

MIDTERM TOPICS—AY3, PROF. FORTNEY, FALL 2013

1. The Sun-Earth-Moon System

- How far is the Earth from the sun? How long does it take the Earth to travel around the Sun?
- Why do we experience seasons on Earth?
- Why do solar and lunar eclipses occur? At what phases do eclipses occur? What is the ecliptic plane?
- What are the phases of the moon, and when does the moon rise and set at each phase?
- What are the Moon's orbital and rotational periods?
- Who was the famous ancient Greek astronomer, and how did he explain the motion of the stars, planets and the Sun?

2. Laws of Motion: Kepler and Newton

- What are Kepler's 3 laws?
- What are Newton's 3 laws?
- What is Newton's Universal Law of Gravitation? How does the force of gravity change when you vary mass? Distance?
- What is the difference between mass and weight?
- What is Newton's version of Kepler's 3rd law?
- What are the 3 conserved quantities? Under what conditions are these quantities conserved?
- What causes tides?

3. Light and Matter

- What are the different wave and particle properties of light?
- What are wavelength and frequency? How do they relate to the speed of a wave?
- How does the energy of a photon relate to its frequency? It's wavelength?
- What happens when an atom absorbs a photon? When an atom emits a photon?
- How does matter interact with light? Why do different objects appear different colors?
- What are the 3 main types of spectra? When do we observe these spectra? What can we learn about objects in space from their spectra?
- What are the two laws of thermal radiation? How can we use them to determine an object's temperature?
- What are the phases of matter? How does matter change as its temperature increases?

- What is the Doppler Effect? How does this affect spectra of objects in the universe?

4. Properties of Objects in the Solar System

- What are the properties of the objects in the solar system? How do their properties (mass, size, and temperature) compare? What are the different planets made of? Where do they lie in the solar system?

5. Formation of the Solar System

- What are the various steps in the formation of the solar system according to the solar nebula theory?
- What is the solar nebula made of?
- How does solar nebula theory explain the observed properties of Jovian and Terrestrial planets?
- What is the frost line and how does it affect planet formation?
- What does the term “half-life” mean for a radioactive substance? How do we use this information to determine ages of the solar system?

6. The Sun

- What is the Sun's main energy source? Under what conditions can this process happen, and where in the Sun does it occur? What is the specific process (at the scale of nuclei) by which this happens in the Sun?
- How hot is the Sun? What color is it? What is it made of? What kind of stuff happens on the surface, and how does it affect life on Earth?
- What prevents the Sun from collapsing under its own gravity? How does this relate to the Sun's stability (in terms of temperature and brightness)?

Planetary Geology

- What are the different layers inside of terrestrial planets? What is the process that creates these layers? How does it work?
- What is geological activity? What causes geological activity?
- What are the different sources of heat inside terrestrial planets? Where is the energy coming from in each of these processes?
- How do planets cool? What properties of a planet affect its ability to cool?
- What processes shape planetary surfaces? How can we tell which surfaces are young and old?