

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 40 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.**

1. The most important information about the deep interior structure of the Earth comes from
A) Earthquakes B) Volcanoes C) Magnetic field D) Drills E) Gravity
2. Which of the following planets has exactly two moons?
A) Venus B) Mercury C) Uranus D) Mars E) Neptune
3. Which method is currently used by spacecraft and has discovered more extrasolar planets than any other method?
A) Direct imaging: Looking for images of planets next to their stars
B) Doppler: Detecting planets by seeing the Doppler shift (velocity) of their parent stars
C) Transit: watching the light from the star dim because it is blocked by the planet
D) Astrometry: Watching the star move from side to side under the gravity of the planet
E) Gravitational microlensing: Watching a distant star get brighter due to the gravity of a planet
4. Besides Earth, which planet is believed to have currently active volcanoes?
A) Mars, but not Venus nor Mercury
B) Mercury, but not Venus nor Mars
C) Venus, but not Mars nor Mercury
D) Venus and Mars, but not Mercury
E) Venus, Mars, and Mercury
5. Put the following three steps in order from first to last in the formation of planets
A) Protoplanetary disk, atmospheres, planetismals
B) Planetismals, atmospheres, protoplanetary disk
C) Protoplanetary disk, planetismals, atmospheres
D) Planetismals, protoplanetary disk, atmospheres
E) Atmospheres, planetismals, protoplanetary disk
6. Which of the following is a member of the asteroid belt?
A) Pluto B) Ceres C) Eris D) Charon E) None of these

7. For the planets and larger moons, metal and then rock tend to be near the center, and ices and atmospheres are on the outside. Why?
 - A) Rock and metal have high boiling points, so they condensed first
 - B) Rock and metal are dense, so they sink to the bottom
 - C) The Sun attracted rock and metal first, so these were available first
 - D) Ices and atmosphere are more fluid, so they are pulled out of the planets by the Sun's gravity
 - E) Electrical currents for generating magnetic fields need to be near the center
8. How is it that there are asteroids that are almost pure metal?
 - A) They probably formed near the Sun, where only metal could condense
 - B) They probably were made of asteroids that differentiated, and later were shattered
 - C) They probably formed in regions of high magnetic fields
 - D) They were probably expelled from the cores of terrestrial planets
 - E) They were formed near rock bands that played heavy metal music
9. The gas primarily responsible for the high temperature on the surface of Venus is
 - A) Carbon dioxide
 - B) Carbon monoxide
 - C) Methane
 - D) Ozone
 - E) Sulfuric acid
10. Which of the following is not considered a requirement for a layer of a planet to generate magnetic fields
 - A) It must contain permanent magnetic materials
 - B) It must be a liquid region
 - C) It must conduct electricity
 - D) There must be rotation or a similar source of motion
 - E) Actually, all of these are requirements for producing a magnetic field
11. Besides Earth, the other planet with liquid water on the surface is
 - A) Mars
 - B) Venus
 - C) Mercury
 - D) Saturn
 - E) None of these
12. Inside the Earth it is very hot. This heat ultimately comes from
 - A) The Sun
 - B) Heat of formation left over from when the Earth formed
 - C) Chemical reactions inside the Earth
 - D) Friction from the convection of the mantle
 - E) Radioactive materials inside the Earth
13. Which of the following is larger than the planet Mercury?
 - A) Io
 - B) Earth's Moon
 - C) Ganymede
 - D) Pluto
 - E) None of these
14. The protoplanetary disk around a newborn star typically is rotating at a pretty fast rate. Where did this rapid rotation come from?

- A) Gravitational interactions with the newborn star
 - B) Light pressure from the newborn star
 - C) Wind from the newborn star
 - D) Volcanism from the new planets
 - E) Shrinking of the disk causes it to accelerate any spin it had initially
15. I am standing on a moon with active volcanoes spewing sulfur. As I look into the sky, I see a planet. Which planet do I see?
- A) Mars
 - B) Jupiter
 - C) Saturn
 - D) Uranus
 - E) Neptune
16. The central part of the Earth is composed primarily of
- A) Solid metal
 - B) Liquid metal
 - C) Rock
 - D) Ices
 - E) Atmosphere
17. Which of the following can be found in the Kuiper belt?
- A) Pluto (only)
 - B) Eris (only)
 - C) Charon (only)
 - D) Pluto and Charon, but not Eris
 - E) Pluto, Charon, and Eris
18. Which of the following orbits Neptune?
- A) Callisto
 - B) Miranda
 - C) Enceladus
 - D) Triton
 - E) Charon
19. A planet or moon is more likely to keep its atmosphere if it has
- A) Small mass and high temperature
 - B) Large mass and high temperature
 - C) Small mass and low temperature
 - D) Large mass and low temperature
 - E) Mass and temperature have very little to do with atmospheres
20. The only moon with an atmosphere thicker than Earth's is
- A) Triton
 - B) Enceladus
 - C) Europa
 - D) Titan
 - E) Io
21. The largest fraction of Neptune is probably made of
- A) Ices (water)
 - B) Rock
 - C) Hydrogen
 - D) Metals
 - E) Helium
22. How large is the Great Red Spot on Jupiter, the largest storm in the Solar System?
- A) The same size as a typical storm on Earth
 - B) About the size of a hurricane on Earth
 - C) Larger than a hurricane, but smaller than the Earth
 - D) About the size of Earth
 - E) Significantly larger than the Earth
23. Which of the following planets has no rings around it?
- A) Saturn
 - B) Uranus
 - C) Neptune
 - D) Jupiter
 - E) All of these have rings

24. What clue indicates that parts of the surface of Pluto are surprisingly young?
- A) Large percentages of short-lived radioactive elements
 - B) The presence of unstable chemical compounds
 - C) High levels of volcanism
 - D) A nearly complete absence of craters
 - E) An absence of mountains or other “wrinkles”
25. The substance responsible for the bluish color of Uranus and Neptune is
- A) Water
 - B) Carbon monoxide
 - C) Methane
 - D) Ozone
 - E) Sulfuric acid
26. Which planet has no appreciable atmosphere?
- A) Venus B) Mars C) Mercury D) Neptune E) Uranus
27. Which type of meteorites probably came from objects that were once parts of large asteroids that got broken apart?
- A) Stony (only)
 - B) Iron (only)
 - C) Primitive (only)
 - D) Stony and Iron, but not primitive
 - E) Stony, Iron, and primitive
28. Why is it that the planets closer to the Sun tend to be composed almost exclusively of rock and metal, while those farther out have lots of water and other ices?
- A) Rock and metal have high mass, so they are attracted to the region near the Sun
 - B) Ices have low melting/boiling points, and the inner regions were too hot to allow them to condense
 - C) Volcanism on the inner planets lasted a lot longer, boiling off these components
 - D) The wind from the early Sun swept the ices away from the inner regions
 - E) Magnetic fields from the Sun attracted metals, and the rocks were attracted to the metals

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

29. What are these pictures of?

- A) Venus B) Mars C) Jupiter D) Moon E) Io

30. What is this a picture of?

- A) Iapetus B) Triton C) Ganymede D) Miranda E) Titan

31. What is this a picture of?

- A) Titan B) Europa C) Triton D) Neptune E) Uranus

32. What is this a picture of?

- A) Earth B) Jupiter C) Mars D) Moon E) Saturn

33. What are these pictures of?

- A) Mercury B) Uranus C) Titan D) Europa E) Venus