

Many, but not all of the final exam questions will be from this list. Sorry, answers will not be provided on the final.

Szto

why are planetary nebula considered rare?

ANS: due to the composition of planetary nebula, they are relatively short lived, around 10,000 yrs. And they need to be relatively close to the earth to be seen.

Why isn't the gravity on Jupiter much greater than Earth's gravity, despite the being 11 times larger in diameter.

ANS: Jupiter's composition is mostly gas, so the mass would not be that much greater.

What was the purpose of the planetary gear set beneath the stand of the telescope?

ANS: it was to help keep the stand centered on the pivot point.

What cause the motion of the planets across the night sky to be reversed (aka retrograde motion)?

ANS: this is caused by the relative motion of the planets as seen from earth with respect to the background stars.

Is the summer triangle considered a constellation?

ANS: No, the summer triangle is considered to be an asterism.

Cherry:

A. Why are Adaptive Optics important (what problem does it solve)?

it's important because it allows for the mirrors to be adjusted in order to be able to compensate for the interference caused by the Earth's atmosphere which normally limits the performance of ground-based astronomical telescopes.

B. What is star made of/how is it made?

A star is a luminous ball of gas, mostly hydrogen and helium, held together by its own gravity. A star is created through nuclear fusion reactions in its core. This supports the star against gravity and produce photons, heat, and small amount of heavier elements.

C. What is a major interference with seeing stars through a telescope that can be cause by different spider designs?

How the star's light gets diffracted while traveling around the spider/holder. Different spider designs will split the light causing the star to almost mimic the design of the spider.

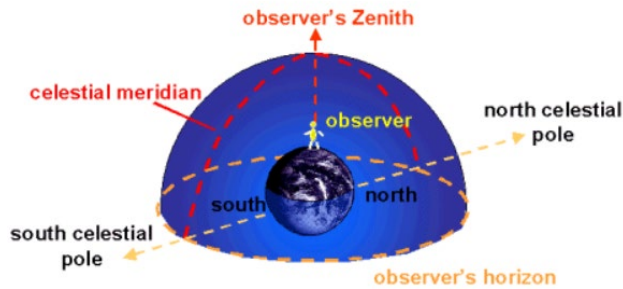
D. Given a telescope length of 10ft and two eye pieces, one with 10mm and one with 20mm. How much of a difference in magnification would you experience between the two eye pieces?

$$\text{Magnification} = \frac{\text{Telescope Focal Length}}{\text{Eyepiece Focal Length}}$$

Based on the above equation, you would find that the 10 mm eyepiece would provide twice as much magnification to the 20mm eyepiece.

E. How are the Celestial Meridian and Observer's Zenith related?

The celestial meridian is the line on the sphere that joins the location of the observers Zenith (directly above the person) and the north and south poles.



Wu

From my own presentation:

Q: How does the Sun generate its energy?

A: Through nuclear fusion.

From my teammate's presentation:

Q: What is the ultimate purpose of the James Webb Space Telescope?

A: Uncover new information about the formation of the early universe.

Regarding the design of a telescope:

Q: How do we align the primary mirror and the secondary mirror?

A: we use a laser pointer that shoots out a laser beam through the focuser, then adjust the secondary so that the laser strikes the middle of the primary mirror, and then adjust primary to make the point of the laser return to the center of the focuser.

Not directly related to design:

Q1: How many arcseconds equal to 1 arcminute?

A1: 60 arcseconds.

Q2: Where is zenith?

A2: it is the point of the sky that is directly above the observer.

Ledbetter

a) Question and answer from own presentation

Q: True or False: Amateur radio telescopes cannot see much outside of the solar system.

A: True

b) Question and answer from teammate's presentation

Q: True or False: Aside from the Moon and Sun, Venus is the brightest natural object in the night sky.

A: True

c) Question and answer regarding telescope design

Q: Describe the difference between an equatorial and an altitude/azimuth mount.

A: An altitude/azimuth mount moves on two axes that correspond to altitude (up-down) and azimuth (rotation). An equatorial mount also moves on these two axes but is tilted such that its azimuthal axis is aligned with the path of objects in the sky.

d) Two questions and answers from the assignments not directly related to design

Q: Describe what seeing means in relation to viewing conditions.

A: Seeing refers to the steadiness of the atmosphere. Good seeing leads to sharp viewing while poor seeing leads to twinkly and blurry views.

Q: What defines a stellar object as opposed to an extended object in the night sky?

A: A stellar object cannot be magnified while an extended object can be.

Lillia Smith

- A. What type of star does the protostar become if it does not get hot enough to become a main sequence (regular) star?
-Brown dwarf star
- B. Why do we need a reference (guide star) for adaptive optics to work?
-A guide star is needed because it helps adjust for the blurring/distortion caused by the atmosphere.
- C. If looking at a star in the telescope, how would having two perpendicular rods support the secondary mirror make the star look different compared to just one rod holding the secondary mirror up?
-There would be four diffraction spikes rather than two diffraction spikes.
- D. What does field of view refer to?
-The amount of sky (angular measurement) seen through an eyepiece.

Is the primary mirror of a reflector telescope concave or convex?

-The primary mirror is concave.

Daniel Henderson

- a) Name 3 of the 4 types of galaxies.
Answer: Irregular, Elliptical, Spiral, or Dwarf Galaxy
- b) What does it mean when Mars is in opposition?
Answer: It means that Mars and the sun are on opposite sides of the Earth.
- c) Given a primary mirror diameter of 8" and a focal ratio of 7, what should the focal length be?
Answer: Focal Length = Focal Ratio * Diameter (Primary) = 56"
- d) The moon has a radius of 1,079 miles, and an apparent size of 32 arcminutes. What is the moon's distance from you, at this time?
Answer: $d = r / \tan(\text{angle}/2) = 231,831$ miles

e) What is the focal length of a converging lens is $S_d=20\text{cm}$ and $S_i=30\text{cm}$?

Answer: $1/f = 1/S_d + 1/S_i = 12\text{cm}$

Aymon Klem

a) Q: Why use orbiting telescopes versus Ground-based telescopes?

A: Orbiting telescopes negate atmospheric interference (including unsteady air (poor seeing), clouds, and light "pollution" (including daylight))

b) Q: What kind of wavelengths do solar telescopes detect?

A: Light with wavelengths in the visible and non-visible spectrum

c) Q: What is the purpose of the stand/tube joint on a telescope?

A: The stand/tube joint is responsible for connecting the telescope tube and the stand to each other at the tube's center of mass with all components included

d) 1. Q: What does Apparent Field of View (AFOV) mean? What is the actual field of view (FOV)?

A: AFOV is the angular measurement describing how wide the view we can see with our eyes looking through a telescope – it is a function of the eyepiece only. Actual field of view is the angular measurement describing how much of the sky we are actually looking at – it is a function the magnification and AFOV.

2. Q: How many times brighter or dimmer is mag. 9 star vs mag. 6 star?

A: A mag. 6 star is 2.5^3 times brighter than mag. 9 star.

Helbling

A) Question from my presentation

Q: Saturn has an axial tilt of 27.5 degrees which causes it to experience which phenomenon similar to earth which has an axial tilt of 23.5 degrees. **A:** Seasonal or Seasonal Weather

B) Question from partner's presentation [Colin Tanner]

Q: What are the two key features in identifying a dwarf planet? **A:** A dwarf planet (1) is not a satellite and (2) has not cleared its neighborhood.

C) Design question

Q: Determine where a 8" f/6 mirror (focal length is $6 \cdot D_{\text{mirror}} = 36$) should sit along an 10 inch diameter tube if the eye piece sits on a focuser that is 2" tall. Assume the primary mirror is at the very end of the tube.

D) Extra Questions

(1) What was revolutionary about the design philosophy of Dobsonian telescope? [HW 2-15]

(2) Calculate the apparent size (arcminutes) of your fist extended at arms-length. [HW 6-5]

Melissa Chan-Jones

a) Question: What are the four Galilean Moons of Jupiter and what makes them different?

Answer: The four Galilean Moons are composed of rock and ice. They include: Europa the smallest moon, Ganymede the largest moon, Io the innermost moon, and Callisto the moon that is not in orbital resonance with the other Galilean Moons.

Explanation: The four largest moons of Jupiter are known as the Galilean Moons.

Question: What defines a planetary nebula?

Answer: It is a type of emission nebula that is characterized by its ring-shape from the expanding of ionized gas that is emitted from late red giant stars.

Explanation: There are many different types of nebulae, so it's necessary to classify them.

Question: What is the field of view and how does it apply to the design of a telescope?

Answer: The field of view is the angular measurement of how much an observer can see the sky through a telescope's eyepiece. Mathematically it is equivalent to the apparent field of view divided by the telescope's magnification. Knowing the field of view of a telescope is important when designing how much of the sky you want to be visible to easily identify what you are seeing.

Explanation: Different fields of view dramatically influences what an observer sees through their telescope.

Question 1: What size eyepiece is the most common?

Answer 1: The most common eyepiece size is a 1.25" because they are cheaper and are most compatible Barlow lens and fitters that incorporate a design to thread into the barrel of the eyepieces.

Question 2: What is the Barlow Lens used for?

Answer 2: Barlow lens are diverging lens that increase the focal length of an optical system when placed in series of other optics. They are easy to use and help magnify an image by a large amount (typically, doubling the magnification).

Explanation: Eyepieces and lens come in many different varieties, so it's important to understand and identify them when building an amateur telescope.

Matt Haney

1. From My Own Presentation

Question: What is the launch year for the James Webb Space Telescope?

- A) 1996
- B) 2005
- C) 2011
- D) 2021

2. From Charlie Wu's Presentation

Question: Which of these is not a major event exhibited by the Sun?

- A) Sunspot
- B) Solar Flare
- C) Coronal Mass Ejection
- D) Geomagnetic Storm

3. General Telescope Question

Question: All telescopes consist of a combination of *only* mirrors.

- A) True
- B) False

4. Assignment Question 1

Question: What famous astronomer is known to have a catalogue of deep sky objects named by a prefix "M" and followed by a number?

- A) Charles Messier
- B) William Herschel
- C) Galileo Galilei
- D) Nicolaus Copernicus

5. Assignment Question 2

Question: Which of these constellations does not contain a star that makes up the "Summer Triangle?"

- A) Orion
- B) Cygnus
- C) Lyra
- D) Aquila

Kellyn Smith

1. Explain what the difference is in globular cluster classes? (i.e. I – XII)

ANSWER: "I" (one) meaning very concentrated at the center and "XII" (twelve) meaning not very concentrated at the center.

2. How can a supernova be created?

ANSWER: A supernova can be created when a dwarf white star steals mass from another star and eventually reaching critical mass and then exploding into a supernova. The second way they can form is when a star is reaching the end of its life it begins to lose mass. Overtime the core begins to build up heavier materials and the outward pressure begins to drop and start to collapse in on itself creating an explosion.

3. What is the importance of the Tube?

ANSWER: The importance of the tube is that it makes sure that everything is kept in place such as the primary mirror, secondary mirror, etc...

4. What is Zenith of the sky?

ANSWER: The Zenith is the highest point in the sky – directly overhead.

5. What is the Summer Triangle?

ANSWER: The summer triangle is a triangle that this made up of 3 bright stars: Altair, Deneb, and Vega. It is an asterism that is easy to recognize in the summer sky.

Silva

From own presentation (Mars)

1. Q: Why does Mars look red?
A: The oxidization of iron in the rocks.

Daniel's presentation (Galaxies)

2. Q: How are stellar groups defined?
A: By how objects (or group of objects) are gravitationally bound.

Design

3. Q: What is the job of the primary mirror?
A: Gathers light from celestial objects and focuses it towards a secondary mirror bring light to focus at the eyepiece.

Assignment (not related to design)

4. Q: What is parallax?
A: The relative movement between objects in the foreground and objects in the background.

Q: What is the meridian?

A: An imaginary line that runs from north to south and goes straight over your head through zenith.

Payson Wilde

1. One question and answer from your own presentation:
 - a. What planet has the fastest and shortest orbit around the Sun?

- b. Mercury
2. One question and answer from your teammates presentation (Steven Ledbetter):
 - a. The Event Horizon Telescope radio telescope array captured the first image of what deep space object?
 - b. Black Hole
 3. One question and answer regarding the design of a telescope:
 - a. True or False: According to lean manufacturing practices, you can minimize total cost by forming short-term business relationships with many suppliers based on the lowest price.
 - b. False
 4. Two questions and answers from the assignments not directly related to design:
 - a. Will a 100-Hz radio wave have more, less, or the same energy as a 100-kHz radio wave?
 - b. Less
 - c. Which star appears brighter: Sirius (-1.46 magnitude) or Polaris (1.97 magnitude)?
 - d. Sirius

Colin Tanner

- a) From Pluto & Dwarf Planets **Q:** Differentiate between Meteoroids, Meteors, and Meteorites.
A: A meteoroid is a small piece of rock broken off from asteroids and comets. A meteor is a meteoroid which enters Earth's atmosphere and is vaporized. A meteorite is a meteoroid which penetrates Earth's atmosphere and lands on the surface.
- b) From Saturn & Moons **Q:** Explain how Saturn's rings were formed, and what they are predominantly made of.
A: Saturn's rings are composed primarily of rock and ice, and are formed by Saturn's gravity crushing space debris within its gravitational field. The debris gathers along the planet's horizontal plane due to Saturn's rotation.
- c) **Q:** What are some benefits of using an equatorial mount on a telescope?
A: An equatorial mount has one axis aligned with Earth's rotational axis, and another perpendicular axis. Rotating about the single axis compensates for Earth's rotation, and allows the observer to stay aligned with a fixed celestial object in the night sky.
- d) 1. **Q:** Calculate the apparent size of the Sun from Saturn. The diameter of the sun is 864,340 miles, and Saturn is located 890.8×10^6 miles from the Sun.
A: $(890.8 \times 10^6) \times 2\pi / 360 = 15,539,511$ miles

$$(864,340)/(15,539,511) = 0.056^\circ$$

2. **Q:** Briefly describe the purpose of the New General Catalogue (NGC).

A: The NGC is a catalogue of 7,840 deep-space objects including galaxies, star clusters, emission nebulae and absorption nebulae. It can be used by “comet chasers” to help distinguish between permanent deep-sky objects and ‘temporary’ deep-space objects such as comets.

Kai Weyland

1. What is dark energy, and how did supernovas help explain its existence?

Dark energy is an unknown repelling force that must exist with our current knowledge of physics. Supernovas are some of the brightest objects in existence, and often happen thousands of light years away. We were able to measure this light, and found that it was redshifted differently than what would be expected if the expansion of the universe was slowing.

What is a globular cluster, and how are they formed?

A globular cluster is a spherical collection of stars that all orbit a core. They are formed when large clouds of molecules come together and form stars that begin to orbit a core.

How do you find the focal length of a spherical mirror?

The focal length of a spherical mirror is approximately equivalent to half the length of the radius of curvature of the spherical mirror.

What is a schlieren system?

A schlieren system is a way to visualize differences in density in a fluid. Differences in density may be caused by thermal differences and pressure differences.

What is the difference between a synodic day and a sidereal day on earth?

A sidereal day is the time it takes for the earth to rotate 360 degrees – which is about 23 hrs and 56 minutes. A synodic day (aka solar day) is how much time it takes the earth to rotate with respect to the sun – it is almost exactly 24 hours.

Fritz

Question from my presentation

Q: What causes distortion in solar telescopes?

A: Heat from the Sun

Question from partner's presentation

Q: What initial problem occurred with the Hubble Space Telescope?

A: Initial images were out of focus due to the mirror shape being inappropriate for the weightless environment of space.

Question about telescope design

Q: What must be calculated to accurately place a pivot point for the tube?

A: Center of gravity/mass of a complete optical tube assembly (including eyepieces).

Questions from homework

Q: What causes the light streaks coming from stars occasionally in observation?

A: Diffraction of light around the secondary mirror spider.

Q: The Andromeda Galaxy has brightness magnitude of 3.4, but is difficult to see even far away from light pollution. Stars of the same magnitude (3.4) are pretty bright and easy to see from a rural setting (some light pollution). Why is the Andromeda Galaxy much more difficult to see?

A: The light from the Andromeda Galaxy more spread out.