# Astronomy 104, Spring 2025

## Test 1

## CORRECT SOLUTIONS

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**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** **What is in Picture 5?**

A: A solar prominence.

B: A solar flare.

C: A sunspot.

D: Aurora.

E: A solar eruption.

**C** **What is in Picture 6?**

A: A planetary nebula.

B: An open cluster.

C: A diffuse nebula.

D: A supernova remnant.

E: A galaxy.

**A** **What is in Picture 2?**

A: A solar flare.

B: A hot cloud of gas hovering over a sunspot area (called 'facula').

C: A solar prominence.

D: A hot solar granule.

E: A sunspot.

**A** **What is in the Picture 7?**

A: An open cluster.

B: A supernova remnant.

C: A planetary nebula.

D: A galaxy.

E: A diffuse nebula.

**B** **How is the motion of charged particles restricted by the magnetic field of Earth?**

A: Charged particles are reflected by field lines back into space.

B: Charged particles closely follow magnetic field lines.

C: Charged particles cancel out the magnetic field lines of Earth.

D: Charged particles are slowed and stopped by magnetic field lines.

E: Charged particles do not interact with magnetic field lines but move on straight.

**B** **How large is the Universe?**

A: 1.0 arc minutes.

B: 14 billion light years.

C: 200,000 km.

D: 150 million km.

E: 4.5 billion light years.

**B** **How long before/after the Sun did the planets form?**

A: The planets were formed long before the Sun and were captured by the Sun's gravity.

B: The planets were formed right after the Sun did.

C: The planets were formed 1 billion years ago, while the Sun is 4-5 billion years old.

D: The planets were formed only a few thousand years ago, while the Sun is billions of years old.

E: The Sun is 14 billion years old, the planets are 4-5 billion years old.

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

A: 1 AU is the distance from Earth to Moon, equals 400,000 km.

B: 1 AU is the distance to the center of the Galaxy, equals 150,000,000 km.

C: 1 AU is the circumference of the equator, equals 150,000,000 km.

D: 1 AU is the distance from the Sun to Earth, equals 150,000,000 km.

E: 1 AU is the size of the observable Universe, 14,000,000,000 light years.

**A** **How old is the Universe?**

A: 14 billion years.

B: infinitely old.

C: 4.5 billion years.

D: 65 million years.

E: 6,000 years.

C **How large is the Galaxy?**

A: Ten million light years.

B: About one light year.

C: A good 100,000 light years.

D: 14 billion light years.

E: A hundred astronomical units.

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

A: Gas clouds.

B: Planets.

C: Stars.

D: Galaxies.

E: Star clusters.

D **Where in the Galaxy is the Sun?**

A: The Sun is not in the Galaxy at all.

B: 20,000 light years from the center, inside a spiral arm.

C: At the center of the Galaxy.

D: 20,000 light years from the center, between two spiral arms.

E: At the outer edge of the galaxy.

E **How far is the farthest constellation?**

A: 150 million kilometers.

B: 14 billion light years.

C: 750 light years.

D: 4 light years.

E: This question is nonsense.

B **How many stars are brighter than 5 magnitudes?**

A: Millions.

B: Five thousand.

C: Three.

D: None.

E: Two hundred.

**D** **What is the absolute magnitude of the Sun?**

A: +11.4 mg.

B: 0 mg.

C: -26.4 mg.

D: 5 mg.

E: -12.5 mg.

**B** **Can we see a 21 mg star with the naked eye?**

A: Barely.

B: No, because it is too faint.

C: No, because it is too small.

D: No, because it is too far.

E: Yes, it looks very bright.

**D** **What instrument do you need to see a 7-magnitude star?**

A: Only your naked eyes.

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

C: A 12-inch amateur telescope.

D: A pair of binoculars.

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

**E** **What is distance modulus?**

A: The ratio of the distance to a star to the distance to the Sun.

B: The amount of starlight lost due to interstellar dust between us and the star.

C: The amount of change in the color of the star due to distance.

D: The distance to the star expressed in parsecs.

E: The difference between apparent and absolute magnitude.

**D** **The majority of the individual stars, but not all, of those that are visible in the sky without a telescope, are in …**

A: the Galaxy.

B: the Solar System.

C: a little area around the center of the Galaxy.

D: the Solar Neighborhood.

E: the Galaxy and a few close-by galaxies.

**A** **What is absolute brightness?**

A: The calculated brightness of a star, as observed from a distance of 10 pc.

B: The calculated brightness of the star with invisible light forms added.

C: The brightness of the star as observed outside the atmosphere.

D: The brightness the star would have if it was located at 1AU, where the Sun is now.

E: The brightness of the star as we see it in the sky.

**E**

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

A: Polaris, 0 mg.

B: Proxima Centauri, 11.7 mg.

C: Betelgeuse (Alpha Orionis), 0.5 mg.

D: Polaris, 2 mg.

E: Sirius, -1.6 mg.

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

A: Orion is closest because it contains the brightest stars in the sky.

B: This question is nonsense because the distance to constellations changes as Earth revolves around the Sun.

C: This question is nonsense because constellations are not real objects.

D: The Andromeda Galaxy is the closest constellation, except for a few small irregulars.

E: All constellations are in the sky, consequently at the same distance.

**C** **What is a parsec?**

A: The time light takes to cross the solar system.

B: A very long time. The solar system is almost 5 parsecs old.

C: A unit of distance. The parallax of a star at 1 parsec is 1 arc second.

D: The time light takes to arrive from the Sun to Earth.

E: The angle the closest star moves in the sky in one year.

**D** **All stars that one can see as individual stars in the sky are part of …**

A: either our Galaxy or the space between galaxies.

B: the Solar System.

C: the Solar Neighborhood.

D: the Galaxy.

E: the Andromeda Galaxy.

**A** **The Pleiades is … ?**

A: An open cluster.

B: A star.

C: A planet.

D: A constellation.

E: A galaxy.

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

A: The Andromeda galaxy, 270 arc minutes.

B: Polaris, 100 light years.

C: Venus, 0.3 AU.

D: Proxima Centauri, 4 light years.

E: Alpha Centauri, 150 million km.

**E** **What is the name of the first and most famous deep-sky object catalogue?**

A: Messerschmidt

B: Stefan-Boltzman

C: Terminator

D: Herzsprung-Russell

E: Messier

**C** **How large is a globular cluster?**

A: 10,000 kilometers.

B: 10 astronomical units.

C: 10 - 100 light years.

D: 10 billion light years.

E: 100,000 light years.

**D** **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: The result of a supernova explosion.

D: A star with a very strong stellar wind.

E: A gas cloud around a planet.

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

A: A planet.

B: A meteorite.

C: A moon (satellite).

D: A bright star.

E: A deep-sky object.

**C** **How long does a planetary nebula live?**

A: A few hundred million years.

B: A few years.

C: 10-20 thousand years.

D: 10 billion years.

E: A few million years.

**C** **What is a globular cluster?**

A: a large galaxy that has no spiral arms.

B: a loose, desintegrating collection of young stars.

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

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

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

**A** **Why can we not see spectacular views of nebulae and galaxies in a telescope?**

A: Because they are all exceedingly faint.

B: Because they all radiate in invisible (IR) light only.

C: Because their light is obscured by interstellar dust.

D: Because they are all too far to see.

E: Because they are all too small.

**D** **How is a planetary nebula different from a supernova remnant?**

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

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

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

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

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

**C** **Sirius, the Dog Star, has its parallax measured as 0.33 arc seconds. How far is it?**

A: 0.33 light years.

B: 100 light years.

C: 3 parsecs.

D: 5 AU's.

E: 1 million light years.

**B** **What is aurora?**

A: The light of the rising/setting sun scattered in the atmosphere.

B: Fluorescing air due to charged particles from the Sun.

C: Sunlight reflected in very high elevation clouds.

D: The upper atmosphere glows due to extreme solar heating.

E: Sunlight is reflected in interplanetary dust particles.

**C** **Define the photosphere.**

A: The illuminated, bright half of the Sun where it is day.

B: The part of the Sun where heat is produced in a nuclear reaction.

C: The visible outside 'shell' of the Sun.

D: The non-convective inner part of the Sun.

E: The part of the Sun that is hot, from the center out.

B **How hot is the photosphere of the Sun?**

A: 1 million degrees.

B: 6000 degrees.

C: -200 F below.

D: 15 million degrees.

E: 20 F.

E **If the Sun were covered all in sunspots, how would it appear?**

A: Much hotter, brighter and whiter than it is now.

B: Much hotter, brighter and redder than it is now.

C: Dark and almost unnoticeable in the sky.

D: As dim as the full Moon, red.

E: Still very bright and hot, but dimmer than now and red in color.

E **Where in the Sun is there heat production?**

A: Nowhere: the Sun is only hot because is cooling off.

B: Only in the photosphere.

C: Only in the convection zone.

D: Everywhere inside.

E: Only in the core.

A **The number of sunspots changes with what time period?**

A: 11 years.

B: 4.5 billion years.

C: 22 years.

D: 1 month.

E: 1 year.

E **What minimum temperature is needed for hydrogen to helium fusion?**

A: 200 million K.

B: 6000 K.

C: 400 K.

D: 3 K.

E: 1 million K.

**C** **What heats the Sun?**

A: The Sun is slowly contracting and using its gravitational energy to produce heat.

B: It has no energy source now, but it is still hot and cooling off slowly.

C: Hydrogen to helium fusion.

D: Helium is used up to produce oxygen and carbon.

E: Hydrogen burns into water in its core.

**B** **What is granulation?**

A: Rotating storms on the Sun, the equivalent of tornadoes.

B: The heads of hot upcoming gas bubbles in the Sun look like bright spots.

C: The 'surface' of the Sun is very uneven. Higher elevations look brighter.

D: Giant waves travelling along the surface of the Sun.

E: Matter falling onto the Sun from outer space makes the Sun look grainy.

**E** **How long is the sunspot cycle?**

A: 1 month.

B: 350 years.

C: 1 day.

D: 9 months.

E: 11 years.

**B** **In the Sun, what can you say about the motion of magnetic field lines relative to matter?**

A: Matter crossing magnetic field lines gets heated up.

B: Magnetic field lines are frozen into the matter of the Sun, they can only move together.

C: Matter crossing magnetic field lines also gets magnetized.

D: There is no magnetic field in the Sun.

E: Magnetic field lines attempt to sink, while hot matter tries to move up.