Name:_____

FIRST EXAM
APAS 1030 SECTION 001
October 4, 2006

Possibly Useful Information:

$c=3\times10^{10}$ $G=6.7\times10^{-8}$ $h=6.6\times10^{-27}$ $\sigma=5.7\times10-5$

$1pc=3\times10^{18}cm$ $1AU=1.5\times10^{13}cm$ $M_\odot=2\times10^{33}g$ $R_\odot=7\times10^{10}cm$

$\lambda\nu=c$ $E=h\nu$ $L=\sigma AT^4$ F=ma $\lambda T=3x10^7$ x=vt   v=at

$$P=\frac{2\pi r}{v} \qquad P=2\pi\sqrt{\frac{r^3}{GM}} \qquad v=\sqrt{\frac{2GM}{r}} \qquad \frac{v}{c}=\frac{\delta\lambda}{\lambda_0} \qquad R=\frac{2GM}{c^2}$$

You must do all 21 multiple choice and one long answer. If you attempt both long answers we will use the higher score of the two.

Multiple Choice – 3points each

1. _____ You are standing at the South Pole. The Sun is 23.5 degrees above the horizon. What is the date?
   a) March 21   b) June 21   c) September 21   d) December 21

2. _____ How many degrees of latitude are covered by the tropics?
   a)   23.5   b) 47.   c) 66.5   d) 15

3. _____ What is the precession period of the equinox?
   a)   6 months   b) 1 yr   c) 11 yrs   d) 26000 yrs   e) 600 million years

4. _____ A waxing crescent moon is rising. What time is it?
   a)   3am   b) 9am   c) 3pm   d) 9pm

5. _____ A star which passes directly overhead on the tropic of Cancer has what declination?
   a. 0 def   b. 23.5 deg   c. -23.5deg   d 66.5deg   e. -66.5deg

6. _____ What is the longitude of the International Date Line?
   a. 0   b. 90 east   c. 180   d. 90 west

7. _____ You are on an alien planet. You travel 100 miles north and note that the angle between the horizon and the pole has changed by 6 degrees. What is the radius of the planet?
   a. 100 mi   b. 1000 mi   c. 10,000mi   d. 100,000 mi

8. _____ Mars exhibits retrograde motion when it is at:
   a. opposition   b. inferior conjuction   c. quadrature   d. superior conjunction   e. perihelion

9. _____ What is the phase of the Moon during a Solar Eclipse?
   a. new   b. first quarter   c. full   d. third quarter

10. _____ You are living on the Moon, and the Sun is on the local meridian. Your
   spouse calls to say he/she won't be home until sunset. How long will your wait
   be?
   a. 3 hours   b. 6 hours c. one week d. one month e. forever (get a divorce)

11. _____ You are living on the Moon, and the Earth is on the local meridian.
   Your spouse calls to say he/she won't be home until earthset. How long will
   your wait be?
   a. 3 hours   b. 6 hours c. one week d. one month e. forever (get a divorce)

12. _____ The great astronomer Ptolemy
   a) Lived in Egypt and was Roman
   b) Lived in Egypt and was Muslim
   c) Lived in Greece and was Roman
   d) Lived in Sicily and was Greek

13. _____ How many planets are visible to the unaided eye (not counting Earth)?
   a)2 b)3 c)4 d)5 e)6

14. _____ What is the maximum number of planets that can be seen by the
   unaided eye at midnight in Boulder (not counting Earth)?
   a)2 b)3 c)4 d)5 e)6

15. _____ Constellations:
   a)define the ecliptic b)must contain planets c)have fixed R.A. and Dec.
   d)are regions of the sky

16. _____ The purpose of an epicycle is to:
       a) predict retrograde motion
       b) predict brightness of the planets
       c) predict eclipses
       d) explain the number of visible planets

17. _____ You are in Boulder and call a friend long distance. It is 7pm here, and
   9am there. Your friend is:
   a)75 degrees east of Boulder
   b)75 degrees west of Boulder
   c)150 degrees east of Boulder
   d)150 degrees west of Boulder

18. _____ At the Fall equinox the Sun has a Right Ascension of:
   a)0 hr b)6 hr c)12 hr d)18 hr e)none of these

19. _____ Two weeks after the full moon the moon is:
a)third quarter b) new c)gibbous d)crescent e)first quarter

20. _____ An annular eclipse is:
a) an eclipse that happens once per year
b) a lunar eclipse with the moon at a distant orbit point
c) a solar eclipse with the moon at a distant orbit point
d) a lunar eclipse with the moon at a close orbit point
e) a solar eclipse with the moon at a close orbit point

Harder Multiple Choice – 15 points
21. _____ You are standing in some wooded mountains. Your watch, which is set to Greenwich Mean time, says it is 5pm on October 11. The Sun is on the meridian half way between the Southern horizon and directly overhead. Which mountains are these?
a) Appalachians b) Alps c) Himalayas d) Andes e) Atlas

Long Answer: 25 points
Answer one of the next two questions. Be as quantitative as possible. Continue onto the back of this sheet.

Explain how the ancient Greeks estimated the distance to the Moon. Use numbers to recreate their estimate.

Or

You are Magellan and have just discovered some islands somewhere in the middle of the Pacific Ocean. Your Captain's clock is known to drift up to a minute per day. Your sextant can measure star altitude to about half a degree. You have traveled from Portugal at about 150miles per day.
How accurately do you know your latitude? How accurately do your know your longitude? Is there any hope of finding the islands again?