ASTR 100	**Things you need to know <u>NOW</u> – Part 1**	
1	What are the three main lines of evidence supporting the existence of Dark Matter?	1. 2. 3.
2	What did Fritz Zwicky discover re: Dark Matter?	
3	What did Vera Rubin discover re: Dark Matter?	
4	What is gravitational lensing and why does it indicate the presence of Dark Matter?	
5	Who predicted gravitational lensing?	
6	What are MACHO's?	
7	Why do temps in the Intracluster Medium indicate the presence of Dark matter?	
8	Why were the MACHO candidates ruled out as Dark Matter?	
9	What are WIMP's?	
10	Why were neutrinos ruled out as Dark Matter?	

11	How do rotational velocities in galaxies and orbital velocities in galaxy cluster indicate the presence of Dark Matter?	
12	What are specific characteristics of Dark Matter?	1. Does not ___ 2. Does not ___ 3. Has no candidate in ____
13	What is the basic observation supporting the concept of Dark Energy?	
14	When did the Universe begin to accelerate its rate of expansion?	
15	4 fundamental forces in the universe	1. 2. 3. 4.
16	Discovered the moons of Jupiter	
17	Adherent of Pythagorean philosophy	
18	Created 1st comprehensive heliocentric model	
19	Geocentric explanation for planets' retrograde motion	
20	Occam's Razor	
21	Discovered phases of Venus	

22	Developed explanations of planetary motion based on fundamental laws of physics	
23	Created comprehensive geocentric model of universe	
24	Wrote the “Principia”	
25	Author of the Scientific Method	
26	Resolved discrepancies in Ptolemy’s circular orbits	
27	Developed parallax method of measuring distances within Solar System	
28	Invented reflector telescope	
29	First known proposal of heliocentric system posited by?	
30	Developed model of universe with over 80 moving parts	
31	Kepler’s Third Law	
32	Kepler’s First Law	
33	Sought to remove supernatural causation from science	
34	Kepler’s Second Law	
35	Went through tribunal for seeking to reconcile Scripture with heliocentric model	

36	Newton's thought experiment leading to explanation of orbits	
37	Discovered craters and mountains on moon	
38	Tutored Alexander the Great	
39	First to use telescope for astronomy	
40	Father of scientific reasoning	
41	What did Newton emphasize that is essential for a scientific theory to be valid?	
42	1 Parsec = ?	
43	What is an AU	
44	What is a light year?	
45	Approximately how many miles in 1 LY?	
46	1 AU = ? miles	
47	1 AU = ? Km	
48	1 pc = approximately how many AU's?	
49	1 hour = ? seconds	
50	1 mile = ? feet	
51	1 kilometer = ? meters	
52	1 kilogram = ? grams	
53	Giga = ? (power of ten)	
54	Centi = ? (power of ten)	
55	Kilo = ? (power of ten)	
56	Milli = ? (power of ten)	
57	Micro = ? (power of ten)	
58	Mega = ? (power of ten)	

59	Nano = ? (power of ten)	
60	What is a Universal Constant?	
61	Why are space and time considered to be two sides of the same coin (spacetime)?	
62	According to Special Relativity what happens to time in a moving object from the perspective of the stationary observer?	
63	According to Special Relativity what happens to length of a moving object from the perspective of the stationary observer?	
64	What is a relativistic velocity?	
65	What is a non-relativistic velocity?	
66	What are the three measures of the speed of light (“c”)?	1. 2. 3.
67	What is gravitational lensing and what is it caused by?	
68	What happens to time (from the perspective of the observer) in an object as it approaches a gravitational source?	

69	What is the Lorentz transformation for time?	
70	What is the Lorentz transformation for length?	
71	What is the Lorentz transformation for mass?	
72	According to Einstein, gravity is the _____ ___ _____	
73	Approximately what percentage of a galaxy's observable mass is the interstellar medium?	
74	What are the three main components/materials in molecular clouds?	1. 2. 3.
75	What are PAH's?	
76	What is a Bok Globule and where are they found?	
78	What is the Jean's Instability?	
79	What is a protostar?	
80	What is the minimum solar mass in a protostar required to trigger hydrogen fusion?	
81	What is the temp (in Kelvins) required to trigger hydrogen fusion	

82	What is the temp threshold (in Kelvins) of the Jean's Instability?	
83	What triggers the phenomenon of an emission nebula?	
84	What is a reflection nebula?	
85	What becomes of protostars with less than .08 $m_{\odot}$?	
86	What is hydrostatic equilibrium?	
87	Two conditions that define a Main Sequence star:	1. 2.
88	Have we ever observed the death of Red Dwarf star – why or why not?	
89	Internal process that is unique to a Red Dwarf Star	
90	Red Dwarf stars are estimated to make up ? % of stars in our galaxy	
91	Hydrogen core fusion converts hydrogen to ?	
92	In stars greater than .4 $m_{\odot}$ what is the next fusion process after core hydrogen fusion has ceased?	
93	What happens to a star when hydrogen shell fusion occurs?	

94	What is the minimum temp (in Kelvins) for helium fusion?	
95	What is the main product of helium fusion?	
96	What is the Triple Alpha Process?	
97	Star classification on H-R diagram from hottest to coolest	
98	Is the star Betelgeuse a Main Sequence star – why or why not?	
99	What is an AGB star?	
100	What causes an AGB star to blow off its outer layers?	
101	What is planetary nebula?	
102	What is the final leftover product of a star between .4 $m_{\odot}$ and 8 $m_{\odot}$?	
103	What is a White Dwarf primarily made of ?	
104	A White Dwarf is supported by ?	
105	What is electron degeneracy?	

106	What is a Roche lobe?	
107	What is the process of a nova?	
108	What is the numeric value Chandrasekhar Limit?	
109	What happens when a White Dwarf exceeds the Chandrasekhar Limit?	
110	What is the Absolute Magnitude of a Type 1A supernova?	
111	What is a standard candle?	
112	Why is a Type 1A supernova an excellent Standard Candle?	
113	What happens to the White Dwarf after a nova?	
114	What happens to the White Dwarf after a Type 1A Supernova?	
115	What are the by-products of a Type 1A supernova?	
116	What is the primary element involved in Type 1 Cepheid variable star?	

117	What is the difference between single-ionization and double-ionization of helium atoms, and how does it affect the opacity of helium?	
118	What kind of core fusion is involved in Cepheid variable stars?	
119	What did Henrietta Leavitt contribute to our understanding of Cepheid variable stars?	
120	What is the peak luminosity – period relationship?	
121	What is the Kappa mechanism, and who discovered it?	
122	Type 1 Cepheids can be used to measure distance up to ? parsecs	
123	Describe Population 1 stars	
124	Describe Population 2 stars	
125	In stars greater than 8 $m_{\odot}$ carbon fusion occurs at what temp (in Kelvins)?	
126	What are the products of carbon fusion?	
127	How long does carbon fusion last?	

128	What is the minimum temp (in Kelvins) to trigger carbon fusion?	
129	What are the products of neon fusion?	
130	What is the minimum temp (in Kelvins) to trigger neon fusion?	
131	How long does neon fusion last?	
132	What are the products of oxygen fusion?	
133	What is the minimum temp (in Kelvins) to trigger oxygen fusion?	
134	How long does oxygen fusion last?	
135	What is the product of silicon fusion?	
136	What is the minimum temp to trigger silicon fusion?	
137	How long does silicon fusion last?	
138	Why is iron considered “the star killer?”	
139	What is the approximate size of the iron core just prior to collapse?	
140	What happens when the iron core reaches the Chandrasekhar Limit?	

141	What temps (in Kelvins) are reached in the first .1 sec of core collapse?	
142	How long does it take the iron core to collapse to nuclear density?	
143	What is nuclear density?	
144	What is photodisintegration?	
145	What is “core bounce?”	
146	When suddenly unsupported layers of shell fusing material collapses onto collapsed core they reach speeds of ?	
147	When the layers collapse onto collapsed core how long does it take the shock wave to reach the surface?	
148	What happens when the shock wave reaches the surface?	
149	When the shock wave reaches the surface, what is this event called?	
150	As layers are compressed by neutrino pressure and the shockwave, what is triggered and what created in the process?	

151	What is the average Absolute Magnitude of a Type II supernova?	
152	How does spectrum analysis allow astronomers to distinguish between a Type 1A and a Type II supernova?	

Things you need to know how to do NOW:

1. Factor-Label conversions (feet to miles, days to hours to seconds, etc.)
2. Metric conversions – Kilometers to meters and vice-versa
3. Conversions from scientific notation to standard notation and vice-versa
4. Conversions of light years to parsecs, parsecs to AU's, etc.
5. Calculate actual times of astronomical events adjusting for "lookback time."
6. Use Kepler's Third Law to calculate orbital periods and orbital radii
7. Use Newton's Version of Kepler's Third Law to determine orbital periods, orbital radii, and mass of primary in orbital system
8. Calculate surface gravity on astronomical body given size and mass and using Newton's Law of Gravity
9. Calculate time dilation and length contraction using Lorentz Transformations as articulated in Special Relativity