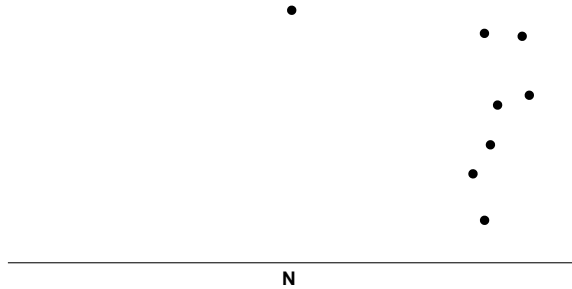


**Answer *TRUE* or *FALSE* (not *T* or *F*) (2 pts each)**

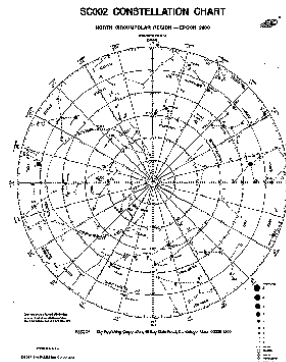
1. If SI units (the “metric system”) are being properly used the “Megamall” is a billion times bigger than a normal mall.
2. The zenith is always directly overhead.
3. At CSB/SJU the celestial equator is an hour circle.
4. The celestial equator has zero altitude viewed at the Earth’s north pole.
5. If a star is on the meridian, a little less than 24 hours later (about  $23^h56^m$ ) it will again be on the meridian—exactly 24 hours later it will have moved a bit further to the west.
6. The sidereal period of the Moon is shorter than the synodic period of the Moon.
7. A full Moon sets as the Sun rises.
8. The far side of the Moon is in perpetual darkness.
9. Because of the motion of the Moon through the zodiac, each day, the Moon rises later.
10. At the time of a solar eclipse the Moon enters the shadow of the Earth.
11. The smaller the magnitude, the brighter the star.
12. The changing direction of the Earth’s axis (the axis pointing in different directions during a year) is the cause of the seasons.
13. Copernicus was born before St. Benedict was born.
14. Kepler was born after Columbus was born.
15. Since the Earth is more massive than the Moon, the gravitational force of the Earth on the Moon is greater than the gravitational force of the Moon on the Earth.
16. According to one of Kepler’s laws, a planet, during its closest approach to the Sun, spins a bit faster on its axis.
17. According to Kepler’s third law, if planet *A* takes 10 years to orbit the Sun and planet *B* takes 20 years to orbit the Sun then planet *B* is twice as far from the Sun as planet *A*.
18. Newton’s second law states that the speed of an object is proportional to the force and inversely proportional to its mass.
19. If the size of the Earth were to double (with the mass unchanged) there would be no change in the gravitational attraction between the Earth and the Sun.
20. A new force called *evoL* is discovered. It is found that if Johnnie *A* is strongly attracted to Bennie *B*, then Bennie *B* would be repulsed by Johnnie *A*.

**Give a short explanation (5 pts each)**

21. An astronomy book says that our Galaxy is a disk  $10^5$  LY in diameter and that the Sun's distance from the center of the Galaxy (i.e., radius not diameter) is  $3 \times 10^4$  LY. The picture of the Galaxy in the book shows a circle with a 2 inch diameter representing the Galaxy. How far from the center of the book's circle should you place the dot that represents the Sun?
22. Consider the below picture of a midnight view looking north at CSB/SJU. Make a similar sketch on your paper showing what the view would look like 6 hours later.



23. Consider the below (retouched) photocopy of your SC002 star map. Redraw the map on your answer sheet and clearly label a diurnal circle, an hour circle and the north celestial pole.



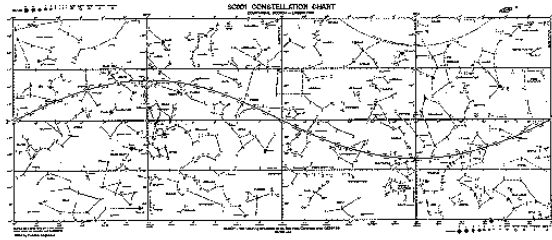
24. What was the maximum altitude that the Sun achieved here at CSB/SJU on September 21? What will be the maximum altitude of the Sun here at CSB/SJU on December 21?
25. Why do we see different stars December evenings than we do June evenings?
26. Why isn't there a *solar eclipse* every new Moon? Approximately how many solar eclipses are there per year?
27. You go outside at about 7 P.M. and face south. The Moon is up and off to your right, near the horizon. Is it rising or setting? What is its phase? The next night you go out again at 7 P.M.. How has the Moon's position changed?
28. This year Thanksgiving is November 23. The Moon will be new on November 26. What phase of Moon should you expect to see on Thanksgiving? State a time-of-day and the location in the sky (e.g., approximate altitude and azimuth) where you would see the Moon on Thanksgiving.

29. Using the above information, when is the first full Moon in 2001?
30. “Superior planets have retrograde motion at opposition.” Define: superior planet, retrograde motion and opposition.
31. What *observations* supported the following “scientific” theories.
- (a) The Earth is a sphere.
  - (b) The heavens are made of an element (the quintessence) unlike earthly elements.
  - (c) The force of gravity is universal, i.e., acts between any two bodies.
32. Draw a picture showing two possible orbits around the Sun. Show and label an orbit with large eccentricity and an orbit with small eccentricity. Of the two orbits you have drawn, which would have the longer period?
33. On December 22 Venus will have a RA of about  $21^h 15^m$ . At what time of day and in which direction should you look for Venus on December 22? Explain! On December 22 will Venus have a positive or negative declination?
34. Consider a planet orbiting the Sun. Sketch the path of the planet around the Sun, and show: the direction of all forces acting on the planet and the direction the planet would go if no forces acted on it.
35. While holding above your head a non-spinning wheel, you step on a unmoving spin table. While on the spin table you grab the wheel and start it rotating clockwise. What happens? You now flip the wheel over so it’s now spinning the other way. What happens? You now grab the spinning wheel, stopping its motion. What happens? (Assume that throughout this experiment you never touch the ground and that the spin table has no friction.)

**Write out a complete answer (10 pts each)**

36. Qaqortoq, Greenland has a latitude of about  $60^\circ$  and a longitude of about  $45^\circ$ . On the recent autumn equinox the planet Jupiter had a right ascension of  $04^h 40^m$  and a declination of  $21^\circ$ . Display and label Jupiter on your (question 39) sketch of the SC001 and report the time of day (on the autumn equinox) when Jupiter crosses the meridian and its altitude at Qaqortoq (you must report your reasoning to receive any credit).
37. Report three of Galileo’s telescopic discoveries that provided evidence supporting the Copernican Theory. In each case report how the observation contradicted the geocentric theory.

38. Consider the below (retouched) photocopy of your Star Locator. Redraw the Star Locator's oval that represents the sky and clearly label where the following are found: horizon, meridian, zenith, north celestial pole, celestial equator, north, south, east, and west points on the horizon. Add a dot (and label it) to show where a star with altitude  $45^\circ$ , azimuth  $90^\circ$  would be.



39. Consider the above (retouched) photocopy of your SC001 star map. Redraw the maps' rectangle that represents part of the celestial sphere and clearly label where the following are found: celestial equator, ecliptic, point of RA=0 (spring equinox), a hour circle and a diurnal circle. The Big Dipper stars have declination of about  $55^\circ$  and RAs that range from  $11^h$  (bowl) to  $14^h$  (handle); indicate where the bowl and handle would be found on the map.
40. The diagram below shows possible locations of Mars (A, B, C) and the Moon (D, E). **I:** For each location report the phase of the object as viewed from Earth. **II:** For each location report the phase of *Earth* as viewed from that location.

