**PROBLEMS**

**INDONESIAN ASTRONOMY OLYMPIAD 2011**

**Level: Province**

**MULTIPLE CHOICE**

1. If Mars average distance to the Sun is , its period will be ….
2. about days longer than Earth orbital siderial period
3. about days longer than Earth orbital siderial period
4. about days longer than Earth orbital siderial period
5. about days longer than Earth orbital anomalistic period
6. none of the above
7. Which one describes Solar evolution correctly from the beginning to the end?
8. White dwarf, red giant, main sequence, protostar
9. Red giant, main sequence, white dwarf, protostar
10. Protostar, main sequence, red giant, white dwarf
11. Protostar, red giant, main sequence, white dwarf
12. Protostar, main sequence, white dwarf, red giant
13. During the evolution, nuclear reaction in Sun-like stellar core is unable to produce iron because ….
14. all iron is ejected once a star evolves to planetary nebula
15. all iron formed from nuclear reaction changes into uranium
16. iron is stored in stellar atmosphere due to the existence of strong magnetic field there
17. core temperature of the star is not sufficiently high for nuclear reaction producing iron
18. none of the above
19. When the Sun evolves to a red giant, its core will ….
20. expand and become hotter
21. expand and become cooler
22. shrink and become hotter
23. shrink and become cooler
24. expand in constant temperature (no changing of temperature)
25. A star with mass and luminosity has main sequence lifetime ….
26. times longer than the Sun
27. times longer than the Sun
28. times shorter than the Sun
29. times shorter than the Sun
30. times shorter than the Sun
31. A giant star has similar luminosity with a main sequence star. Because the giant star has larger size, it will have… than the corresponding main sequence star.
32. smaller parallax angle
33. larger parallax angle
34. lower temperature
35. higher temperature
36. none of the above
37. Star A has similar size with star B. If luminosity A is larger, it will have … than B.
38. smaller parallax angle
39. larger parallax angle
40. lower temperature
41. higher temperature
42. none of the above because physical properties of the stars will remain the same
43. When hydrogen burning takes place in shell, outer layer of star will heat up. It causes the outermost layer of the star … and the temperature …, while luminosity …. After that, the star will evolve to red giant phase.
44. shrinks, increases, increases
45. shrinks, increases, decreases
46. expands, decreases, increases
47. expands, decreases, decreases
48. expands, remains constant, remains constant
49. How do we resolve proper motion of a star from the effect of trigonometric parallax?
50. Result of proper motion observation is corrected from trigonometric parallax which is obtained from separate observation.
51. It is enough for us to observe the star at a same date every year.
52. By calculating star distance using secondary method to get parallax which will be employed as correction factor for proper motion observation.
53. We will need star radial velocity, so the tangential velocity (in this case is proper motion) can be determined separately from the parallax.
54. It is impossible for us to observe proper motion without effect of star trigonometric parallax.
55. What can you conclude from a star with temperature class of ?
56. High temperature star
57. Main sequence star
58. Member of population stars
59. Member of population stars
60. Giant horizontal branch star
61. Seven stars have temperature class of and . Which statement is CORRECT?
62. Stars class and have lower surface temperature than stars class and .
63. Temperature classes of show the order from the highest to the lowest temperature.
64. Stars class and have longer lifetime than stars class and .
65. Temperature classes of show the order from the smallest to the largest star radius.
66. Stars class have the longest lifetime.
67. Observation shows that Andromeda has blueshift. Based on this fact, which statement is CORRECT?
68. Andromeda appears in blueshift due to observational effect. Its redshift will appear if the data is corrected from Milky Way proper motion.
69. Some morphological type of galaxy show blueshift in their spectrum. Andromeda is one of them.
70. Giant spiral galaxy like Andromeda needs many corrections from its own stars motion. Employing this correction, it will be detected that Andromeda has redshift.
71. Andromeda is too close to Milky Way, that the effect of universe expansion will not be observable, it will be dominated by its motion in space, approaching the Milky Way.
72. Inacuracy of detector causes redshift detected as blueshift. Using more acurate devices will help to see redshift of Andromeda.
73. Stars are usually classified into Population , Population , and Population (which are still being searched). Which statement is NOT correct
74. Population stars have higher metal abundance than Population stars.
75. Globular clusters consist of Population stars.
76. Open clusters consist of Population stars.
77. Spiral arms consist of Population stars.
78. Population stars are older than Population stars.
79. Given nebulae: Planetary nebula, Dark nebula, Supernova remnant, region, which objects represents the end of a death star?
80. Planetary nebula and Supernova remnant
81. Supernova remnant and Dark nebula
82. Dark nebula and region
83. region and Planetary nebula
84. Planetary nebula, Dark nebula, Supernova remnant, region
85. Observing Galactic center is quite difficult because the existence of interstellar dusts. Therefore, we need to observe Galactic center in … wavelength.
86. Visible light, ultraviolet, X-ray
87. Gamma ray, X-ray, infrared, and radio
88. Ultraviolet, X-ray, and gamma ray
89. Visible light, radio, and gamma ray
90. Infared, ultraviolet, and X-ray
91. Star occultation by a planet is useful to determine ….
92. planet temperature
93. density of planet ring
94. matter which forms a planet
95. planet mass
96. planet rotation
97. A comet with of diameter located at away from Earth will appear in a size of ….
98. How are stellar clusters distributed in space?
99. Open clusters are spread along the Milky Way, with high stellar number density.
100. Globular clusters are spread along the Milky Way, with hight stellar number density.
101. Half of globular clusters in our Galaxy lie near Sagitarius constellation.
102. Half of open clusters in our Galaxy lie near Sagittarius constellation.
103. 1, 2, 3
104. 1, 3
105. 2, 4
106. 4
107. All of the above are correct
108. Which statement is NOT correct
109. Redshift of galaxies indicate that the universe is expanding.
110. There is linear correlation between receding velocity of galaxies and its distance from us.
111. The fact that some quasars have highest observable redshift means that these quasars are the furthest objects we can observe.
112. Open universe model states that the universe will be continuosly expanding.
113. Observations show that all far galaxies are moving away from us. From this, it can be concluded that Milky Way is center o the universe.
114. A aperture of telescope can gather a number of photon in an hour. How long will a telescope with aperture be able to gather photon as many as the previously mentioned telescope?
115. minute
116. minute
117. minute
118. minute
119. minute

**ESSAY**

1. An observer in wants to observe the Sun rising right after its half part sets. What date would it be (neglecting atmospheric refraction)?
2. A spaceship will be sent to revolve Jupiter and placed in fixed orbit to observe that planet in 2020.
3. Calculate height of spaceship from Jupiter surface and what is its period (in days) in order that an astronout in the spaceship feels same gravitational field as that on Moon surface? (Gravitational acceleration on Moon surface is times of gravitational acceleration on Earth surface, siderial period of the Moon days, and its average distance from the Earth is km)
4. Is it possible for the astronout to stand uprightly in the spaceship as if he was on Moon surface? If yes, what is the direction of his zenith at that time? If not, explain why! (assuming Jupiter radius and its mass times of the Earth)
5. Two micro satellites A and B are revolving the Earth. Their mass are . These two micro satellites then collide each other. Their velocity before collision are:

After collision,

1. What is the fraction of loss kinetic energy in this collision? (show in %)
2. Draw vectors of velocity for those micro satellite before and after collision
3. A radius of asteroid is in thermal equilibrium with the environment. It is known that the asteroid absorp of power. Its albedo, . What is the asteroid temperature?
4. It was known that there would be two total lunar eclipses in 2011. Both occurred in June, 15th-16th and December, 10th respectively.

Additional information:

Total lunar eclipse in June, 15th-16th 2011 was the 34th lunar eclipse of 72 lunar eclipses in Saros series 130. Full moon occurred in June, 16th 2011 at 3.15 am of Western Indonesian Time. Umbra eclipse occurred in the same day between 1.22 am to 5.03 am Western Indonesian Time and total lunar eclipse occurred between 2.22 am to 4.03 am Western Indonesian Time.

Total lunar ecliplse in December, 10th 2011 was the 23rd lunar eclipse of 71 lunar eclipses in Saros series 135. Full moon occurred in December, 10th 2011 at 9.37 pm Western Indonesian Time. Umbra eclipse occurred in the same day between 7.45 pm to 11.18 pm Western Indonesian Time and total lunar eclipse occurred between 9.05 pm to 9.58 pm Western Indonesian Time.

Questions:

1. What constellations that would be Moon background when those total lunar eclipses occured? What constellations that would be Sun background at that time?
2. Compare the duration of total lunar eclipse for observer on the north pole and south pole!