Yellow Key

Ast 1040 Test #2

Write the color of your test booklet on the top of your bubble sheet!
Be sure to fill in your name and student ID# (and their bubbles). That's how your grade gets back to you and not someone else.

If you can't do this correctly, it will cost you two points!!!

Be sure to follow the stnadard bubble-sheet drill:

- use a #2 pencil (some pens get ignored by the scanner)
- completely fill in the circles
- if you want to change an answer, be sure to completely erase the old one

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) Volcanism is more likely on a planet that 1) D
A) is closer to the Sun.
B) is struck often by meteors and solar system debris.
C) doesn't have an atmosphere or oceans.
D) has high internal temperatures.

2) What surprising discovery did the *New Horizons* spacecraft make during its recent flyby of Pluto? 2) A
A) Pluto's surface shows signs of very recent geological activity.
B) Pluto really is a lost moon of Neptune.
C) Pluto has the largest known volcano in the solar system.
D) Pluto's surface consists mostly of rocky material.
E) all of the above

3) Overall, Jupiter's composition is most like that of _____. 3) b
A) a comet B) Earth C) an asteroid D) the Sun

4) Which statement about planetary rings is *not* true? 4) C
A) Rings are always located closer to a planet's surface than any large moons.
B) All four jovian planets have rings.
C) Saturn's rings formed along with its moons 4.6 billion years ago.
D) Individual ring particles orbit their planet in accord with Kepler's laws, so that particles closer in orbit faster than particles farther out.

5) Which of the following lists the composition of the solar nebula from highest to lowest percentage of mass? 5) C
A) light gases (H, He), hydrogen compounds (H_2O, CH_4, NH_3), metals, rocks
B) hydrogen compounds (H_2O, CH_4, NH_3), rocks, metals, light gases (H, He)
C) light gases (H, He), hydrogen compounds (H_2O, CH_4, NH_3), rocks, metals
D) hydrogen compounds (H_2O, CH_4, NH_3), light gases (H, He), metals, rocks
E) hydrogen compounds (H_2O, CH_4, NH_3), light gases (H, He), rocks, metals

6) The reason that most extrasolar planets discovered by the Doppler method are found close to their parent stars is 6) A
A) the wavelength shift of the star's spectrum is larger.
B) more of the starlight is blocked by the planet when it transits the star.
C) they transit more frequently, and have thus been more likely to be detected in the short time we have been searching for them.
D) planets that are close to a star are heated up and therefore larger.
E) the closer to a star, the hotter and therefore brighter the planet is.

7) Where are most of the known asteroids found? 7) A
A) between the orbits of Mars and Jupiter
B) in the Oort cloud
C) between the orbits of the terrestrial planets
D) between the orbits of the jovian planets
E) in the Kuiper belt

8) Meteorites can come from 8) E
A) the Moon.
B) the crusts and mantles of asteroids.
C) Mars.
D) the cores of asteroids.
E) all of the above

9) The relatively few craters that we see within the lunar *maria* 9) D
A) were created by the same large impactor that led to the formation of the *maria.*
B) are volcanic in origin, rather than from impacts.
C) are sinkholes that formed when sections of the *maria* collapsed.
D) were formed by impacts that occurred after those that formed most of the craters in the lunar highlands.
E) were formed by impacts that occurred before those that formed most of the craters in the lunar highlands.

10) What drives the motion of the continental plates on Earth? 10) A
A) convection cells in the mantle
B) rotation of the liquid core
C) Earth's magnetic field
D) lava flows in trenches along the sea floor
E) tidal forces

11) Where is most of the water on Mars? 11) B
A) distributed evenly throughout its atmosphere
B) in its polar caps and subsurface ground ice
C) frozen on the peaks of its tall volcanoes
D) in frozen lakes and oceans on its surface
E) in its clouds

12) Why are there no visible impact craters on the surface of Io? 12) B

A) Any craters that existed have been eroded through the strong winds on Io's surface.
B) They have been covered up by Io's active surface geology.
C) It is too small to have been bombarded by planetesimals in the early solar system.
D) Its close proximity to Jupiter protects it from impacts.
E) Io's thick atmosphere obscures the view of the craters.

13) Which of the following does the solar nebular theory *not* predict? 13) E

A) planets orbit the Sun in nearly circular orbits in a flattened disk
B) the compositional differences between the terrestrial and jovian planets
C) planets orbit the Sun in the same direction
D) the presence of asteroids and comets
E) the equal number of terrestrial and jovian planets

14) According to our theory of solar system formation, what three major changes occurred in the solar nebula as it shrank in size? 14) D

A) Its mass, temperature, and density all increased.
B) Its gas clumped up to form the terrestrial planets, nuclear fusion produced heavy elements to make the jovian planets, and central temperatures rose to more than a trillion Kelvin.
C) It gained energy, it gained angular momentum, and it flattened into a disk.
D) It got hotter, its rate of rotation increased, and it flattened into a disk.

15) Why is Jupiter denser than Saturn? 15) D

A) Its core is much larger than Saturn's.
B) It is made of a different composition than Saturn, including a higher proportion of hydrogen compounds and rocks.
C) It has a greater proportion of helium to hydrogen compared to Saturn.
D) The extra mass of Jupiter compresses its interior to a greater extent than that of Saturn.
E) Scientists do not know why this is so.

16) The terrestrial planet cores contain mostly metal because 16) C

A) radioactivity created metals in the core from the decay of uranium.
B) the entire planets are made mostly of metal.
C) metals sank to the center during a time when the interiors were molten throughout.
D) convection carried the metals to the core.
E) metals condensed first in the solar nebula and the rocks then accreted around them.

17) How did the lunar *maria* form? 17) B

A) Volatiles escaping from the Moon's interior heated and eroded the surface in the regions of the *maria.*
B) Large impacts fractured the Moon's lithosphere, allowing lava to fill the impact basins.
C) The early bombardment created heat that melted the lunar surface in the regions of the *maria.*
D) The *maria* are the result of gradual erosion by micrometeorites striking the Moon.
E) The giant impact that created the Moon left smooth areas that we call the *maria.*

18) Which of the following does *not* have a major effect in shaping planetary surfaces? 18) D

A) impact cratering
B) erosion
C) tectonics
D) magnetism
E) volcanism

19) Most extrasolar planets discovered using the Doppler method 19) C
A) are less massive than Earth and orbit very close to the star.
B) are found around neutron stars.
C) are more massive than Earth and orbit very close to the star.
D) are more massive than Earth and orbit very far from the star.
E) are less massive than Earth and orbit very far from the star.

20) What do we mean by the *frost line* when we discuss the formation of planets in the solar nebula? 20) D
A) It is another way of stating the temperature at which water freezes into ice.
B) It is the altitude in a planet's atmosphere at which snow can form.
C) It marks the special distance from the Sun at which hydrogen compounds become abundant; closer to the Sun, there are no hydrogen compounds.
D) It is a circle at a particular distance from the Sun, beyond which the temperature was low enough for ices to condense.

21) What mechanism is most responsible for generating the internal heat of Io that drives its volcanic activity? 21) B
A) differentiation
B) tidal heating
C) bombardment
D) accretion
E) radioactive decay

22) What are *greenhouse gases*? 22) C
A) gases that absorb visible light
B) gases that transmit visible light
C) gases that absorb infrared light
D) gases that transmit infrared light
E) gases that absorb ultraviolet light

23) Which of the following is *not* a piece of evidence supporting the idea that Europa may have a subsurface ocean? 23) A
A) Astronomers have detected small lakes of liquid water on Europa's surface.
B) Photos of Europa's surface show regions that appear to consist of jumbled icebergs frozen in place.
C) Europa has a magnetic field that appears to respond to Jupiter's magnetic field.
D) Europa's surface shows very few impact craters.

24) Why aren't small asteroids spherical in shape? 24) D
A) Small asteroids have odd shapes because they were all chipped off larger objects.
B) Large asteroids were once molten and therefore became spherical, but small asteroids were never molten.
C) Large asteroids became spherical because many small collisions chipped off pieces until only a sphere was left; this did not occur with small asteroids.
D) The force of gravity in small asteroids is less than the resistance of the rock to deform.

25) According to the nebular theory, how did the Kuiper belt form? 25) D

A) It is made of planetesimals formed in the outer solar system that were flung into distant orbits by encounters with the jovian planets.
B) It is material left over from the interstellar cloud that never contracted with the rest of the gases to form the solar nebula.
C) It is made of planetesimals between the orbits of Mars and Jupiter that never formed into a planet.
D) It is made of planetesimals that formed beyond Neptune's orbit and never accreted to form a planet.
E) It consists of objects that fragmented from the protosun during a catastrophic collision early in the formation of the solar system.

26) Which of the following is an example of *convection*? 26) D

A) different kinds of material separating by density, like oil and water
B) rocks sinking in water
C) ice floating on a frozen lake
D) warm air expanding and rising while cooler air contracts and falls

27) What is the primary reason we divide the ingredients of the solar nebula into four categories (hydrogen/helium gas; hydrogen compound; rock; metal)? 27) D

A) The amount of energy required to ionize these materials varies considerably.
B) The atomic mass number of these materials differs considerably.
C) The abundance of these materials depended on their location in the solar nebula.
D) The temperature at which these materials condense into a solid varies considerably.

28) Which of the following are relatively unchanged fragments from the early period of planet building in the solar system? 28) D

A) asteroids
B) Oort cloud comets
C) Kuiper belt comets
D) all of the above

29) According to our present theory of solar system formation, why were solid planetesimals able to grow larger in the outer solar system than in the inner solar system? 29) C

A) because only the outer planets captured hydrogen and helium gas from the solar nebula
B) because the Sun's gravity was stronger in the outer solar system, allowing more solid material to collect
C) because only metal and rock could condense in the inner solar system, while ice also condensed in the outer solar system
D) because gas in the outer solar system contained a larger proportion of rock, metal, and hydrogen compounds than the gas in the inner solar system

30) If the freezing point of all ices was at a much lower temperature, what change would that imply for the formation of our solar system? 30) C

A) The gas giants could have formed closer to the sun.
B) The gas giants could not have formed at all.
C) The gas giants would have to form at a larger distance from the sun.
D) There would be no change in where gas giants could form, because the freezing point of ices did not affect the formation of gas giants.

31) Why do asteroids and comets differ in composition? 31) A
A) Asteroids formed inside the frost line, while comets formed outside.
B) Comets formed from the jovian nebula, while asteroids did not.
C) Asteroids are much larger than comets.
D) Comets are much larger than asteroids.
E) Asteroids and comets formed at different times.

32) Which of the following is *not* a characteristic of the outer planets? 32) E
A) They have rings.
B) Their orbits are separated by relatively large distances.
C) They have thick atmospheres.
D) They are primarily made of hydrogen, helium, and hydrogen compounds.
E) They have relatively high densities.

33) Suppose you view the solar system from high above Earth's North Pole. Which of the following statements about planetary orbits will be true? 33) B
A) The inner planets orbit the Sun counterclockwise while the outer planets orbit the Sun clockwise.
B) All the planets orbit counterclockwise around the Sun.
C) All the planets except Uranus orbit the Sun counterclockwise; Uranus orbits in the opposite direction.
D) The inner planets orbit the Sun clockwise while the outer planets orbit the Sun counterclockwise.

34) The planet HAT-P-32b has more than twice the radius of Jupiter, yet is only the same mass. It orbits its star more than a factor of ten closer than Mercury's orbit around the Sun. Which is the most plausible explanation for its large size? 34) B
A) It is made of elements other than hydrogen and helium which do not compress under their own gravity.
B) Planets that are close to a star are puffed up and therefore larger.
C) The hydrogen and helium gas compressed under their own gravity.
D) The mass measurement is mistaken, and it is actually about 10 times more massive than Jupiter.

35) Based on our current theory of Earth's formation, the water we drink likely comes from 35) B
A) material left behind during the giant impact that formed the Moon.
B) water bearing planetesimals that impacted Earth.
C) ice that condensed in the solar nebula in the region where Earth formed.
D) chemical reactions that occurred in Earth's crust after Earth formed.
E) chemical reactions that occurred in Earth's core after Earth formed.

36) The Doppler method can be used to measure the orbital period of a planet by 36) C
A) measuring the speed at which the star orbits the mutual center-of-mass of the star and planet.
B) measuring the asymmetries in the velocity curve.
C) measuring the time it takes for the star's line-of-sight velocity to cycle from peak to peak.
D) measuring the amount by which the starlight is reduced when the planet transits.

37) Which of the following statements does *not* apply to the formation of gas giants like Jupiter, compared to terrestrial planets? 37) B

A) formed in regions cold enough for water to freeze
B) surface dramatically altered during bombardment
C) accreted from icy planetesimals
D) caused icy planetesimals to slingshot away from the Sun, to become Oort cloud comets
E) formed in a region with lower orbital speeds

38) Which new idea has been added into our theory of solar system formation as a result of the discoveries of extrasolar planets? 38) C

A) In addition to the categories of terrestrial and jovian, there must be an "in-between" category of planet that has the mass of a jovian planet but the composition of a terrestrial planet.
B) Some of the "exceptions to the rules" in our own solar system are likely to have been the result of giant impacts.
C) Planets can migrate from the orbits in which they are born.
D) In some star systems, it is possible for jovian planets to form in the inner solar system and terrestrial planets to form in the outer solar system.

39) Which of the following is most *unlikely* to be found on Titan? 39) C

A) lakes of liquid methane
B) rain or snow consisting of methane or ethane droplets or ice crystals
C) lakes of liquid water in the warmer equatorial regions
D) volcanic outgassing of methane and other gases

40) According to the nebular theory, how did the Oort cloud form? 40) A

A) It is made of planetesimals formed in the outer solar system that were flung into distant orbits by encounters with the jovian planets.
B) It consists of objects that fragmented from the protosun during a catastrophic collision early in the formation of the solar system.
C) It is material left over from the interstellar cloud that never contracted with the rest of the gases to form the solar nebula.
D) It is made of planetesimals that formed beyond Neptune's orbit and never accreted to form a planet.
E) It is made of planetesimals between the orbits of Mars and Jupiter that never formed into a planet.

41) What do meteorites reveal about the solar system? 41) D

A) They reveal that the solar system once contained 10 planets.
B) Nothing, because they come from other star systems.
C) They reveal that the early solar system consisted mostly of hydrogen and helium gas.
D) They reveal that the age of the solar system is approximately 4.6 billion years.
E) They reveal that meteorites are about the same age as most Earth rocks.

42) According to current evidence, Pluto is best explained as _____. 42) B

A) an escaped moon of Neptune
B) a large member of the Kuiper belt
C) a terrestrial planet that is surprisingly far from the Sun
D) a very small jovian planet

43) The *Caloris Basin* on Mercury covers a large region of the planet, but few craters have formed on top of it. From this we conclude that 43) E
A) Mercury's atmosphere prevented smaller objects from hitting the surface.
B) only very large impactors hit Mercury's surface in the past.
C) erosion destroyed the smaller craters that formed on the basin.
D) the *Caloris Basin* was formed by a volcano.
E) the *Caloris Basin* formed toward the end of the solar system's period of heavy bombardment.

44) Why do Earth rocks have much younger ages than most meteorites? 44) A
A) Most Earth rocks have been melted and reformed since Earth formed from the solar nebula.
B) Most meteorites come from other planetary systems that formed before our solar system.
C) Earth formed billions of years after most meteorites formed.
D) Meteorites formed before the solar nebula began to condense.

45) According to the nebular theory, how did the asteroid belt form? 45) A
A) It is made of planetesimals between the orbits of Mars and Jupiter that never formed into a planet.
B) It is made of planetesimals that formed beyond Neptune's orbit and never accreted to form a planet.
C) It consists of objects that fragmented from the protosun during a catastrophic collision early in the formation of the solar system.
D) It is material left over from the interstellar cloud that never contracted with the rest of the gases to form the solar nebula.
E) It is made of planetesimals formed in the outer solar system that were flung into distant orbits by encounters with the jovian planets.

46) Which of the following most likely explains why Venus does *not* have a strong magnetic field? 46) B
A) It is too large.
B) Its rotation is too slow.
C) Its atmosphere is too thick.
D) It is too close to the Sun.
E) It does not have a molten metallic outer core.

47) Which direction does a comet's plasma tail point? 47) B
A) always almost due north
B) straight away from the Sun
C) perpendicular to the ecliptic plane
D) straight behind the comet in its orbit

48) What are the two primary methods by which planets have been found around other stars in our galaxy? 48) A
I) Direct images in visible and infrared light
II) Indirectly by detecting the motion of the host star
III) Indirectly by measuring the drop in brightness of the host star when the planet crosses our line of sight
A) II and III
B) I and III
C) I and II

49) Suppose you could float in space just a few meters above Saturn's rings. What would you see as you looked down on the rings? 49) A

A) countless icy particles, ranging in size from dust grains to large boulders
B) a solid, shiny surface, looking much like a piece of a DVD but a lot bigger
C) dozens of large "moonlets" made of metal and rock, each a few kilometers across
D) Nothing–up close; the rings would be so completely invisible that you'd have no way to know they are there. They can be seen only from a distance.

50) Suppose you find a rock that contains some potassium–40 (half–life of 1.25 billion years). You measure the amount and determine that there are 5 grams of potassium–40 in the rock. By measuring the amount of its decay product (argon–40) present in the rock, you realize that there must have been 40 grams of potassium–40 when the rock solidified. How old is the rock? 50) C

A) 1.25 billion years
B) 5 billion years
C) 3.75 billion years
D) 2.5 billion years
E) none of the above

51) Which of the following planets has the thinnest atmosphere? 51) B

A) Venus B) Mars C) Earth

52) The depth of the dip in a star's brightness due to the transit of a planet depends most directly on 52) D

A) the eccentricity of the planet's orbit.
B) the planet's mass.
C) the size of the planet's orbit.
D) the planet's size.
E) the planet's density.

53) How do we think the "hot Jupiters" around other stars were formed? 53) C

A) Many planets were formed around the star but coalesced into a single planet close in.
B) They formed as dense, rocky planets close to the star in the same orbits that they are seen today.
C) They formed as gas giants beyond the frost line and then migrated inwards.
D) They formed as gas giants close to the star in the same orbits that they are seen today.

54) Which of the following is *not* a characteristic of the inner planets? 54) E

A) They are smaller than the outer planets.
B) They have relatively high densities.
C) Their orbits are relatively closely spaced.
D) They have solid, rocky surfaces.
E) They have substantial atmospheres.

55) Why do astronomers believe that Triton is a captured moon? 55) C

A) Triton is too large to have been formed in the "miniature solar nebula" thought to have surrounded Neptune in its very early history.
B) Triton is very small and potato–shaped, which is common of captured moons.
C) Triton orbits Neptune in a direction opposite that of Neptune's rotation.
D) Triton appears to be made mostly of ice.

56) What do asteroids and comets have in common? 56) A

A) Most are unchanged since their formation in the solar nebula.
B) They have similar densities.
C) They have a similar range of orbital inclinations.
D) They have similar orbital radii.
E) They have nothing in common with each other.

57) In what part of the solar system is Pluto found? 57) C

A) the terrestrial planet region
B) the Oort cloud
C) the Kuiper belt
D) the asteroid belt

58) How do asteroids differ from comets? 58) C

A) Asteroids and comets are both made of rocky and icy material, but asteroids are larger in size than comets.
B) Asteroids are made mostly of icy material. Comets are made of mostly rocky material.
C) Asteroids are made mostly of rocky and/or metallic material. Comets are made mostly of icy material.
D) Asteroids and comets are both made of rocky and icy material, but asteroids are smaller in size than comets.

59) According to current understanding, which of the following is required for a planet to have rings that last for a very long time? 59) B

A) The planet must orbit its star at a distance greater than Mars orbits the Sun.
B) The planet must have many small moons that orbit relatively close to the planet in its equatorial plane.
C) The planet must be at least as massive as Saturn.
D) The planet must once have had a large moon that came too close to it, shattering the moon and creating the ring particles.

60) The reason that small planets tend to lose interior heat faster than larger planets is essentially the same as the reason that _____. 60) D

A) lower density bubbles form and rise upward in boiling water
B) thunderstorms tend to form on hot summer days
C) Earth contains more metal than the Moon
D) a large baked potato takes longer to cool than a small baked potato