

Astronomy 161 Exam 3

November 15, 2002

WHITE VERSION

Select the single best answer for each question, unless otherwise instructed. No notes or calculators are permitted. Each question is 1 point unless otherwise noted.

1. The two planets whose rotational axis is most highly inclined with respect to their orbits are

(a) Neptune and Pluto.

(b) Uranus and Pluto.

(c) Uranus and Neptune.

(d) Saturn and Uranus.

Both Uranus and Pluto are rotating almost on their sides.

2. The rings of Neptune appear to be younger than the rings of the other Jovian planets because

(a) there are far more of them – over one thousand ringlets.

(b) Neptune has an unusually large number of shepherd moons.

(c) the ring particles are very dark in color.

(d) the particles are not uniformly distributed around the rings.

3. Match the Jovian planet to its properties. Select from Jupiter, Saturn, Uranus, and Neptune. You can use each more than once, or not at all. (9 points)

___Neptune___ once had a Great Dark Spot, an Earth-sized anti-cyclone which is no longer present.

___Saturn___ has rings made largely of ice chunks.

___Saturn___ has the lowest density of any planet – less than water’s density.

___Neptune___ was predicted on the basis of gravitational calculations.

___Uranus___ is the only Jovian planet without a planet-sized moon.

___Jupiter___ has the fastest rotational period of any planet.

___Uranus___ rotates on its side with respect to the ecliptic.

___Uranus___ has the coldest surface temperatures.

___Jupiter___ is surrounded by a plasma torus ejected from its volcanic moon.

4. The distance 2.4 radii from Saturn inside of which a moon cannot hold together gravitationally is known as the

- (a) F Ring (b) Kuiper Belt (c) Cassini Division (d) Roche Limit

5. The magnetic fields of Uranus and Neptune are thought to be due to a layer of

- (a) liquid metallic hydrogen. (b) water and ammonia slush.
(c) dense iron and nickel (d) compressed hydrogen gas ions.

6. The presence of an atmosphere around Pluto is indicated by

- (a) speckle interferometry. (b) albedo measurements. (c) clouds.
(d) Kepler’s Laws. (e) occultation measurements.

This means Pluto passed in front of a dim star, allowing its atmosphere to be seen as it dimmed the light from the star.

7. Which class of Kuiper Belt Objects (KBOs) does Pluto fit into best?

- (a) Scattered KBOs (b) Resonant KBOs (c) Classical KBOs

The resonant KBOs include the “Plutinos”.

8. Which of the following has Pluto **not** been considered to be now or any time since its discovery?

- (a) a brown dwarf (b) the ninth major planet (c) a Kuiper Belt Object
(d) an escaped satellite of Neptune (e) an Earth-sized planet

A brown dwarf is a type of star, not a planetary object.

9. The largest layer of Saturn’s interior is made of

- (a) liquid molecular hydrogen. (b) liquid metallic hydrogen.
(c) molten rock and metal. (d) pressurized water

10. Compared to Jupiter and Saturn, the rock cores of Neptune and Uranus are, as a fraction of the planet,

- (a) about the same size. (b) somewhat larger. (c) somewhat smaller. (d) absent.

Neptune and Uranus are smaller, so they hold less light gasses relative to heavy elements.

11. Dark streaks on the surface of Triton apparently indicate the presence of

- (a) craters. (b) lava flows. (c) running water.
(d) organic compounds. (e) ice volcanoes.

12. Which of the following is **not** a similarity between Pluto and the Kuiper Belt Objects?

- (a) Its highly inclined orbit with respect to the ecliptic plane.
- (b) Its highly elliptical orbit which takes it inside and outside Neptune's orbit.
- (c) Its high albedo.
- (d) Its icy/rocky composition.

Most Kuiper Belt Objects have relatively low albedo, while Pluto's is very high.

13. Which is **not** a true similarity of Uranus and Neptune?

- (a) Their characteristic color is caused by methane.
- (b) They both have rings.
- (c) They have an internal heat source producing more heat than they radiate.
- (d) They are both about 4 times as large as the Earth.
- (e) They both have substantial magnetic fields.

Uranus is the only Jovian planet without an internal heat source.

14. In 1989, the furthest planet from the Sun was

- (a) Pluto. (b) Charon. (c) Quaoar. (d) Uranus. (e) Neptune.

Pluto was inside Neptune's orbit at that time.

15. Quaoar is

- (a) a binary Kuiper Belt Object.
- (b) a Charon-sized Kuiper Belt Object.
- (c) a possible major planet beyond the orbit of Pluto.
- (d) a shepherd moon.

16. What is the atmospheric pressure on Titan in terms of the Earth's atmospheric pressure?

- (a) zero (b) 1/100 atmospheres (c) 1.6 atmospheres (d) 1/100,000 atmospheres

Titan is the only planetary satellite with such a dense atmosphere.

17. Match the outer planet's moons to their properties. Select answers from Io, Europa, Ganymede, Callisto, Titan, Triton, and Charon. You can use each answer more than once, or not at all. (10 points)

__Io__ is the most volcanically active body in the solar system.

__Triton__ has a retrograde revolution around its planet.

__Titan__ has a surface hidden by an opaque atmosphere.

__Charon__ is so large relative to the planet it orbits that it almost forms a double-planet system with its planet.

__Europa__ is believed to have vast water oceans under its smooth icy exterior, which could possibly harbor life.

__Triton__ has an atmosphere comparable to Pluto's in composition and density.

__Titan__ has evidence of liquid hydrocarbons on the surface suggesting the remote possibility of life.

__Ganymede__ is the only body other than Earth in the solar system which shows clear evidence of plate tectonics.

__Ganymede__ is larger than the planet Mercury.

__Titan__ has an atmosphere similar to the primordial Earth atmosphere, and denser than Earth's current atmosphere.

18. The most important similarity between Pluto and the Kuiper Belt Objects known as "Plutinos" is

- (a) their unusually high albedo. (b) their relatively large size
(c) their highly inclined orbits. (d) a 3:2 orbital resonance with Neptune's orbit.
(e) that they share approximately the same orbit.