

Astronomy 4/Section 1 Final Exam

- 1.) Explain what causes the seasons on Earth: name two things that make it hotter in the summer, versus cooler in winter. How do seasons in the northern hemisphere differ from those in the southern hemisphere, in terms of time of year? Does distance from the Sun play a role in our seasons? If Earth were tilted completely on its side, how would our seasons differ- would we have any?
- 2.) Compare and contrast the giant planets with the terrestrial planets. Which planets are in each group? Which major features differ between the two sets? Be sure to include the four aspects we discussed in class: atmosphere, surface, interior, and magnetic field. What additional features make the giant planets different from the terrestrial ones (list at least two)?
- 3.) What are Kepler's three laws of planetary motion? Discuss the basic idea behind each. Imagine a comet from the Kuiper Belt that is in orbit around the Sun: what does Kepler's second law tell us about the comet's speed as it approaches the Sun? Now imagine a whole family of comets at different average orbital distances from the Sun. What does Kepler's third law tell us about their orbital periods?
- 4.) The moon's appearance changes on our sky, causing us to see different phases over time. What is the cause of these phases and how long does it take the moon to complete a full cycle of them? In which phases can lunar eclipses occur? In which phases can solar eclipses occur? Explain why we do not see lunar eclipses frequently.
- 5.) Stars, planets, and the Sun all appear to move across our sky. What are the causes of this apparent motion, on daily and yearly timescales? Describe the nightly motion of a star at our latitude (37° N), specifying whether it is circumpolar (i.e., close to Polaris) or not. On longer timescales (i.e., months), how do our solar system planets move? Do they always move in the same direction? How about our Sun- what is its daily apparent motion, and how does that change throughout the year?
- 6.) Astronomers use telescopes to observe celestial objects like planets and galaxies. What are two types of telescopes, and what is the primary difference between them? What are the three main purposes of a telescope, and which of these purposes is most important to astronomers? If you double the diameter of a telescope, how does that impact its ability to observe an astronomical object?

7.) Spectra can provide us with many important pieces of information about stars, planets, and other astronomical objects. What is a spectrum, and what are the three main types? When observing a star's spectrum, we are able to infer 1.) its temperature, 2.) composition, and 3.) its radial velocity. Pick one of these three parameters and explain in detail how we determine it from the stellar spectrum.

8.) Atmospheres are an important part of planetary structure. What is an atmosphere? What are some of the most common elements/molecules found in atmospheres of our solar system? Which planet(s) in our solar system has/have little to no atmosphere at the current time? There is evidence that some planets' atmospheres have changed drastically over time. Describe a case where we believe this has happened, and explain how.

9.) We are very interested in finding out if there is or has been life beyond Earth in our solar system. What do we think is a likely location for life right now, and why? Where could life have thrived in the past, even if it is no longer present (name two locations)? What might have happened to life in these locations?

10.) Electromagnetic (EM) radiation comes from many different sources, whether on Earth or in space. Name three different types of EM radiation, along with one object that emits each. Which has the longest wavelength, and which has the shortest? What types of EM radiation does Earth's atmosphere allow through?

11.) Astronomers have discovered over 4,000 exoplanets in the past 25 years. What is an exoplanet? Name three methods that can be used to find an exoplanet. Choose one of these three methods and describe in detail how it works. What is being observed- is it a star, planet, or both?

12.) Material from our moon appears to have a very similar composition to silicates found on Earth. Why do we think this is, and how does it relate to moon's formation? Discuss the most popular idea for how the moon formed. Then contrast that with another hypothesis for moon formation, and discuss why the latter is most likely incorrect.