

PHY 101: Introduction to Astronomy
 Fall 2020 Final Exam
 Dec. 7, 10:30 - 12:15 pm
 Upload test to MyWLC by 12:15 pm for
 full credit.
 No electronic devices or notes of any kind;
 just this test and your pencil.
 Exam, Form: A

Name: _____
 Student Number: _____
 TA: _____
 Date: _____

Section 1. Matching of scientific terms and concepts (6 pts.). Note: there are definitions on the next page!

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|----------------------|---|
| _____ pole | (a) conceal |
| _____ corpuscle | (b) of or relating to the Christian Church or its clergy |
| _____ stade | (c) arranged or existing for the present, possibly to be changed later |
| _____ locomotion | (d) showing strong feeling; forceful, passionate, or intense |
| _____ vehement | (e) either of the two points at which the axis of a sphere intersects its surface |
| _____ archetype | (f) a thin leaflike structure |
| _____ isotropic | (g) unnecessary, especially through being more than enough |
| _____ folia | (h) completely empty |
| _____ ecclesiastical | (i) a length or portion of time |
| _____ passive | (j) mercy; lenience |
| _____ anomaly | (k) provide with a quality, ability, or asset |
| _____ period | (l) accepting or allowing what happens or what others do, without active response or resistance |
| _____ void | (m) of or with respect to the distant stars |
| _____ endow | (n) an ancient Roman or Greek measure of length, about 185 meters |
| _____ occult | (o) something that deviates from what is standard, normal, or expected |
| _____ superfluous | (p) concise and exact use of words in writing or speech |
| _____ clemency | (q) the feast of passover |
| _____ vie | (r) having a physical property that has the same value when measured in different directions |
| _____ corroborate | (s) movement or the ability to move from one place to another |
| _____ provisional | (t) confirm or give support to (a statement, theory, or finding) |
| _____ sidereal | |
| _____ brevity | |
| _____ pasch | |
| _____ geodesy | |

- (u) the branch of mathematics dealing with the shape and area of the earth or large portions of it
- (v) a minute particle regarded as the basic constituent of matter or light.
- (w) an original that has been imitated
- (x) compete eagerly with someone in order to do or achieve something

Section 2. Multiple choice (17 pts.)

1. Approximately where is the constellation Orion located right now—at around 11 am on Monday, December 7?
 - (a) just below the horizon toward the east
 - (b) a bit above the horizon to toward the east
 - (c) just about overhead, but a little bit toward the west
 - (d) just above the horizon to the west
 - (e) basically below my feet
2. Which of these is in the correct chronological order of authors?
 - (a) Leavitt, Galileo, Aristotle
 - (b) Galileo, Ptolemy, Kepler
 - (c) Bede, Kepler, Leavitt
 - (d) Brahe, Hubble, Bede
 - (e) Waldseemuller, Newton, Ptolemy
3. Which of the following was taught by the Pythagoreans?
 - (a) the earth is flat
 - (b) the earth below us is infinite
 - (c) the earth floats like wood on top of a fluid
 - (d) the sun is at the center of the world, since fire is the most precious thing
 - (e) the earth is motionless because of its indifference to forces in any particular direction
4. A full moon is separated from the sun by about how many signs of the zodiac?
 - (a) 1
 - (b) 2
 - (c) 3
 - (d) 4
 - (e) 6
5. The ecliptic
 - (a) is essentially the plane of the solar system
 - (b) is a great circle which intercepts the celestial equator at the first point of Aries and the last point of Virgo
 - (c) is a great circle inclined at an angle of about 24 degrees to the celestial equator.
 - (d) runs through the twelve constellations comprising the zodiac
 - (e) all of the above
6. For someone standing on the equator at local noon on the winter solstice, the sun will be approximately how many degrees above the southern horizon?
 - (a) 90
 - (b) 66
 - (c) 24
 - (d) 12
 - (e) actually, the sun will lie in the northern part of the sky

7. When standing on the tropic of cancer, the sun will pass through your zenith (be directly overhead)
- (a) once per year
 - (b) twice per year
 - (c) once each day for half of the year
 - (d) once each day during the whole year
 - (e) never
8. Which planet has an orbital period (about the sun) of approximately 30 years?
- (a) Mercury
 - (b) Venus
 - (c) Mars
 - (d) Jupiter
 - (e) Saturn
9. When Mars sets in the morning, it is at
- (a) perigee
 - (b) apogee
 - (c) perihelion
 - (d) aphelion
 - (e) dodecahedron
10. Which of the following was NOT one of Kepler's laws of planetary motion?
- (a) planets are attracted toward the sun with a force which varies as the inverse of the square of their distance from the sun
 - (b) planets orbit the sun in an elliptical fashion, with the sun at one of the foci
 - (c) equal areas are swept out in equal times when a planet orbits the sun
 - (d) the period of a planet's orbit varies as the $3/2$ power of the orbit's semi-major axis
 - (e) actually, all of these are Kepler's laws
11. The speed of a planet in an elliptical orbit around the sun is largest when it is at
- (a) apogee
 - (b) perigee
 - (c) aphelion
 - (d) perihelion
 - (e) actually, the planets all experience uniform circular motion
12. Which of the following did Galileo -not- conclude, based on his telescopic observations?
- (a) the Milky way is comprised of thousands of stars
 - (b) nebulae are comprised of stars
 - (c) there are mountains on the moon that exceed a mile in height
 - (d) Jupiter has four moons
 - (e) all of the above

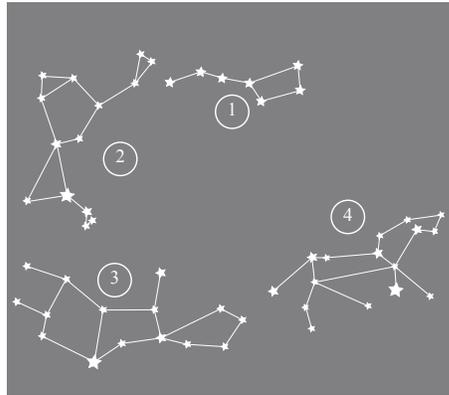
13. Jill, on Earth, sees a half moon one night. At the same time Jack, on the moon, sees
- (a) a new Earth
 - (b) a crescent Earth
 - (c) a half Earth
 - (d) a gibbous Earth
 - (e) a full Earth
14. According to Newton's theory of universal gravitation, the force of gravity between two masses separated by a distance r varies as
- (a) r^2
 - (b) r
 - (c) $1/r$
 - (d) $1/r^2$
 - (e) all of the above
15. The period of the variable stars Henrietta Leavitt observed in the Magellanic clouds
- (a) increased with their brightness.
 - (b) decreased with their brightness.
 - (c) increased with their distance.
 - (d) decreased with their distance.
 - (e) were all the same.
16. If Hubble's law is correct, then
- (a) space itself must be expanding
 - (b) Earth must lie at the center of the universe
 - (c) nebulae are receding from us with a speed proportional to their distance
 - (d) the universe must have arisen from the explosion of a radioactive primeval atom
 - (e) actually: all of these conclusions have been derived, with varying levels of plausibility, based on Hubble's law
17. The idea of Dark Matter was introduced
- (a) because Newton's law of gravity cannot account for the observed motion of stars in spiral galaxies
 - (b) by early modern scientists in order to explain the distance between the planets in our solar system
 - (c) by Henrietta Leavitt, since cepheid change their period of oscillation over long periods of time
 - (d) by Isaac Newton who was trying to connect alchemy to astronomy
 - (e) by a catholic theologian in order to justify big bang cosmology

Section 3. Multiple choice for PHY 105 (lab) students only! (5 pts.)

1. When you built your cross staff in the laboratory this semester, each centimeter on the ruler corresponded to
 - (a) 1 degree
 - (b) 5 degrees
 - (c) 15 degrees
 - (d) 24 degrees
 - (e) 360 degrees
2. What is the approximate angular separation of Jupiter and Saturn today?
 - (a) 0.1 degrees
 - (b) 1.5 degrees
 - (c) 5.5 degrees
 - (d) 10 degrees
 - (e) 30 degrees
3. In which constellation is Jupiter located today?
 - (a) Aries
 - (b) Cancer
 - (c) Pisces
 - (d) between Taurus and Gemini
 - (e) between Sagittarius and Capricorn
4. On which of the following dates was there a full moon this year (2020)?
 - (a) Nov. 15
 - (b) Nov. 19
 - (c) Nov. 23
 - (d) Nov. 30
 - (e) Dec. 6
5. When looking at the planet Mars through the eyepiece of a telescope, it takes one minute (of time) for Mars to drift across the entire field of view. About how many degrees wide is the field of view of this eyepiece?
 - (a) $1/60$ degree (1 minute)
 - (b) $1/4$ degree (15 minutes)
 - (c) 1 degree
 - (d) 2 degrees
 - (e) 10 degrees

Section 4. Constellation and bright star identification (7 pts.)

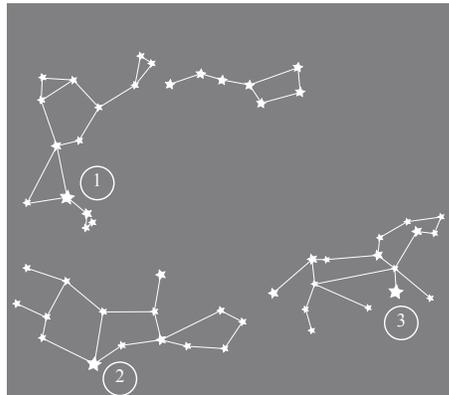
Four Stories



Name the Constellations:

- ① _____
- ② _____
- ③ _____
- ④ _____

Dipper for a Damsel in Distress



Name the Bright Stars:

- ① _____
- ② _____
- ③ _____

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Figure 1:

1.

Section 5. Essay question (5 pts)

Answer the following essay question using correct grammar, clear reasoning, and graceful style. Be sure to provide specific evidence, examples or arguments to clarify any assertions that you make.

1. Clearly explain two methods of measuring the distance to astronomical objects, such as the moon or a distant galaxy. Draw pictures if necessary.