

Astronomy 102 Mid-Term #2 Study Guide

Fall Semester 2009

The time of your Astronomy 102 Midterm Exam is based on which lecture you are in:

- **Cabanela Lecture:** Wednesday, November 11
- **Craig Lecture:** Thursday, November 12

Flu victims take note! If you are ill during the exam, DO NOT come to class to take the exam. Take care of yourself. That said, we strongly request you provide documentation of your illness in order to retake the exam at a later time. You will be expected to inform your lecturer before the exam if at all possible

The midterm covers Chapters 5, 7-9, and 13 but not all topics from each chapter are on the test.

Objective (what you should be able to do on the test)	Reading from the textbook
Describe the electromagnetic spectrum	5.1, 5.2
Describe the difference between different kinds of light in terms of energy, frequency, or wavelength.	5.1, 5.2
List and define the three types (continuous, emission, absorption) of spectra.	5.4 and Activities “Spectra and Spectroscopy” and “Simple Spectral Analysis”
Describe how a light source and gas interact to form an absorption spectrum.	Same as above
Describe the conditions under which a cloud of gas produces an emission spectrum	Same as above
Discuss what can be learned by studying the spectrum of an object.	5.4
Explain what happens at the atomic level in emission and absorption.	5.3, 5.4
Recognize that objects in the solar system tend to spin in the same direction.	7.2
Recognize that the planets fall into two categories based on density, composition, distance from the sun and size	7.2
Describe the nebular hypothesis.	8.1, 8.2, 8.3

Explain how the nebular hypothesis accounts for the trends in the first two objectives.	8.1, 8.2, 8.3
Explain why the composition of the inner and outer planets differs.	8.1, 8.2, 8.3
Explain why the <u>sizes</u> of the inner and outer planets differs.	8.1, 8.2, 8.3
Describe how extrasolar planets (exoplanets) are detected even when they cannot be seen.	13.1 and the “Exoplanets” lab activity.
Describe what Doppler Shift is and how the “sense” of the Doppler Shift (e.g. - A “Redshift” versus a “Blueshift”) is related to the motion of the light source toward or away from us.	13.1 and the “Exoplanets” lab activity.
Describe the properties of the other solar systems discovered so far.	13.2
Describe planetary migration	13.3
Explain how planetary migration allows the nebular hypothesis to describe both the formation of our solar system and the other solar systems discovered so far.	13.3
Describe the processes that shape planetary surfaces.	9.1, 9.2
Explain the causes of heating of a planetary interior.	9.2
Compare geologic activity on Earth to activity on other terrestrial planets and the moon.	9.3-9.6
Explain how we know the structure of the interior of the Earth.	9.1, 9.2
Define differentiation and explain why it occurred.	9.2, 9.6

Astronomy 102 PRACTICE Midterm #2

Fall Semester 2009

A Note about the length of this practice midterm: We expect the practice exam will take about 75 minutes. The actual midterm will be a bit shorter, since you will only be allowed about 50 minutes for it.

Multiple Choice Questions (30 points total): The “real” exam will have between 20 and 30 multiple choice problems.

- The planets never travel in a straight line as they orbit the Sun. According to Newton's second law of motion, this must mean that:
 - a force is acting on the planets.
 - the planets will eventually fall into the Sun.
 - the planets are always accelerating.
 - the planets have angular momentum.
 - the planets have gravity.
- The Hubble Space Telescope while in orbit around the Earth has mass but no weight. Why is this?
 - There is no gravity in space.
 - An object in orbit is moving so fast that gravity has little effect on it.
 - An object in orbit is in a constant state of free fall.
 - Weight depends on Earth's gravity; so being in space means the object is not affected by Earth's gravity.
 - None of the above.
- According to Newton's Universal Law of Gravitation which of the following statements are true?
 - The gravitational force between two objects depends on the masses of both objects and how far apart they are.
 - There is no gravity in space.
 - You are gravitationally attracted to your classmates.
 - Both (a) and (b)
 - Both (a) and (c)**
- The mass of Saturn can be calculated by
 - measuring the orbital speed of one of Saturn's moons.
 - measuring the orbital period and distance (from Saturn) of one of Saturn's moons.
 - knowing the Sun's mass and measuring how Saturn's speed changes during its elliptical orbit around the Sun.
 - knowing the Sun's mass and measuring the average distance of Saturn from the Sun.
- The kind of spectra you looked at in the lab activity when electricity was passed through a glass tube containing a gas in order to excite the electrons in the gas atoms, which then spontaneously de-excited, emitting light, was
 - an emission spectra.
 - an absorption spectra.
 - a continuous spectra.
 - a platinum spectra.
 - a molecular spectra.
- Which of the following statements about X rays and Infrared is **NOT** true?
 - X rays have shorter wavelengths than infrared light.
 - X rays have higher frequency than infrared light.
 - X rays travel through space faster than radio waves.
 - X rays and infrared light are both forms of light, or electromagnetic radiation.
 - X rays have higher energy than radio waves.

7. Which of the following is *not* an observed pattern of motion in our solar system?
 - a. Most planetary orbits lie nearly in the same plane.
 - b. All planets orbit the Sun in the same direction.
 - c. Most planets orbit at the same speed.
 - d. Almost all moons orbit their planet in the same direction as the planet's rotation.
 - e. Most planets rotate about their axes in the same direction in which they orbit.

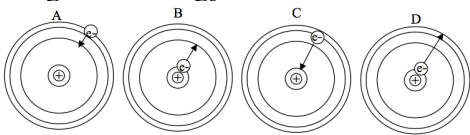
8. The 8 planets in the solar system all lie in nearly the same plane and orbit in the same direction. This is believed to be the case
 - a. because the original solar nebula collapsed into a spinning disk, due to conservation of angular momentum.
 - b. because Jupiter's gravity pulled all the other planets to the plane of its orbit.
 - c. because the planets formed in a spherical distribution and then their mutual gravitational attraction pulled them in to a flat distribution.
 - d. because the sun's magnetic field pulled the solar nebula into a disk.
 - e. because of chance, planets around other stars actually show non-disk-like distributions.

9. Why are the inner planets made of denser materials than the outer planets?
 - a. The Sun's gravity pulled denser materials toward the inner part of the solar nebula, while lighter gases escaped more easily.
 - b. In the inner part of the nebula only metals and rocks were able to condense because of the high temperatures, whereas hydrogen compounds, although more abundant, were only able to condense in the cooler outer regions.
 - c. Denser materials were heavier and sank to the center of the nebula.
 - d. In the beginning, when the protoplanetary disk was spinning faster, centrifugal forces flung the lighter materials toward the outer parts of the solar nebula.
 - e. When the solar nebula formed a disk, materials naturally segregated into bands, and in our particular solar system the denser materials settled nearer the Sun while lighter materials are found in the outer part.

10. According to the nebular theory, what are asteroids and comets?
 - a. They are the shattered remains of collisions between planets.
 - b. They are chunks of rock or ice that condensed long after the planets and moons had formed.
 - c. They are the shattered remains of collisions between moons.
 - d. They are chunks of rock or ice that were expelled from planets by volcanoes.
 - e. They are leftover planetesimals that never accreted into planets.

11. Mercury and Mars are geologically dead worlds whereas Venus and Earth are not. This likely because Earth and Venus
- are chemically very different from the other terrestrial planets.
 - possess magnetic fields whereas Mars and Mercury do not.
 - are too large for their interiors to have completely cooled off yet, whereas the interiors of Mars and Mercury have cooled off more.
 - All of the above.
 - Both (b) and (c).
12. Which of the following does **not** have a major effect in shaping planetary surfaces?
- magnetism
 - volcanism
 - impact cratering
 - tectonics
 - erosion
13. Which of a planet's fundamental properties has the greatest effect on its level of volcanic and tectonic activity?
- size
 - distance from the Sun
 - rotation rate
 - all of the above
 - none of the above
14. Of the planets Mercury, Venus, and Earth, which has the most extensive impact craters?
- Mercury
 - Venus
 - Earth
15. The difference between infrared light and visible light is that
- Visible light moves faster.
 - Visible light has shorter wavelength.
 - Visible light has longer wavelength.
 - Visible light moves faster.
16. The terrestrial planets, which are composed primarily of rock, are located
- Some in the inner solar system, some in the outer.
 - In the inner solar system (close to the sun).
 - In the outer solar system (far from the sun).
17. The structure of the Earth's interior is studied by
- Drilling holes into the core of the earth.
 - Measuring properties of lava coming from volcanoes
 - Observing the timing and pattern of waves from an earthquake
18. The earth's interior is differentiated, which means that
- The earth is not the same as the other terrestrial planets.
 - The earth's interior is a uniform mixture of materials
 - Dense materials are at the center of the earth, with lighter materials on the surface
 - Dense materials are on the surface of the earth, with lighter materials in the core
19. The theory that individual pieces of the Earth's crust move is called the theory of
- Earthquake activity
 - Relative motion
 - Plate tectonics
 - Plate stagnation

20. The planets in the inner solar contain little ice because
- there was never any ice present in that part of the solar system
 - whatever ices were present were rapidly evaporated by the sun
21. How common do disks of dust and gas seem to be around young stars?
- They are very common.
 - They are very uncommon.
 - They never occur
22. The large objects in the solar system (the sun, planets, and large moons) tend to rotate in _____ direction.
- all in a different
 - the same
 - alternating
23. One difference between the terrestrial planets and the jovian planets is size; another is
- age
 - density
 - direction of rotation
24. An emission spectrum looks like a
- smooth rainbow of colors.
 - smooth rainbow of colors with a few thin dark gaps in it.
 - few narrow bright lines at specific colors.
25. The choices below list four different types of electromagnetic radiation. In which list are the types in order of *decreasing* wavelength (in other words from longest to shortest wavelength)?
- Radio waves, Infrared light, Visible light, X-rays
 - Radio waves, Visible light, Infrared light, X-rays
 - Visible light, X-rays, Infrared light, Radio Waves
 - X-rays, Visible light, Infrared light, Radio Waves
26. Which has longer wavelength, red light, or blue light?
- Red light has longer wavelength.
 - Blue light has longer wavelength.
27. As the temperature of a light source increases, the light becomes
- redder and dimmer
 - redder and brighter
 - bluer and dimmer
 - bluer and brighter
28. Which of the choices below is *not* one of the things that can be learned by studying the spectrum of an object like a planet?
- The temperature of the planet.
 - The mass of the planet.
 - What elements the planet is composed of.
 - The speed of the planet.
29. An atom contains an electron in an excited state (say the 2nd state). When the electron moves to the lowest state (the 1st state), it
- Never emits light.
 - Always emits light, but different colors at different times.
 - Always emits the same color of light.
 - Sometimes emits light, and sometimes does not.
30. An absorption spectrum is
- A smooth rainbow of colors without breaks.
 - Mostly dark with colors at a few specific wavelengths.
 - A smooth rainbow of colors with breaks at a few specific wavelengths.
 - Also called a blackbody spectrum.

31. The spectrum of hydrogen includes lines that are red and teal (blue-green). The teal lines come about when
- An electron changes energy by an amount greater than the energy change for the red line.
 - The hydrogen is at very low temperatures.
 - An electron changes energy by an amount less than the energy change for red light.
 - The hydrogen is at very high temperatures.
32. Suppose you discover a new moon of Jupiter. The radius of the orbit is much larger than the radius of the orbit of Io. From this you can conclude that the period of the orbit of your satellite is
- the same as Io's period.
 - much larger than Io's period.
 - much smaller than Io's period.
33. You are looking at a distant hot and dense object; between you and the object is a cloud of gas cooler than the object. The type of spectrum you will probably observe is
- emission
 - continuous
 - absorption
34. The most important difference between the sun and the other objects in our solar system is that
- The sun is made mostly of hydrogen and helium
 - Fusion occurs in the sun.
 - The sun is in equilibrium
35. Electron transitions in for atoms are shown below. In which case is the atom absorbing light with the greatest energy?
- 
- A
 - B
 - C
 - D
36. Objects appear to float in the Space Shuttle because
- There is no gravity in space.
 - All objects fall at the same rate.
 - Gravity is weaker in space.
 - There is no air resistance in space.
37. Which of the statements below best describes the other solar systems discovered so far by scientists?
- Other solar systems are like ours, with small planets close to the star and large planets far away.
 - Other solar systems have large planets close to the central star.
 - No pattern has been observed in other solar systems.
38. In the original version of the nebular hypothesis we studied, giant planets form far from the sun. If a giant planet was observed close to the central star in another solar system, it would mean that
- The nebular hypothesis is wrong; giant planets must form near the central star also.
 - The nebular hypothesis is incomplete; there must be some way for a planet to move within a solar system after it has formed.
 - There can be no single theory that describes the formation of every solar system.
39. A star moving towards us has a spectrum that is _____ an identical star that is not moving.
- The same as
 - Shifted toward blue
 - Shifted toward red
40. Suppose the sun had been hotter when the planets were forming, so that the temperature of each planet was twice as large. Jupiter would have turned out to be _____ it is now
- About the same mass
 - Much less massive than
 - Much more massive than

Short Answer Questions for PRACTICE

MidTerm #2:

(Turn this section in with “computer graded” sheet)

The “real” midterm will have three short answer questions and you must answer two questions for full credit. If you answer all three, your best two answers will be used in determining your score.

1. Explain how a continuous spectrum changes as the temperature of the object emitting the light changes.
2. Describe each of the three types of spectra and how they are produced.
3. Describe how heat is generated inside a planet, and the mechanism by which that heat is transferred from the interior to the surface.
4. Describe the processes that shape planetary surfaces. In addition to saying the names of the processes explain what they are.
5. Compare and contrast our solar system with other solar systems discovered so far.
6. Explain why the planets in the inner and outer solar system are so different in size and composition.