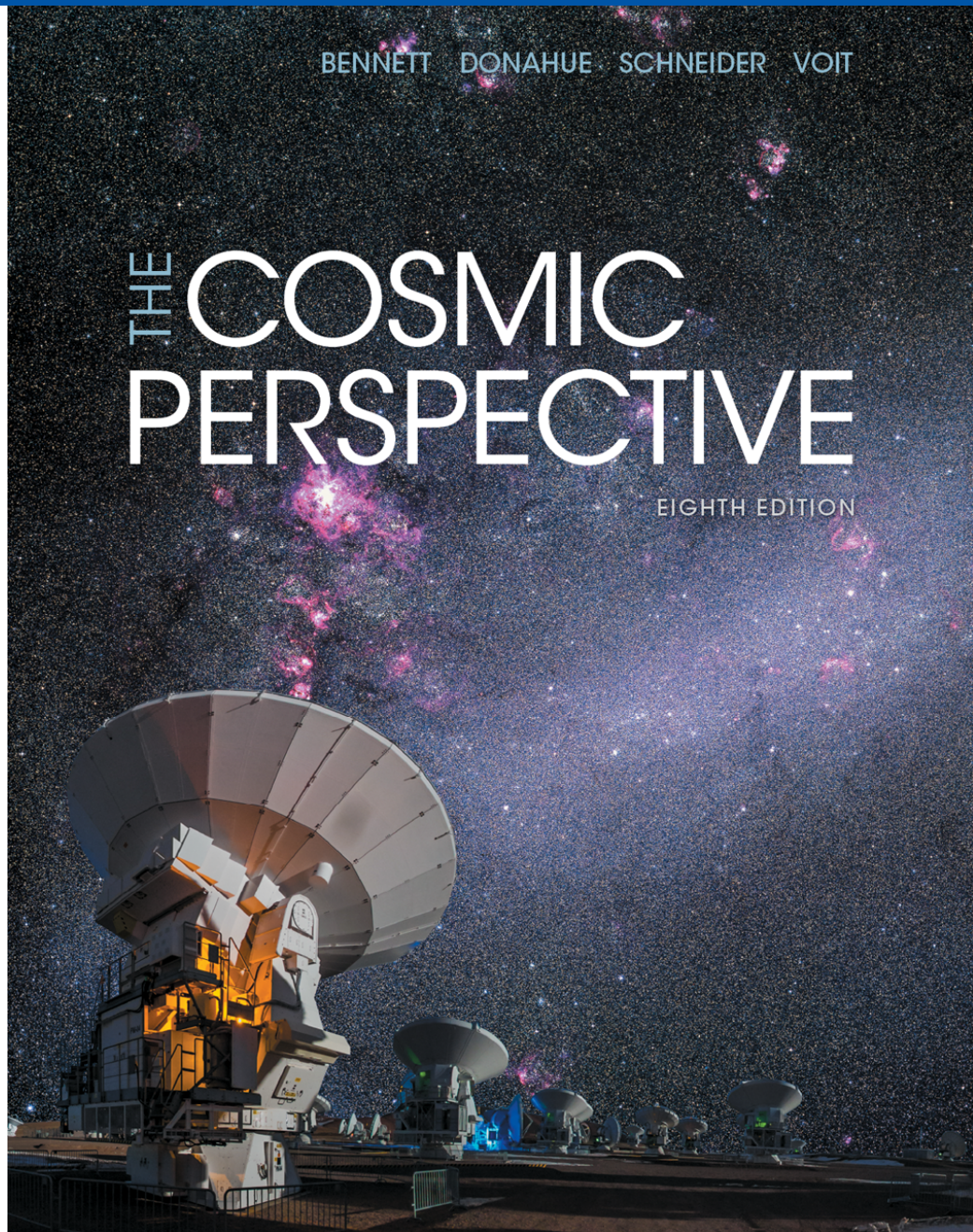
Review Clickers

Chapter 8: Formation of the Solar System



Why do we think that the solar system formed from a rotating, collapsing gas cloud that ended up as a disk orbiting the Sun?

a) Most of the planets revolve and rotate in the same direction and in the same plane.
b) We see clouds of gas and dust in space with apparently young stars in them.
c) We see disks around young stars.
d) all of the above

Why do we think that the solar system formed from a rotating, collapsing gas cloud that ended up as a disk orbiting the Sun?

a) Most of the planets revolve and rotate in the same direction and in the same plane.
b) We see clouds of gas and dust in space with apparently young stars in them.
c) We see disks around young stars.
d) all of the above

What is the primary physical law responsible for the heating of the solar nebula as it collapsed?

a) conservation of energy
b) conservation of momentum
c) conservation of angular momentum
d) Kepler's third law

What is the primary physical law responsible for the heating of the solar nebula as it collapsed?

a) conservation of energy

b) conservation of momentum

c) conservation of angular momentum

d) Kepler's third law

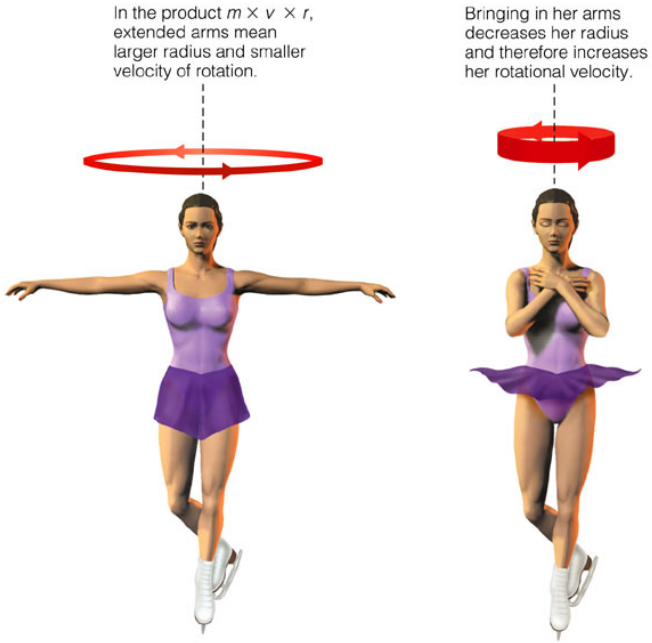
Because of collisions!

What is the primary physical law responsible for the increased rotation rate of the solar nebula as it collapsed?

a) conservation of energy
b) conservation of momentum
c) conservation of angular momentum
d) Kepler's third law

What is the primary physical law responsible for the increased rotation rate of the solar nebula as it collapsed?

a) conservation of energy
b) conservation of momentum
c) conservation of angular momentum
d) Kepler's third law



Why do we think the inner (terrestrial) planets became denser than the outer planets?

a) As the solar nebula collapsed, denser materials sank toward the center.
b) The Sun's gravity pulled denser materials toward the center.
c) The inner part of the solar nebula was so hot that only dense metals and rocks were able to accrete there.
d) The rotating disk in which the planets formed flung lighter elements outward by centrifugal force.

Why do we think the inner (terrestrial) planets became denser than the outer planets?

a) As the solar nebula collapsed, denser materials sank toward the center.
b) The Sun's gravity pulled denser materials toward the center.
c) The inner part of the solar nebula was so hot that only dense metals and rocks were able to accrete there.
d) The rotating disk in which the planets formed flung lighter elements outward by centrifugal force.

What do we think the composition of the solar nebula was?

a) about half hydrogen and helium, half heavier elements (iron, carbon, silicon, etc.)
b) about 98% hydrogen and helium, and 2% heavier elements
c) about 2% hydrogen and helium, and 98% heavier elements

What do we think the composition of the solar nebula was?

a) about half hydrogen and helium, half heavier elements (iron, carbon, silicon, etc.)

b) about 98% hydrogen and helium, and 2% heavier elements

c) about 2% hydrogen and helium, and 98% heavier elements

What is the composition of the gas clouds (nebulae) we see in space?

a) about half hydrogen and helium, half heavier elements (iron, carbon, silicon, etc.)
b) about 98% hydrogen and helium, and 2% heavier elements
c) about 2% hydrogen and helium, and 98% heavier elements

What is the composition of the gas clouds (nebulae) we see in space?

a) about half hydrogen and helium, half heavier elements (iron, carbon, silicon, etc.)

b) about 98% hydrogen and helium, and 2% heavier elements

c) about 2% hydrogen and helium, and 98% heavier elements

What do we think *condensed* out of the solar nebula?

a) hydrogen and helium
b) hydrogen compounds
c) rocky material
d) metals
e) all except A

What do we think *condensed* out of the solar nebula?

a) hydrogen and helium
b) hydrogen compounds
c) rocky material
d) metals
e) all except A

The dense, rocky, and metallic planets are found close to the Sun because

a) the Sun's gravity attracted the denser particles (rocks and metals) closer to it.
b) the Sun was unable to hold onto the lighter (gaseous) particles and they moved farther away where they formed the outer planets.
c) rocks and metals condensed at the relatively high temperatures close to the Sun.
d) they were nudged inward by close encounters with Jupiter early in the solar system's history.

The dense, rocky, and metallic planets are found close to the Sun because

a) the Sun's gravity attracted the denser particles (rocks and metals) closer to it.

b) the Sun was unable to hold onto the lighter (gaseous) particles and they moved farther away where they formed the outer planets.

c) rocks and metals condensed at the relatively high temperatures close to the Sun.

d) they were nudged inward by close encounters with Jupiter early in the solar system's history.

What do we think *first* caused tiny solid bits of material in the solar nebula to *accrete*?

a) gravity
b) friction
c) electrical forces
d) pressure

What do we think *first* caused tiny solid bits of material in the solar nebula to *accrete*?

a) gravity
b) friction
c) electrical forces
d) pressure

Source: Wikipedia, on Triboelectricity

When the first solid bits in the solar nebula became large enough to be called *planetesimals*, what caused them to grow larger more quickly?

a) gravity
b) friction
c) electrical forces
d) pressure

When the first solid bits in the solar nebula became large enough to be called *planetesimals*, what caused them to grow larger more quickly?

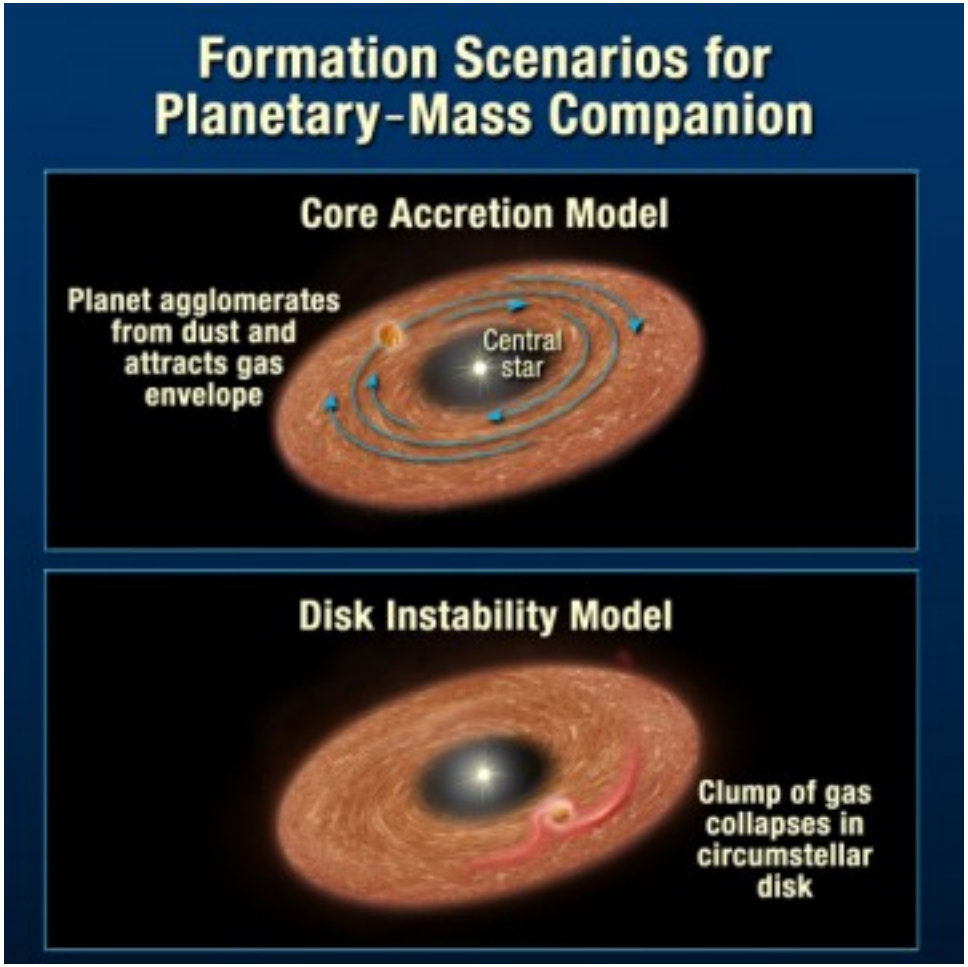
a) gravity

b) friction

c) electrical forces

d) pressure

Accretion



Source: NASA, ESA / A. Feild

Why could the jovian planets grow to be much larger than the terrestrial planets?

a) They were farther from the Sun, where gravity was weaker.
b) They formed beyond the *frost line* where ices could condense, so they included hydrogen compounds.
c) They were far enough from the Sun to escape the *heavy bombardment* that battered the early solar system.

Why could the jovian planets grow to be much larger than the terrestrial planets?

a) They were farther from the Sun, where gravity was weaker.

b) They formed beyond the *frost line* where ices could condense, so they included hydrogen compounds.

c) They were far enough from the Sun to escape the *heavy bombardment* that battered the early solar system.

What appears to have happened to increase the mass of jovian planets?

a) They captured more gas from interstellar space.
b) They captured gas from the solar wind.
c) They captured more mass from heavy bombardment.
d) Their gravity became strong enough to attract hydrogen and helium gas from the solar nebula.

What appears to have happened to increase the mass of jovian planets?

a) They captured more gas from interstellar space.
b) They captured gas from the solar wind.
c) They captured more mass from heavy bombardment.
d) Their gravity became strong enough to attract hydrogen and helium gas from the solar nebula.

What is the *solar wind*?

a) strong radiation that comes from the Sun
b) similar to winds on Earth, but faster and stronger
c) similar to winds on Earth, but less dense and weaker
d) atoms and particles ejected from the Sun at high speed

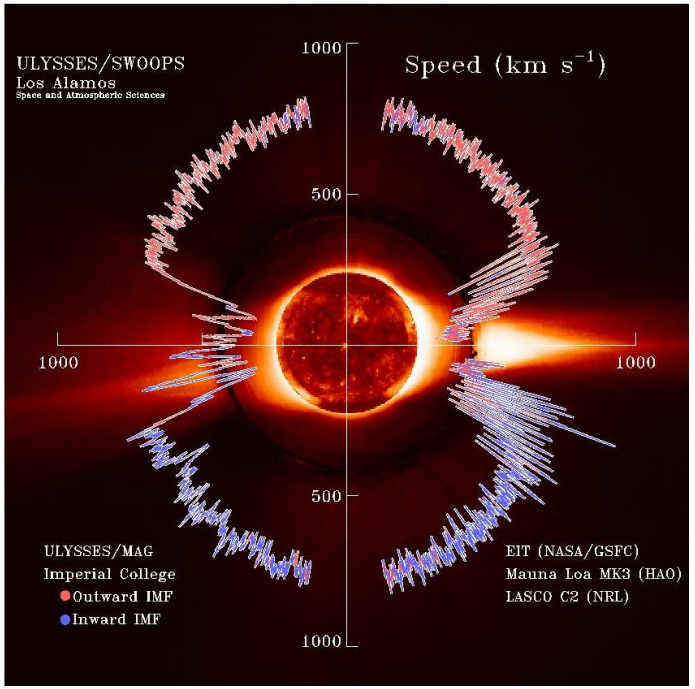
What is the *solar wind*?

a) strong radiation that comes from the Sun

b) similar to winds on Earth, but faster and stronger

c) similar to winds on Earth, but less dense and weaker

d) atoms and particles ejected from the Sun at high speed



How do the *stellar winds* of young Sun-like stars compare to the solar wind we see from the Sun today?

a) Young stars don't have winds.
b) Young stars have weaker winds.
c) Young stars have much stronger winds.

How do the *stellar winds* of young Sun-like stars compare to the solar wind we see from the Sun today?

a) Young stars don't have winds.
b) Young stars have weaker winds.
c) Young stars have much stronger winds.

What do we think happened to the solar nebula after the planets formed?

a) The gas was all used up in planet formation.
b) The rest of the gas gradually drifted away.
c) The solar wind helped blow the gas away.
d) The gas is still here; we just can't see it.

What do we think happened to the solar nebula after the planets formed?

a) The gas was all used up in planet formation.
b) The rest of the gas gradually drifted away.
c) The solar wind helped blow the gas away.
d) The gas is still here; we just can't see it.

Where do asteroids come from?

a) They are the remains of a planet between Mars and Jupiter that broke up.
b) They are escaped small moons.
c) They are leftover planetesimals from the inner solar system.
d) They are leftover planetesimals from the outer solar system.

Where do asteroids come from?

a) They are the remains of a planet between Mars and Jupiter that broke up.
b) They are escaped small moons.
c) They are leftover planetesimals from the inner solar system.
d) They are leftover planetesimals from the outer solar system.

Where do comets come from?

a) They are the remains of a planet between Mars and Jupiter that broke up.
b) They are escaped small moons.
c) They are leftover planetesimals from the inner solar system.
d) They are leftover planetesimals from the outer solar system.

Where do comets come from?

a) They are the remains of a planet between Mars and Jupiter that broke up.
b) They are escaped small moons.
c) They are leftover planetesimals from the inner solar system.
d) They are leftover planetesimals from the outer solar system.

During the *heavy bombardment* early in the solar system's history,

a) giant craters were made on the Moon.
b) giant craters were made on Mercury.
c) giant craters were made on Earth.
d) all of the above
e) A and B only

During the *heavy bombardment* early in the solar system's history,

a) giant craters were made on the Moon.
b) giant craters were made on Mercury.
c) giant craters were made on Earth.
d) all of the above
e) A and B only

Could a solar system like ours have formed with the first generation of stars after the Big Bang?

a) Possibly – there is no physical reason why not.
b) No, there would not have been enough time to form planets.
c) No, the expansion of the universe would have torn the solar system apart.
d) No, there would not have been enough metals and rock to form terrestrial planets.

Could a solar system like ours have formed with the first generation of stars after the Big Bang?

a) Possibly – there is no physical reason why not.
b) No, there would not have been enough time to form planets.
c) No, the expansion of the universe would have torn the solar system apart.
d) No, there would not have been enough metals and rock to form terrestrial planets.

What age would radiometric dating give for a chunk of recently solidified lava from Kilauea, an active volcano in Hawaii?

a) zero
b) the half-life of potassium-40 (1.25 billion years)
c) the half-life of Uranium-238 (4.5 billion years)
d) the age of the solar system
e) the age of the volcano

What age would radiometric dating give for a chunk of recently solidified lava from Kilauea, an active volcano in Hawaii?

a) zero

b) the half-life of potassium-40 (1.25 billion years)

c) the half-life of Uranium-238 (4.5 billion years)

d) the age of the solar system

e) the age of the volcano

Radiometric dating failure!

What age does radiometric dating give for Moon rocks and meteorites?

a) zero
b) about 6000 years
c) about 4 million years
d) about 4 billion years
e) about 14 billion years

What age does radiometric dating give for Moon rocks and meteorites?

a) zero
b) about 6000 years
c) about 4 million years
d) about 4 billion years
e) about 14 billion years