Your name (print) _____

Your FSUID _____

AST 1002 Section 1 (Dobrosavljevic)
PLANETS, STARS, GALAXIES

Midterm Exam 1, Fall 2019

Instructions:

1. Use a pencil for marking the machine scoring sheet.
2. Enter and encode your name and FSUID in the identification location on the machine scoring sheet.

3. Write your name and FSUID on the top of this page.
4. Each question has one answer. Circle the correct answer and mark the same answer on the machine scoring sheet. You may use these exam sheets as scratch paper.

NOTE: Anyone discovered in any way to have cheated on this examination will fail this course.

Potentially Useful Information:

1 ly = 10^{13} km; 1 AU = 1.5 x 10^{8} km; 1pc = 3.26 ly = 206265 AU; Speed of light c = 3 x 10^{5} km/sec; Gravitational constant (G) = 6.67 x 10^{-11} m^3/kg sec^2; 1 degree = 60 arc minutes = 3600 arc sec; Mass of Sun = 2 x 10^{30} kg; Mass of Earth = 6 x 10^{24} kg; Mass of Moon = 7.35x 10^{22} kg; "nano-"(n) = 10^{-9} "micro-"(m)= 10^{-6} "milli-"(m) = 10^{-3} "kilo-"(k) = 10^{3} "mega-"(M) = 10^{6}. Circles: area=πr^2, Perimeter=$2\pi r$; Spheres: volume = $4/3\pi r^3$, surface area = $4\pi r^2$; Diameter D=2r; time=distance/speed or distance = rate x time ; $P^2 = a^3$; F = ma.

Choose the closest answer.

Please read the problems CAREFULLY.

1. $10^{-3} \times 10^{3} =$

- ○ **a.** 1/100
- ○ **b.** 0
- ○ **c.** 10,000
- ⊗ **d.** 1

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2. The average distance from Earth to the Sun, 149,600,000 km, can be written in shorthand notation as

- ⊗ **a.** 1.496×10^{8} km.
- ○ **b.** 1.496×10^{6} km.
- ○ **c.** 1.496×10^{9} km.
- ○ **d.** 1.496×10^{7} km.

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3. The mean distance of Saturn from the Sun, 1,427,000,000 km, can be written in shorthand notation as

- ○ **a.** 1.427×10^{6} km.
- ○ **b.** 0.1427×10^{9} km.
- ○ **c.** 1.427×10^{7} km.
- ⊗ **d.** 1.427×10^{9} km.

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4. If you follow the arc of the handle of the Big Dipper away from the dipper, the first moderately bright star you come to is

- ○ **a.** Polaris, the North Star.
- ○ **b.** Spica, in Virgo.
- ⊗ **c.** Arcturus, in Bootes.
- ○ **d.** Vega, in Lyra.

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5. How much of the overall sky is north of the celestial equator?

- ○ **a.** less than one-half because of the tilt of the equator to the ecliptic plane
- ○ **b.** more than one-half because of the precession of the poles
- ⊗ **c.** exactly one-half
- ○ **d.** all of it, by definition

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6. The Sun's apparent path across our sky against the background stars (which would be seen if the sunlit sky were not light) is known as the

- **a.** celestial meridian.
- **b.** celestial equator.
- **c.** great circle.
- (x) **d.** ecliptic.

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7. Seasonal variations on a planet's surface are caused by

- **a.** clouds that periodically form and disappear as the planet orbits the Sun.
- (x) **b.** the tilt of the planet's spin axis with respect to the perpendicular to its orbital plane.
- **c.** volcanoes that erupt periodically because of tidal interactions and obscure the atmospheres of planets.
- **d.** the variation of the planet's distance from the Sun during its passage along its elliptical orbit.

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8. How did Copernicus know Mercury was closer to the Sun than Earth?

- (x) **a.** It can always be seen relatively close to the Sun.
- **b.** He measured the period and used Kepler's third law.
- **c.** It was sometimes seen to pass in front of the Sun.
- **d.** It can be high in the sky at midnight.

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9. The eccentricity of a planet's orbit describes

- **a.** the tilt of the planet's spin axis with respect to its orbital plane.
- (x) **b.** its shape compared to that of a circle.
- **c.** its motion at any specific point in its orbit as seen from Earth, that is, whether direct, retrograde, or stationary.
- **d.** its tilt with respect to the plane of Earth's orbit (the ecliptic plane).

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10. Comet Halley returns to the Sun's vicinity approximately every 76 years in an elliptical orbit. According to Kepler's third law, what is the semimajor axis of this orbit?

- **a.** 0.59 AU
- (x) **b.** 17.9 AU
- **c.** 50.000 AU
- **d.** 1 AU

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11. Why did the temperature start to rise at the center of the solar nebula?

- **a.** Supernova explosions were stirring up the material there and causing turbulence.
- (x) **b.** The nebula was contracting, which increased the speed of the atoms moving in it.
- **c.** Fusion reactions were beginning in the core, releasing tremendous amounts of heat.
- **d.** Massive stars nearby were heating the nebula with their ultraviolet radiation.

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12. The asteroid belt exists between the orbits of which planets?

- **a.** Jupiter and Saturn
- **b.** Venus and Earth
- (x) **c.** Mars and Jupiter
- **d.** Earth and Mars

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13. In the ancient Greek era, it was almost universally believed that the

- **a.** pole star represented the center of the universe about which Earth and all other objects revolved.
- **b.** Milky Way represented the observable universe, and its center was the center of the universe.
- **c.** Sun was at the center of the universe.
- (x) **d.** Earth was at the center of the universe.

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14. Ptolemy's model for the solar system was

- **a.** Earth-centered, with the Sun, the Moon, and the planets moving in ellipses in the sky.
- **b.** Sun-centered, with elliptical planetary orbits.
- **c.** Sun-centered, with the planets moving in circles around it.
- (x) **d.** Earth-centered, with planetary orbits composed of deferents and epicycles.

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15. The Copernican system for planetary motions is

- **a.** Earth-centered, with the planets, the Sun, and the stars mounted on crystal spheres, pivoted to allow the correct motions around Earth.
- **b.** Earth-centered, with the planets moving in epicycles around Earth.
- **c.** Sun-centered, with the planets moving in elliptical orbits and the Sun at one focus of the ellipse.
- (x) **d.** Sun-centered, with the planets moving in perfect circles around the Sun.

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16. Kepler's first law states that the orbit of a planet about the Sun is a(n)

- **a.** circle with the Sun at the center.
- **b.** oval with the Sun at the center.
- (x) **c.** ellipse with the Sun at one focus.
- **d.** ellipse with the Sun at the center.

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17. In order to see the pole star Polaris in Tallahassee (latitude=30 degrees North, longitude=84 degrees West), you must:

- ○ **a.** look North and 60 deg. above the horizon
- ○ **b.** look South and 30 deg. above the horizon
- ○ **c.** look West and 84 deg. above the horizon
- (x) **d.** look North and 30 deg. above the horizon

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18. The constellation of Leo (the Lion) is to be found

- ○ **a.** along the polar axis.
- ○ **b.** along the prime meridian.
- ○ **c.** along the celestial equator.
- (x) **d.** along the ecliptic.

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19. The ecliptic crosses the celestial equator

- (x) **a.** at two points, known as equinoxes.
- ○ **b.** on the meridian.
- ○ **c.** at two points, known as solstices.
- ○ **d.** at one point only, known as the vernal equinox.

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20. What is the lowest latitude above which one would see the Sun for a full 24 hours on at least one day per year?

- ○ **a.** 23.5°
- ○ **b.** 90°
- ○ **c.** 52°
- (x) **d.** 66.5°

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21. At the summer solstice in the northern hemisphere, the Sun is

- (x) **a.** at its highest angle in the sky for the whole year.
- ○ **b.** at midday at its lowest angle above the southern horizon for the whole year.
- ○ **c.** on the celestial equator.
- ○ **d.** nearest Earth.

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22. Because of precession, how long will it be before the spin axis of Earth points toward the present pole star again?

- **a.** at least 1 million years
- **b.** 13,000 years
- (x) **c.** 26,000 years
- **d.** 9 years

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23. The full Moon always occurs

- **a.** on the first of the month.
- **b.** when the Moon is at right angles to the direction of the Sun.
- **c.** when the Moon is closer to the Sun than Earth is.
- (x) **d.** when the Moon is farther from the Sun than Earth is.

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24. Eclipses of the Moon can occur only

- **a.** in the spring and fall, when the Sun is on the ecliptic plane.
- **b.** at new Moon.
- **c.** in June and December, when the Sun is near the solstices.
- (x) **d.** at full Moon.

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25. The angular diameter of Venus appears largest when its phase is

- (x) **a.** crescent.
- **b.** half.
- **c.** gibbous.
- **d.** full.
