

Name \_\_\_\_\_

Do not forget to write your name and fill in the bubbles with your student number, and fill in test form A on the answer sheet. Write your name above as well. You have 50 minutes. For each question, mark the best answer. There are no formulas for this test. **The final five questions are based on images projected at the front of the room.**

- Which of the following is not a method that was discussed for discovering exoplanets
  - Bouncing radio waves directly off the planet to detect its presence
  - Measuring the Doppler shift from the star
  - Watching the star to see if it dims as the planet passes in front of it
  - Measuring the precise time from a “pulsar,” a star that blinks very regularly
  - Direct imaging; searching for the image of the planet next to the star
- Why is it that some of the large moons of Jupiter have very little ice on them?
  - The Sun warmed them so much the ice couldn't form
  - They are captured asteroids, which do not contain ices
  - Early Jupiter was so hot it probably evaporated the water away
  - The high levels of radiation from Jupiter destroyed the ice
  - Tidal heating melted and evaporated the ice
- The giant magnetic fields of Jupiter are believed to be generated
  - In the gaseous hydrogen/helium mixture at the surface
  - In liquid hydrogen layers in the interior
  - In the vast layer of liquid ices
  - In the rocky mantle near the core
  - In the metallic core
- I am standing on a moon. Nearby is a lazy river containing liquid methane and ethane. As I look up into the sky, I see a planet. Which one?
  - Saturn
  - Jupiter
  - Mars
  - Uranus
  - Neptune
- Which of the following is the reason that the protoplanetary disk forms a disk, rather than a sphere?
  - The disk is rotating
  - There are magnetic fields that force it that way
  - The disk forms from planets, which started in a disk shape
  - The early Sun had strong winds, which swept away everything except the disk
  - Gravity is strongest in the disk direction, all the rest is lost
- Which object is believed to have an ocean of liquid water trapped beneath a surface layer of ice?
  - Io
  - Iapetus
  - Mars
  - Moon
  - Europa
- Which of the following planets does not have storms on it?

A) Mercury B) Mars C) Saturn D) Neptune E) Jupiter

8. Saturn's rings are made primarily of  
A) Rock B) Ice C) Metal D) Hydrogen E) Helium
9. Which of the following is an indication that the surface of a planet or moon is old, and hasn't been resurfaced in a long time?  
A) High levels of oxidation  
B) Erosion by wind and rain  
C) A high density of craters  
D) A dark color to the surface  
E) High levels of radiation
10. The way we have learned the most about the interior of the Earth is by studying  
A) Earth's magnetic field  
B) Core samples drilled from the Earth  
C) Magma/Lava from volcanoes  
D) Earthquakes  
E) Measuring the gravitational pull of the Earth
11. Which of the following moons has the thickest atmosphere?  
A) Triton B) Io C) Europa D) Ganymede E) Enceladus
12. The gas primarily believed to be responsible for the recent rise in temperature on Earth is  
A) Methane  
B) Ethane  
C) Sulfuric acid  
D) Carbon monoxide  
E) Carbon dioxide
13. Why is it that Saturn is the only planet with rings?  
A) Saturn is the only planet formed in a region with lots of ice, from which the rings formed  
B) Saturn recently had a moon break up near it; the other planets did not  
C) One of its moons is spewing out ice near Saturn, not any other planet  
D) Saturn has a low density, which allows the rings to form  
E) Actually, it isn't. All the gas giants have rings
14. I am standing on a moon. I can see a giant planet with rings around it. Nearby, fissures in the moon are spewing ice out into space. Where am I?  
A) Titan B) Io C) Europa D) Enceladus E) Ganymede

15. Which two indicators are likely to make a moon or planet likely to retain its atmosphere?
- A) High temperature and high gravity
  - B) Low temperature and high gravity
  - C) High temperature and low gravity
  - D) Low temperature and low gravity
  - E) Gravity and temperature have little to do with if something retains its atmosphere
16. Which planet has the largest known mountain (extinct volcano) in the solar system?
- A) Earth
  - B) Mercury
  - C) Mars
  - D) Jupiter
  - E) Venus
17. Which of the following was the most common component of the disk from which the planets formed?
- A) Rock
  - B) Metal
  - C) Ices
  - D) Hydrogen
  - E) None of the above
18. Which is the largest planet in the Solar System?
- A) Earth
  - B) Neptune
  - C) Saturn
  - D) Uranus
  - E) Jupiter
19. Why does the presence of a planet often cause the star it is orbiting to alternately have its spectrum red-shifted and blue-shifted?
- A) The planet's color is sometimes added and sometimes subtracted from the star's spectrum
  - B) The planet's atmosphere can cause slight shifts in the star's spectrum
  - C) Occasional collisions of the planet with the star cause the surface to move towards or away from us
  - D) As the planet orbits the star, the star is also moving in a small orbit, so it is moving towards or away from the Earth
  - E) The composition of the planet adds and subtracts certain elements from the star, causing the red-shift and blue-shift
20. The moon Io has active volcanoes. What is believed to be the ultimate source of energy for these volcanoes?
- A) Radioactive decays
  - B) Tidal heating from Jupiter's immense gravity
  - C) Sulfur reactions inside Io
  - D) Magnetic fields from its metal core
  - E) Ionized particles from the rings of Jupiter
21. Which of the following is not made primarily of rock and metal?
- A) Venus
  - B) Earth
  - C) Mercury
  - D) Mars
  - E) Uranus
22. What is the largest asteroid?
- A) Pluto
  - B) Ceres
  - C) Eris
  - D) Charon
  - E) Miranda

23. Which of the following, besides Earth, is believed to have active volcanoes on the surface?
- A) Mercury (only)
  - B) Mars (only)
  - C) Venus (only)
  - D) Mercury and Mars
  - E) Mercury and Venus
24. Which of the following has the most moons?
- A) Earth
  - B) Mars
  - C) Neptune
  - D) Mercury
  - E) Venus
25. Besides Earth, which planet, if any, has icy polar caps?
- A) Venus
  - B) Mars
  - C) Jupiter
  - D) Saturn
  - E) Mercury
26. Charon is a moon of
- A) Jupiter
  - B) Neptune
  - C) Mars
  - D) Uranus
  - E) Pluto
27. Which planets, besides Earth, have had spacecraft land on them?
- A) Venus (only)
  - B) Mars (only)
  - C) Mercury (only)
  - D) Venus and Mars
  - E) No planet besides Earth has had spacecraft land on them
28. Which planets has the highest surface temperature?
- A) Venus
  - B) Mars
  - C) Jupiter
  - D) Earth
  - E) Mercury

**For each of the following, please look at the pictures on the screen to identify the object.**

29. What is this a pictures of?
- A) Iapetus
  - B) Ganymede
  - C) Mercury
  - D) Moon
  - E) Europa
30. What is this a picture of?
- A) Saturn
  - B) Uranus
  - C) Earth
  - D) Mercury
  - E) Venus
31. What is this a picture of?
- A) Titan
  - B) Triton
  - C) Europa
  - D) Miranda
  - E) Earth
32. What are these pictures of?
- A) Neptune
  - B) Iapetus
  - C) Miranda
  - D) Io
  - E) Mars
33. What is this a picture of?
- A) Earth
  - B) Uranus
  - C) Titan
  - D) Jupiter
  - E) Neptune