

Astronomy 104, Spring 2023

Test 1

CORRECT SOLUTIONS

Make sure your scantron has your name and code on it.

**Show a picture ID,
and
turn in the test paper with the scantron.**

**It is advisable but not required
to fill in the answers on the test paper.**

**There were many scrambled versions.
Here is a solved copy of one of the versions.**

- 1 Depends on the version.**
- 2 Depends on the version.**
- 3 Depends on the version.**

A A 10-magnitude star is ...

- A: Easily observable in a telescope.
- B: Visible with the naked eye.
- C: Only visible in a very large telescope.
- D: Brighter than Sirius.
- E: Larger but not brighter than the Sun.

B How bright do you think is the faintest star still visible in MS in the haze of August? (Without a telescope; give a ballpark number.)

- A: 5.5 mg.
- B: 2 mg.
- C: 13 mg.
- D: 21 mg.
- E: -10 mg.

E How do stars look in the telescope?

- A: They look like tiny disks but few or no details can be seen on them.
- B: They look like large disks and we can see a lot of detail on them.
- C: They look like large disks but there is not much detail to see, although telescopes would have been able to resolve the details.
- D: They look like star-shaped objects with rays emanating from them.
- E: They look like points (no details visible).

A How does a deep-sky object look in a telescope through visual observation?

- A: A faint, hazy glow in the middle of the field of view.
- B: As a collection of many stars in the field.
- C: As a large, colorful, bright cloud.
- D: As a bright but small disk.
- E: As a faint glow all across the sky.

E How far is the closest star, and what is its name? (Exclude the Sun.)

- A: Polaris, 100 light years.
- B: Alpha Centauri, 150 million km.
- C: Venus, 0.3 AU.
- D: The Andromeda galaxy, 270 arc minutes.
- E: Proxima Centauri, 4 light years.

C How is a planetary nebula different from a supernova remnant?

A: A planetary nebula is millions of times larger than a supernova remnant.

B: A planetary nebula is in our galaxy, a supernova remnant must be in other galaxies.

C: A planetary nebula is not an explosion but a continuous blow-off of gas from a star.

D: A planetary nebula is the birthplace of stars, a supernova remnant is a blown-up star.

E: A planetary nebula is in the empty space outside galaxies, supernova remnants are in the centers of galaxies.

D How large is a star cluster?

A: ~ 100,000 light years.

B: Star clusters are not real objects, so they do not have a 'size'.

C: ~ 14 billion light years.

D: 10 light years.

E: 1-2 AU.

B How large is the Galaxy?

A: Ten million light years.

B: A good 100,000 light years.

C: 14 billion light years.

D: A hundred astronomical units.

E: About one light year.

A How large is the smallest object one can make out on the Moon with a telescope?

A: 1 mile.

B: 10 feet.

C: 100 miles.

D: 1 inch.

E: 10 inches.

E How large is the solar neighborhood, compared to the size of the Galaxy?

A: The solar neighborhood is 10% of the galaxy, located in its center.

B: The galaxy is much smaller than the solar neighborhood: there are millions of galaxies in the solar neighborhood.

C: They mean the same thing.

D: The solar neighborhood is a very tiny part of the galaxy, ranging from the Sun to Pluto only.

E: The Solar neighborhood is a small part of the Galaxy.

E How large is the Universe?

A: 200,000 km.

B: 150 million km.

C: 1.0 arc minutes.

D: 4.5 billion light years.

E: 14 billion light years.

B How long does a planetary nebula live?

A: A few hundred million years.

B: 10-20 thousand years.

C: A few years.

D: 10 billion years.

E: A few million years.

D How many naked-eye stars are there in the sky?

A: None.

B: Three.

C: Two hundred.

D: Five thousand.

E: Millions.

D How many stars are brighter than 5 magnitudes?

A: Two hundred.

B: Millions.

C: Three.

D: Five thousand.

E: None.

D How much is a parsec?

- A: 1.54 arc seconds.
- B: 150 million kilometers.
- C: 250 thousand miles per hour.
- D: 3.26 light years.
- E: 2.1 million years.

D How old is the Sun?

- A: 14 billion years.
- B: 65 million years.
- C: 6,000 years.
- D: 4.5 billion years.
- E: 400 million years.

A How old is object #3 ?

- A: About 10 billion years.
- B: A few hundred million years.
- C: Only a few years.
- D: 1 million years.
- E: About 10,000 years.

C How to convert between parsec and light year?

- A: $1 \text{ pc} = 150,000,000 \text{ light years}$.
- B: $1 \text{ pc} = 0.00032 \text{ light years}$.
- C: $1 \text{ pc} = 3.26 \text{ light years}$.
- D: Cannot convert, because light year is time, parsec is distance.
- E: $1 \text{ pc} = 0.0001 \text{ arc seconds}$.

C Is the Sun large or small as stars go?

- A: The Sun is by far the largest of all stars.
- B: The Sun is very large as stars go.
- C: Average.
- D: The Sun is very small as stars go.
- E: The Sun is not a star at all.

A Knowing the absolute magnitude and the apparent magnitude of a star, what can be calculated?

A: Its distance.

B: Its age.

C: Its temperature.

D: Its true size.

E: Its apparent size.

B Tau Ceti. What type of an object is it? What is Cetus, based on the name only?

A: Tau Ceti must be a planet around the star named Cetus.

B: Tau Ceti must be a not-too-bright star in the constellation of Cetus.

C: Tau Ceti must be a very faint star in the center of the Cetus galaxy.

D: Tau Ceti must be a very bright star in the center of the Cetus galaxy.

E: Tau must be a constellation and Cetus must be the name of a bright star.

C The magnitude of a star is a measure of its ...

A: color.

B: size.

C: brightness.

D: distance.

E: speed.

B The Pleiades is ... ?

A: A constellation.

B: An open cluster.

C: A galaxy.

D: A planet.

E: A star.

D The whole universe is build up of ...'s. (Provide the name of the type of objects.)

A: Star clusters.

B: Gas clouds.

C: Stars.

D: Galaxies.

E: Planets.

C What are the two most important purposes of a telescope?

A: 1. Making objects look larger, 2. Seeing out to larger distances.

B: 1. Bringing objects look closer, 2. Making objects look larger.

C: 1. Collecting much light, 2. Seeing much detail.

D: 1. Bringing objects look closer, 2. Seeing out to larger distances.

E: 1. Collecting much light, 2. Seeing out to larger distances.

E What causes seeing?

A: The fact that large mirrors can collect much light.

B: The large distance between us and astronomical objects.

C: The fact that space is almost completely empty.

D: The fact that the atmosphere is transparent gas.

E: The turbulent motion of the atmosphere.

C What instrument do you need to see Titan, a 9-magnitude moon of Saturn?

A: Such an object would be too faint to see at all.

B: A pair of binoculars.

C: A 4-inch amateur telescope.

D: A large professional telescope, at least 80 inches.

E: Only your naked eyes.

A What is a globular cluster?

A: a collection of ~ 100,000 old stars.

B: a loose, desintegrating collection of young stars.

C: a globe-shaped nebula of gas and dust.

D: a star with a large collection of planets orbiting around it.

E: a large galaxy that has no spiral arms.

C What is a light year?

A: A time as long as the lifetime of a star.

B: A large distance, comparable to the size of the Universe.

C: A distance comparable to the distance between next-door-neighbor stars.

D: A long time. For comparison, stars live a lot longer than one light year.

E: A large distance. For comparison, stars are usually much closer to each other than one light year.

C What is a planetary nebula?

- A: The result of the explosion of a star.
- B: A star with a planet that is forming now.
- C: A star with a very strong stellar wind.
- D: The result of a supernova explosion.
- E: A gas cloud around a planet.

D What is an astronomical unit, and how many km's is it?

- A: 1 AU is the size of the observable Universe, 14,000,000,000 light years.
- B: 1 AU is the distance to the center of the Galaxy, equals 150,000,000 km.
- C: 1 AU is the distance from Earth to Moon, equals 400,000 km.
- D: 1 AU is the distance from the Sun to Earth, equals 150,000,000 km.
- E: 1 AU is the circumference of the equator, equals 150,000,000 km.

E What is an astronomical unit?

- A: 384,400 kilometers, the distance to the Moon.
- B: 384,400 kilometers, the Sun-Earth distance.
- C: 10 trillion kilometers, the distance light travels in a year.
- D: 150 million kilometers, the distance to the Moon.
- E: 150 million kilometers, the Sun-Earth distance.

E What is astrology?

- A: The observation of the Universe.
- B: The theory that predicts the motion of the planets.
- C: The science of the stars.
- D: The observation of the Solar System.
- E: The (con) art of predicting the future.

D What is distance modulus?

- A: The amount of starlight lost due to interstellar dust between us and the star.
- B: The ratio of the distance to a star to the distance to the Sun.
- C: The amount of change in the color of the star due to distance.
- D: The difference between apparent and absolute magnitude.
- E: The distance to the star expressed in parsecs.

A What is in picture # 4?

- A: A diffuse nebula.
- B: A supernova remnant.
- C: A planetary nebula.
- D: A galaxy.
- E: An open cluster.

C What is in picture # 5?

- A: A diffuse nebula.
- B: A supernova remnant.
- C: An open cluster.
- D: A planetary nebula.
- E: A galaxy.

C What is the absolute magnitude of the Sun?

- A: -26.4 mg.
- B: 0 mg.
- C: 5 mg.
- D: +11.4 mg.
- E: -12.5 mg.

E What is the diameter of the Galaxy?

- A: 10 parsecs.
- B: 2.5 arc minutes.
- C: 150,000,000 kilometers.
- D: 14 billion light years.
- E: 100-150 thousand light years.

B What is the difference between an open cluster and a constellation?

A: An open cluster is special kind of galaxy, and constellations are all in our Galaxy.

B: A constellation is a bunch of unrelated stars at various distances; an open cluster is a real object.

C: An open cluster is a random collection of stars, while constellations are real objects.

D: Constellations are small parts of clusters.

E: An open cluster contains much fewer stars (only ~10) than a constellation, which is a system of ~ 100 billion stars.

C What is the largest reasonable magnification a large telescope can have in good weather conditions? Approximately ...

A: 40.

B: 10000.

C: 500.

D: 0.5 arc seconds.

E: 12 magnitudes.

E What is the light of the Milky Way in actual fact?

A: The glow of gas left behind when the Universe was born.

B: A reflection of sunlight on dust particles in the Solar System.

C: A reflection of sunlight in Earth's atmosphere.

D: The glow of the upper atmosphere due to cosmic rays.

E: The light of a few billion stars washed together.

C What is the Seven Sisters?

A: a star.

B: a galaxy.

C: an open cluster.

D: a planet.

E: a constellation.

B What object must M 42 be, judged only by its name?

- A: A moon (satellite).
- B: A deep-sky object.
- C: A planet.
- D: A meteorite.
- E: A bright star.

A When is extinction strongest?

- A: When a star is low over the horizon.
- B: When a star is bright.
- C: When a star twinkles strongly.
- D: When a star is red.
- E: When the Moon is up.

C When we say 'magnitude' without qualification, what do we mean?

- A: The diameter of the star.
- B: The apparent diameter of the star in arc seconds.
- C: Apparent magnitude.
- D: Absolute magnitude.
- E: The distance to the star in parsecs.

E Where in the Galaxy is the Sun?

- A: At the center of the Galaxy.
- B: At the outer edge of the galaxy.
- C: 20,000 light years from the center, inside a spiral arm.
- D: The Sun is not in the Galaxy at all.
- E: 20,000 light years from the center, between two spiral arms.

D Which constellation is closest to us, and how do we know?

- A: This question is nonsense because the distance to constellations changes as Earth revolves around the Sun.
- B: The Andromeda Galaxy is the closest constellation, except for a few small irregulars.
- C: Orion is closest because it contains the brightest stars in the sky.
- D: This question is nonsense because constellations are not real objects.
- E: All constellations are in the sky, consequently at the same distance.

E Which description matches best with the object in picture # 1?

A: A star blew up a few thousand years ago in a powerful supernova explosion, and the blowup's matter is still glowing around the old star.

B: A nebula is contracting and is in the process of giving birth to a new star in its center.

C: A small star, like the Sun, blew up, but did not get quite destroyed because it was not a full supernova explosion.

D: A fast-rotating planet.

E: A dying star is blowing off its matter into space in a powerful wind.

B Which is the brightest star in the sky and how bright is it? (Exclude the Sun.)

A: Polaris, 2 mg.

B: Sirius, -1.6 mg.

C: Proxima Centauri, 11.7 mg.

D: Polaris, 0 mg.

E: Betelgeuse (Alpha Orionis), 0.5 mg.

D Which of these explains why astrology does not work?

A: Astrology is based on thousand years of experience, not on modern observation.

B: Few people believe in astrology in the 21st century.

C: Astrology is a matter of religious faith.

D: Astrology is based on which planet is in which constellation. But constellations do not exist in fact.

E: Astrology is based on the motion of the planets. But planets are not different from stars.

D Why does the Hubble Telescope make very detailed images?

A: Because it is of exceptionally good quality.

B: Because it is in space, closer to the stars than other telescopes.

C: Because it has the largest diameter of all telescopes.

D: Because it is in space where seeing is zero.

E: Because it can detect UV radiation, which other telescopes cannot.

A What is in picture # 2?

A: A galaxy.

B: A planetary nebula.

C: An open cluster.

D: A supernova remnant.

E: A diffuse nebula.