

Exam 2 Summer 2001

Please do not use more than the space provided on this exam (there will be no room to "ramble on"). Multiple choice questions are all worth 1 point—circle your choice; other point distributions are indicated.

IN GENERAL

1. (2) The temperature of a planet is determined mainly by what?

2. (2) The composition of a planet's atmosphere (its ability to hold on to a given atmosphere for the age of the solar system) depends on what? (List 2 of the 3 things.)

3. (2) List two results of giant impacts occurring during the early stages of the formation of the solar system.

4. Impacts during recent times (geologically speaking, the past 100 million years or so) are responsible for

- a) the Pacific Ocean
- b) the demise of the dinosaurs on Earth
- c) the mare on the Moon
- d) the loss of Mar's atmosphere
- e) All of the above answers are correct.

5. All of the following are needed in order to have tidal heating of a moon except one. Which one is not needed?

- a) a massive central planet
- b) three or more outer moons in circular orbits
- c) a moon orbiting close to the massive planet.
- d) an outer moon having an orbital resonance with an inner moon.
- e) an eccentric orbit.

6. What is differentiation in planetary geology?

- a) any process by which a planet's surface evolves differently from another planet's surface
- b) the process by which gravity separates materials according to density
- c) the process by which different types of minerals form a conglomerate rock
- d) any process by which a planet evolves differently from its moons
- e) any process by which one part of a planet's surface evolves differently from another part of the same planet's surface

7. Which of the following describes tectonics?

- a) the eruption of molten rock from a planet's interior to its surface
- b) the wearing down or building up of geological features by wind, water, ice, and other phenomena of planetary weather
- c) the excavation of bowl-shaped depressions by asteroids or comets striking a planet's surface
- d) the disruption of a planet's surface by internal stresses
- e) None of the above actually describes tectonics.

8. Which of the following describes erosion?

- a) the excavation of bowl-shaped depressions by asteroids or comets striking a planet's surface
- b) the wearing down or building up of geological features by wind, water, ice, and other phenomena of planetary weather
- c) the disruption of a planet's surface by internal stresses
- d) the eruption of molten rock from a planet's interior to its surface
- e) None of the above.

9. Which of the following describes volcanism?

- a) the eruption of molten rock from a planet's interior to its surface
- b) the excavation of bowl-shaped depressions by asteroids or comets striking a planet's surface
- c) the wearing down or building up of geological features by wind, water, ice, and other phenomena of planetary weather
- d) the disruption of a planet's surface by internal stresses
- e) None of the above describes volcanism.

10. Which of the following describes impact cratering?

- a) the eruption of molten rock from a planet's interior to its surface
- b) the excavation of bowl-shaped depressions by asteroids or comets striking a planet's surface
- c) the disruption of a planet's surface by internal stresses
- d) the wearing down or building up of geological features by wind, water, ice, and other phenomena of planetary weather
- e) None of the above.

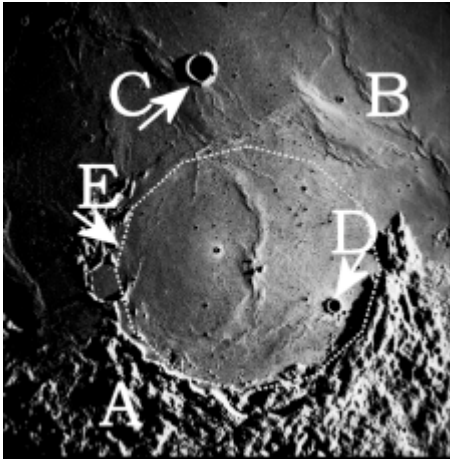
MOON, MERCURY, CRATERING

11. (3) Why is the "law of superposition" important to our study of planetary surfaces?

12. (3) Briefly, how do planetary scientists use crater counts to estimate the relative geological ages of planetary surfaces from the number of impact craters?

13. (3) Explain one of the limitations to using crater densities as a way to determine the relative ages of the surfaces of planets or moons.

The next 4 questions refer to the figure below. (See also the overhead projected for a more detailed image.)



A represents all of the rough area at the bottom of the image; B, all of the relatively smooth region; C, the nearly perfectly round feature; D, another nearly perfectly round feature; E outlines what remains of a large, complex crater.

14. Based upon your knowledge of the “Law of Superposition,” which of the following gives the best guess for the order of events for this region of the Moon (from first formed to last formed):

- a) B, E, D, C, A
- b) A, E, B, C, D
- c) E, D, C, B, A
- d) A, C, D, B, E
- e) Not enough information is given.

15. Which of the following statements is not necessarily true?

- a) B must be older than D.
- b) D must be younger than C.
- c) E must be older than A.
- d) A must be older than B.
- e) C must be younger than A.

16. The feature labeled “B” has some funny-looking “crinkles” on it. These are known as

- a) wrinkle ridges
- b) highland terrain
- c) straight rilles
- d) sinuous rilles
- e) crater rays

17. The area labeled “B” is

- a) part of the lunar highlands.
- b) part of the lunar mare.
- c) probably composed of basalts.
- d) Both a) and c) are correct.
- e) Both b) and c) are correct.

18. Our very nearby neighbor, the Moon, has a heavily cratered surface, yet the Earth does not.

This is because:

The Earth has a relatively thick atmosphere.

Surface activity of the Earth destroys craters rather rapidly.

The Earth is covered mostly by oceans.

Thick vegetation covers the evidence of craters on the Earth’s surface.

All of the above are reasons.

19. (3) If the Earth shows so few craters on its surface, why are we so concerned about cratering and giant impacts?

VENUS AND MARS

20. (5) Pick one of the major geological processes (itemized in the “general” section of this test) and compare that process on Earth to the same process on Mars. Include at least one example of how it is similar and how it is different.

21. (5) Pick one of the major geological processes (itemized in the “general” section of this test) and compare that process on Earth to the same process on Venus. Include at least one example of how it is similar and how it is different.

GIANT PLANETS

22. The heat in Jupiter's interior is mostly:

- a) The result of solar heating (heat from the Sun).
- b) Left over from when Jupiter formed; gravitational contraction.
- c) Due to the decay of radioactive isotopes, mostly plutonium.
- d) Due to gravitational energy currently being released from helium rain.
- e) Friction due to its rapid rotation.

23. The heat in Saturn’s interior is mostly:

- a) The result of solar heating (heat from the Sun).
- b) Left over from when Saturn formed; gravitational contraction.
- c) Due to the decay of radioactive isotopes, mostly plutonium.
- d) Due to gravitational energy currently being released from helium rain.
- e) Friction due to its rapid rotation.

24. (2) The atmosphere of Uranus shows much less weather structure (bands, storms, and other signs of activity) than the atmosphere of Neptune. This is probably because:

25. (5) Why might we expect to see the weather patterns on Uranus change? (For example, recent images from the Hubble Space Telescope show increased activity along Uranus’s equator.)

26. (2) Why does Jupiter look so much more colorful than Saturn?

PLUTO, GIANT MOONS, RINGS

27. The fact that most moons always show the same face to their planet is

- a) explained by the law of conservation of angular momentum.
- b) very surprising and a great mystery.
- c) a natural consequence of tidal forces acting on the moons.
- d) a natural consequence of the fact that the entire solar nebula rotated in the same direction.
- e) a result of the fact that the moons once had atmospheres.

28. You are standing on Pluto, look up, and see its moon Charon in the sky. When would you see the moon Charon set?

- a) Never.
- b) Every 6.39 days (the rotation period of Pluto).
- c) Every 248.5 years (the orbital period of Pluto).
- d) Every 3.2 days (half the rotation period of Pluto).
- e) When Charon is on the other side of Pluto)

29. Why are planetary scientists so interested in Saturn's moon Titan (the one with the thick atmosphere)?

- a) Its surface may represent initial conditions on the Earth.
- b) Its atmosphere duplicates the air over Los Angeles, and thus gives us an independent model to study.
- c) It appears to have an abundance of organic compounds.
- d) Alone, of all the satellites in the solar system, it has a significant atmosphere.
- e) All of the above, except **b**, are reason enough to be intrigued.

30. What is a Roche zone?

- a) the region within a planet's magnetic field where charged particles accumulate
- b) a bright layer of gas on Jupiter
- c) the region near a planet where tidal forces would tear apart an object held together only by gravity
- d) a region where gravitational resonances clear a gap in a planet's rings
- e) the region surrounding a planet where it may have large moons

31. (3) Describe one of the leading scenarios for the origin of the planetary rings

32. The "Epsilon" ring of Uranus remains very thin, similar in width to the "F" ring of Saturn. Thus, what did astronomers expect to find among the Voyager images of this ring of Uranus?

- a) Small dark particles that are invisible with telescopes.
- b) Large reflective particles that point the Sun's light away from Earth.
- c) Shepherd satellites that keep the particles "corralled."
- d) Spokes, or clumps of orbiting particles (not a smooth distribution).
- e) Aliens with large rakes.

