

# ASTRONOMY FINAL EXAM REVIEW

## The Practice of Astronomy

- How do you know which evidence to collect during an investigation?
- Why is it important to identify controls and variables before conducting an experiment (or while evaluating another scientist's work)?
- Why is it important that scientists clearly record their procedures?
- Is another scientist's work still valid if their hypothesis is disproven? Why or why not?
- Is another scientist's work still valid if their results are not replicable? Why or why not?

## The Sky

- Compare and contrast the celestial coordinate system (equatorial system) to the use of latitude and longitude to specify locations on Earth.
- What are the purpose of constellations?
- How do scientists determine the location of constellations, celestial spheres, and sky maps?
- How do we use knowledge of light and other forms of energy to calculate distances between objects in space?
- What are different ways of measuring astronomical distances?
- Explain the difference between absolute magnitude and apparent magnitude and how they help scientists determine the distance of the star to Earth.  
How do astronomers use standard candles to estimate the size of the universe?

## The Sun, Earth Moon

- What are the patterns that influence the formation, hierarchy, and motions of the various kinds of objects in the solar system?
- What are the forces that affect the organization and distribution of matter in the Universe?
- Explain the dynamic nature of the Sun.
- How can light be used to investigate the properties of the Sun and other stars?
- How do the activities of the sun affect Earth and its life?
- Why is the Sun special?
- What is the fate of the Sun?
- How is global climate change related to conditions in the atmosphere and ocean?
- How do greenhouse gases affect the heat flow into and out of Earth's atmosphere?
- What is the relationship between greenhouse gases, global warming and global climate change?
- Give specific examples of how changes in each of Earth's systems (exosphere, hydrosphere, geosphere, biosphere and cryosphere) can influence the climate of Earth.
- Why is ozone important?
- Why are astronomical causes of Earth's climate change highly debated?
- Differentiate between modes of heat transfer in terms of Earth's processes.
- Describe what happens to solar radiation that strikes Earth and how the atmosphere is heated.

## Exploring the Universe

- To what extent is space exploration beneficial?
- Explain the justification for future space exploration and continuing technology development in terms of its history.
- What are some significant events in the history of Space Exploration and how do these events contribute to the future of Space Exploration?
- Compare and contrast a reflecting and refracting telescope.
- How has Florida's economy changed since the implementation of the space program?
- How has the role of space exploration shaped Florida's culture?
- Prove that the space program has a financial impact on Florida and choose a position to either justify the continuation or elimination of the program.

## The Planets

- What are the patterns that influence the formation, hierarchy, and motions of the various kinds of objects in the solar system?
- What are the forces that affect the organization and distribution of matter in the Universe?
- How do we use knowledge of light and other forms of energy to calculate distances between objects in space?
- What are different ways of measuring astronomical distances?
- Why are different units needed to measure distances between objects in the solar system and the sizes of objects within the solar system?
- What are the characteristics of our nearest neighbors?
- How does the theory of the Solar System's origin explain its observed properties?
- How do greenhouse gases affect the heat flow into and out of a planet's atmosphere?
- What is the relationship between greenhouse gases, global warming and global climate change?
- How does a planet's temperature depend on its atmosphere?
- How does a planet's atmosphere protect the planet?
- List three factors that affect a planet's temperature.
- Describe the organization of the solar system and the composition and state of matter of objects within it.

## Planetary Movement

- How are planetary systems generally formed?
- How common are planetary systems around other stars?
- How does evidence from the study of our Solar System and newly discovered extra solar planetary systems support the Nebular theory of the formation of planetary systems?
- Explain why an eclipse occurs using the motion of the Earth, Moon, and Sun.
- Explain how celestial objects' orbits are formed using Newton's and Kepler's Laws of motion.
- How does Earth's orbit compare to the other planets in the Solar System?
- As a planet orbits the Sun in an ellipse, at what point is the acceleration the greatest? Explain.
- In what ways does a circular orbit differ from an elliptical one?
- Describe the motion of objects in the solar system in terms of position, velocity, and acceleration as function of time.
- An object slows down in such a way that its acceleration is constant. What can we say about the force acting on the object?
- Suppose an object moves in a circular path at constant speed. What can be said about the force acting on it?
- In what direction should the force vector point in order to keep an object moving in a circular orbit?
- How do Newton's laws explain planetary motion?
- Why does the Earth orbit the Sun? Explain in terms of gravity.
- Compare the gravitational pull of the Earth to that of the moon, the other planets, and the Sun.
- Earth exerts a gravitational force on the Sun and the Sun exerts a gravitational force on Earth. Which exerts the larger force? Explain your choice.
- As a planet orbits the Sun in an ellipse, at what point on the ellipse is the Sun's gravitational force on it greatest? Explain your reasoning.
- What is the difference between weight and mass?
- How does mass and distance affect the gravitational force between two objects?
- How did gravity play a role in the formation of our Solar System?
- What would happen to our solar system if gravitational force did not decrease rapidly with distance?
- If the total kinetic energy remains the same, can the speed of the objects in a collision change?
- Explain why the transfer of angular momentum and energy works in the case of gravity assists, even though the spacecraft and the planet never come into direct physical contact with one another.
- Explain the momentums and velocities involved with an object traveling in a circular path.
- What happens to a planet's orbital speed as it approaches its *farthest* point from the Sun and as it approaches its closest point? How is it related to angular momentum?

## History of Sky Observation

- To what extent is space exploration beneficial?
- Explain the justification for future space exploration and continuing technology development in terms of its history.
- What are some significant events in the history of Space Exploration and how do these events contribute to the future of Space Exploration?
- Compare and contrast a reflecting and refracting telescope.
- What type of electromagnetic radiation cannot be detected by telescopes on Earth?
- If humans cannot see most of the types of light in the electromagnetic spectrum, how do we know about them?
- What can certain technologies (Chandra, Hubble, Magnetospheric Multiscale mission, etc.) tell us about celestial objects? Why are they important?
- What can we learn from space images that we cannot learn from looking at the planet from the ground or air?
- Compare the visible and non-visible components of the electromagnetic spectrum.
- We use the electromagnetic spectrum to study space by viewing planetary images and satellite photographs. If we were only able to use visible light wavelengths to study space how would that affect our current knowledge of space?
- Explain why visible light is arranged into colors in the following order: red, orange, yellow, green, blue, indigo and violet using the term wavelength, frequency, and energy?

## Telescopy

- How do telescopes collect different types of electromagnetic radiation and convert it into images?
- Which types of telescopes work on earth's surface? Which types of telescopes are used in space?
- How has telescope technology changed over time?
- How do telescopes that use only lenses differ from those that use mirrors and lenses?
- How have advances in telescope technology influenced our view and understanding of the universe?

## Spectroscopy

- How does a change in wavelength or frequency impact light?
- How can understanding wavelength and frequency help you understand how light travels?  
How are the color of light and wavelength related?  
How does the structure of atoms influence the observation of light and energy in the universe?
- What features can be observed in the blackbody curves of different color stars?
- How are wavelength, temperature, and color related?
- If an object in space that is emitting light moves away from you, what will you observe in the spectra of that object?
- If an object in space that is emitting light moves toward you, what will you observe in the spectra of that object?

## The Stars

- How many stars are in the universe?
- How can scientists observe stars within our own galaxy and outside our galaxy?
- What will happen to our sun in the future?
- How can scientists predict how stars will develop and change throughout their fusion process?
- What state of matter is found in stars?
- How are stars connected to elements in the universe?

- How is the process of fusion that occurs in stars different from the fission process that occurs on earth in power plants?
- How can the amount of energy emitted from fusion reactions in stars be measured?
- How can electromagnetic radiation be observed?
- Do all objects emit electromagnetic radiation?
- How does the amount of distance between two objects influence the magnitude of gravity between the two objects?
- How do object's masses influence the magnitude of gravity between the two objects?

## Celestial Objects

- If you were collecting spectra data on an eclipsing binary star system what properties of the stars can be measured based on their spectra?
- Is it possible for a star to exist that is 300 times the Sun's mass to exist? What would the luminosity of such a star be?
- Most stars close to the sun are red dwarfs. What can you infer from this data about the average star formation event in our galaxy?
- Why is it not possible to measure space in traditional units, such as kilometers?
- Describe a situation where it would be appropriate to measure using parallax distance.
- Describe a situation where it would be impractical or inaccurate to measure using parallax distance.
- How are convection, conduction and radiation used in space travel?
- What forces play the largest role in keeping satellites in orbit?
- How are the forces seen within a variable star different from those of a star whose characteristics are not in flux?
- There are fewer eclipsing binaries than spectroscopic binaries, why is this?
- How is the angular momentum of a star determined by its mass?
- Predict how the angular momentum of a star will change as it moves through the stages of stellar evolution.

## Cosmology

- Which formed first: hydrogen nuclei or hydrogen atoms? Explain the sequence of events that led to each.
- Describe at least two characteristics of the universe that are explained by the standard Big Bang model.
- Astronomers have found that there is more helium in the universe than stars could have made in the 13.8 billion years that the universe has been in existence. How does the Big Bang scenario solve this problem?
- What are the patterns that influence the formation, hierarchy, and motions of the various kinds of objects in the solar system?
- What are the forces that affect the organization and distribution of matter in the Universe?
- If an object in space that is emitting light moves away from you, what will you observe in the spectra of that object?
- If an object in space that is emitting light moves toward you, what will you observe in the spectra of that object?
- Describe the motion of objects in the solar system in terms of position, velocity, and acceleration as function of time.
- Why does the Earth orbit the Sun? Explain in terms of gravity.
- Compare the gravitational pull of the Earth to that of the moon, the other planets, and the Sun.
- Earth exerts a gravitational force on the Sun and the Sun exerts a gravitational force on Earth. Which exerts the larger force? Explain your choice.
- As a planet orbits the Sun in an ellipse, at what point on the ellipse is the Sun's gravitational force on it greatest? Explain your reasoning.
- What is the difference between weight and mass?
- How does mass and distance affect the gravitational force between two objects?
- How did gravity play a role in the formation of our Solar System?
- What would happen to our solar system if gravitational force did not decrease rapidly with distance?

- What properties of light waves allow it to travel more quickly through a vacuum than other types of waves?
- What properties of a vacuum allow light to travel more quickly through the vacuum than a medium?
- Thinking about the ideas of space and time in Einstein's general theory of relativity, how do we explain the fact that all galaxies outside our Local Group show a redshift?
- Why are measurements such as proper time and proper length needed?
- Describe a situation where time dilation will occur. What parts of the scenario would need to be manipulated to make the dilation increase?