

General Advice for Essays

Good Advice: Do not write essays for the short answer questions. They will be graded on accuracy. Do write essays on questions 2, 3, and 4. They will be graded on breadth, quality, and completeness. Try to write competent English and answer the question that is asked. Clarity of expression will help you show what you know. You will not receive full credit for answering the wrong question. Please do the short answer questions in order. It's easier to grade them that way.

Midterm Exam Essay Questions

Contrast the contributions of Newton and Kepler to astronomy and celestial mechanics. What were the major contributions of each. On what issues did they agree? Where did they differ? Whose work has had the greater impact on modern science and why? Include a description of Newton's tool boxes and Kepler's laws.

Contrast the contributions of Copernicus and Kepler to astronomy and celestial mechanics. What were the major contributions of each. On what issues did they agree? Where did they differ? Whose work has had the greater impact on modern science and why? Include a description of Kepler's three laws and of the Copernican model.

Describe in detail the (astronomical) motions that a patient naked-eye observer could catalog by spending a few years watching the sky. Group the motions according to their "period" (daily, monthly, annual, irregular). How are these motions explained in the Ptolemaic model of the solar system? Briefly describe the Ptolemaic model.

Describe in detail the Keplerian model of the solar system. Discuss his three laws. What role did Tycho Brahe play in Johannes Kepler's work? Describe how Kepler's laws explained the main astronomical motions that a patient naked-eye observer could catalog by spending a few years watching the sky. Briefly describe these motions.

Describe in detail the (astronomical) motions that a patient naked-eye observer could catalog by spending a few years watching the sky. Group the motions according to their "period" (daily, monthly, annual, irregular). How are these motions explained in the Copernican model of the solar system? Briefly describe the model.

Describe in detail the (astronomical) motions that a patient naked-eye observer could catalog by spending a few years watching the sky. Group the motions according to their "period" (daily, monthly, annual, irregular). How are these motions explained in the Keplerian model of the solar system? Briefly describe the model.

Describe the contributions of Isaac Newton to astronomy and celestial mechanics. What were Newton's major contributions. What phenomena was Newton able to explain with his laws. Include a description of Newton's tool boxes – his major laws and contributions.

Discuss optical telescopes. What is the primary purpose of a telescope? What are the two main types? What laws govern their operation and design? What are their principle parts? What kinds

of problems and limitations do they have? Which type is best for what purpose? Include diagrams with labels.

Discuss reflecting telescopes. What laws govern their operation and design? What are their principle parts? What kinds of problems and limitations do they have? What are their advantages over refractors? Include a diagram with labels.

Discuss refracting telescopes. What laws govern their operation and design? What are their principle parts? What kinds of problems and limitations do they have? What are their disadvantages compared to reflectors? Include a diagram with labels.

Discuss the criteria for a successful scientific theory. What tests must a theory pass in order to be generally accepted? Describe the main features of the Ptolemaic model of the solar system and discuss how it did or did not meet these criteria during the period it was generally accepted. Is the model acceptable today? Explain your answers.

Discuss the criteria for a successful scientific theory. Describe the main features of the Copernican model of the solar system and discuss how it did or did not meet these criteria when it was proposed. Is the model acceptable today? Explain your answers.

State and explain Newton's Law of Gravity. What phenomenon was Newton able to explain using this law? What earlier theories was Newton able to derive or prove? What other tools did Newton develop in order to get his results.

State the criteria for a successful scientific theory. Describe the main features of the Ptolemaic (Greek) model of the solar system and discuss how it did or did not meet these criteria when it was proposed. Did it explain the observed motions of the sky and how? Is the model acceptable today? Explain your answers.

State the laws of reflection and refraction. Discuss how each phenomenon is used to construct a telescope. Describe the two major types of telescope. Include a rough diagram of each type. Discuss their relative advantages and disadvantages.

Discuss reflecting telescopes. What physical laws govern their operation and design? What are their principle parts? What kinds of problems and limitations do they have? Why might one prefer a reflector to a refractor? Include a diagram with labels.

Final Exam Essay Questions

Describe and discuss Black Holes. What are they? Describe their physical characteristics. How would they be observed? Where do they fit into the process of stellar evolution? How are they involved in understanding active galaxies? What are the most likely candidates for our having observed them?

Describe and discuss Black Holes. What are they? Describe their physical characteristics. How would they be observed? Where do they fit into stellar evolution and galactic classification? What are the most likely candidates for our having observed them? Relate them to radio galaxies.

Describe and discuss neutron stars and pulsars. What are they and how are they related to each other? Describe their physical characteristics. How are they observed? Where do they fit into the process of stellar evolution?

Describe and discuss neutron stars. What are they? Describe their physical characteristics. What was the phenomenon that led to their discovery? How are they observed? Where do they fit into the scheme of stellar evolution?

Describe and discuss white dwarf stars. What are they? Are they stable? Describe their physical characteristics. How would they be observed? Where do they fit into the process of stellar evolution? How are they involved in supernovas? What are the most likely candidates for our having observed them?

Describe the Big Bang Model of the Universe. When did it occur? Why do we believe that the Universe is expanding? What is the Cosmic Background Radiation and why is it important? What are the possible futures for the Universe?

Describe the life cycle and primary features of a star like our sun. How was it born? What are its important physical characteristics? What is its energy source? What keeps it from collapsing? How will it die? What will it leave behind?

Describe the life cycle and primary features of a star with a mass ten times that of our sun. How was it born? What are its important physical characteristics? What is its energy source? What keeps it from collapsing? How will it die? What will it leave behind? For each item you discuss, contrast the property with that of the sun.

Describe the Standard (Big-Bang) Model of the Universe. Include in your discussion the model's description of the birth and death of the Universe, the specific observational evidence that supports the model, and any major unresolved problems.

Describe the structure and life cycle of a star like our sun. What are its primary physical characteristics? What are the two sets of conditions that must be in balance for the star to be stable? What is its energy source? What keeps it from collapsing? How will it die?

Discuss the evolution of a star from its middle age on the main sequence to its final endpoint. What happens to low mass, medium mass and high mass stars? Identify the final stage of each type and describe its physical characteristics and how it would be observed.

Discuss the expanding universe and its cosmological implications. How was the expansion discovered and by whom? What is the primary evidence for the expansion. What is the best model for the birth of the Universe that explains its current expansion. What is the "cosmic background radiation" (also known as "primordial blackbody radiation") and what does its detection imply? What is the future of the universe?

Discuss the methods used in astronomy for determining distance. Include triangulation and parallax, the use of "standard candles", and the "red shift" method. Describe the major changes these methods have produced in our picture of the Universe from 1900 to 2000. Describe the universe as it was understood in 1900 and as it is understood in 2000.

Draw a rough HR diagram. Label the two axes with the quantity each represents and with approximate numbers. Place the main sequence on your diagram and discuss the types of stars at its (a) upper-left, (b) middle, and (c) lower-right ends. Show where (d) red giants and (e) white dwarfs are located. Discuss the physical properties of star types (a) through (e).

Draw a rough HR diagram. Label its axes with approximate numbers and indicate what each axis represents. Place the main sequence on your diagram and discuss the types of stars at its upper, middle, and lower ends. Discuss where red giants, blue giants, red dwarfs, and white dwarfs are located. Discuss where low mass and high mass stars are located. Discuss where dying stars are located.