due to viscosity/turbulence. NOT gravity	56 0.32 light years	
45 Low metallicity, metal poor	57 M = -0.22	
T6 46 4	58 10.02	
47 8	T12 59 Approaching at 22.7 km/s	

TEAM NUMBER		SCHOOL	PAGE SCORE

PA STATE FINALS ASTRONOMY ANSWER SHEET 3

	66	13		78	2.12E44 kg m^2/s		90	Phillips Relation
T1	67	32.2		79	1.61E9 years 1.61 billion years	T7	91	Nebulium
	68	28.8 Mpc		80	The mass of the combines stars is above the Chandrasekhar limit		92	Peimbert Class
	69	2016 km/s		81	13.6 billion years		93	Bohdan Paczynski
T2	70	The expansion of the universe is accelerating		82	-20 km/s		94	Hulse-Taylor Binary
	71	1.01E5 km		83	17 km/s		95	Helium shell flash
T5	72	40.9 minutes		84	35 km/s		96	Superhumps
	73	1.01E5 km	T10	85	2.06		97	Hot spot
	74	2.30E5 km		86	0.358 seconds		98	Blue stragglers
	75	259 km/s		87	17.6 rad/s		99	Deflagration event
	76	589 km/s	T11	88	2.22E39 kg m^2/s	T16	100	Dark energy density parameter
	77	-2.72E41 J		89	1.95E40 J			

TEAM NUMBER		SCHOOL	PAGE SCORE	