Name: _____ Pd: _____ Date: _____

Preview: *The Cosmic Landscape* Fill-In Notes
Astronomy

Introduction

- _____ – the study of the "_____", the realm extending from _____ the Earth's _____ to the most distant reaches of the _____
  - _____ – the stars
  - _____ – rules, laws, and body of _____
- _____ field to study! …literally the _____
  - Included:
    - _____ with volcanoes that make Mt. Everest look like a sand mound
    - _____ with diameters 100x the Sun's
    - Surfaces that rain _____
    - Enormous _____ of whirling stars and _____ that make Earth almost _____ in size comparison

Earth: Our Home!

- _____ – a _____ in _____ around a _____ that is large enough to have taken on a round shape, and that has cleared the path of its orbit of all bodies of comparable size
  - We'll get into this more with solar systems
- _____ – our _____ ☺
  - Should always be _____!
  - Home base, obviously, so almost all _____ has to be done from here
    - we can't hop from _____ to _____ to _____ ourselves, so we have to study it from home (mostly)
- Features astronomers focus on:
  - The _____ of Earth is _____ from the lava and boiling water erupting form volcanoes and geysers
    - we can't get there, but it tells us what's going on inside
  - The _____ moving motion inside is also what causes the _____ field that reaches past the surface and out into _____ around the planet
    - These pull on the _____ of a compass and also cause the shapes in the _____ _____
- Astronomers use what we know about _____ to anticipate similar situations on other _____ and areas of the _____
  - Ex: Mars and Venus
- The internal, surface, and atmosphere studies of Earth all help astronomers!

The Moon

- The _____ is our nearest _____ neighbor in space
- _____ – a body orbiting a _____
  - Not always a _____!
  - We call those machines "satellites" because of how they move up there
- The Moon is a quarter of a _____ miles away from Earth
  - _____ km
- Held in place by Earth's _____
- Only about a _____ of Earth's diameter

- _____ km (Earth = 6378 km)
- It's _____ is very different from Earth's
  - _____, pitted ball of rock that shows us the same _____ every night
- Why are they so different? … _____
  - Moon is about _____ the mass of Earth
  - 7.349×10^{22} kg (Earth = 5.97×10^{24} kg)
  - This prevents it from having an _____
- The _____ is too low to hold _____ around it
  - Can't hold _____ without atmosphere and _____ doesn't make enough heat to keep replacing what escapes
  - No _____ or _____ from atmosphere means no _____ on the surface
- Because it hasn't changed in _____ of years, it can tell astronomers what Earth was like when it was _____
- This is still the _____ place humans have ever traveled to
  - _____ isn't happening any time soon… we'll talk more later

PAUSE! Scientific Notation

- _____ _____ is a system that uses the power of _____ to help scientists with outrageously large numbers
  - *Trust me, we'll need this*
- Write numbers using _____ to an exponent

Conversions:

- _____ digit in front of the decimal $770 = 7.70 \times 10^{2}$
  - For the amount of places moved to the _____ the exponent _____
    - *<u>Left</u> handed people are always the <u>positive</u> ones!* ☺
  - For the amount of placed moved to the _____ the exponent _____

The Planets

- ___ total planets around the Sun
  - No, Pluto does not count
  - In order:
    - _____
    - Venus
    - _____
    - Mars
    - _____
    - Saturn
    - _____
    - Neptune
- Tidbit on each:
  - <u>Mercury</u>: ancient _____ blasted out by _____
  - <u>Venus</u>: dense clouds of _____ acid droplets rain down
  - <u>Earth</u>: white _____, blue oceans, green _____, and red deserts
  - <u>Mars</u>: huge _____ and deserts spread across with possible ancient _____ and oceans

    - Jupiter: massive _____, one bigger than the whole _____ that has lasted for centuries!
    - Saturn: _____ of icy fragments orbit it making _____
    - Uranus: dark _____ circle this one with a _____ spin from a catastrophe in its distant past
    - Neptune: choking _____ clouds whirl in the deep _____ atmosphere
- Mercury, _____, Mars, _____, and Saturn are all visible to the naked eye from Earth (at some point)
    - they will look like _____ in the night sky
    - Stars don't _____, but the planets will slowly over time because of their _____ around the Sun
    - This is where their _____ came from
        - Ancient cultures named the "moving stars" after _____ and _____
- The names of the days of the _____ also came from this
    - Ex: Saturday came from Saturn and Miércoles (Wednesday in Spanish) came from Mercury
- As far as we know currently, _____ is the only planet that has the ability to give rise to _____ forms of any sort
- _____ is the largest by far and weighs in at more than the rest of the planets _____ … but it's still smaller than the _____
    - Jupiter is _____ x the size of Earth

The Sun

- _____ – a massive, _____ body held together by _____ and generally emitting light through _____ reactions in its _____

Sun

- More than _____ more massive than Earth
    - Sun = volleyball Earth = pinhead Jupiter = nickel
- Contains about _____ more matter than all of the planets combined
- Generates _____ energy from _____ reactions in the core
    - Converts _____ into _____ (H into He)
- This _____ can't last forever
- Its over _____ years old at this point
- Studies show that it shouldn't run out for another _____ years and then _____ away like a cooling ember
- Not only can astronomy allow scientists to _____ currently, but it helps with studying the past and _____ the future of our own solar system

The Solar System

- _____ _____ – the _____, _____, their _____, and other bodies that orbit the Sun
- Many _____ objects orbit the Sun, also
    - Ex: dwarf planets, asteroids, comets, etc.
- Most _____ (big chunks of rock) orbit in a _____ between Mars and Jupiter
    - This is where you'll find the first dwarf planet, Ceres
- Behind Neptune is the new hot topic, _____ _____

    - This is the _____ asteroid belt with many _____, but definitely icy, objects both large and small
    - There are tons of _____ planets, including _____, here
    - Astronomers didn't know much about this area until the newest spacecraft finally made its way out there
        - _____ _____ space craft
    - Common place for _____ (clusters of ice and dust)
- The span of the solar system from the Sun to _____ is almost 300 billion miles
    - _____ km!

Astronomical Units

- _____ _____ (AU) – the average _____ from _____ to the _____
    - About 93 million miles (_____ kilometers)
    - Ex: Earth = _____ from the Sun
        - Mercury = _____ AU from the Sun
        - Neptune = about _____ AU from the Sun

$$km = AU \times 1.496 \times 10^{8}\ km$$
$$AU = km / 1.496 \times 10^{8} km$$

- Ex: Find the distance from Mars to the Sun in AUs
    - Mars = 2.279×10^{8} km from the Sun
    - Mars = _____
    - Mars = _____ _____ _____ from the Sun

- Some _____ on the outskirts of Kuiper's Belt can be every bit of _____ AU away from the Sun
- The _____ space craft (launched in 1977) held all of the records for _____ and _____ traveled by a spacecraft
- Now, these records are split between _____ and _____ _____ as of July 2016
    - _____: spacecraft sent to study Jupiter that arrived July 4, 2016
    - _____ _____*:* sent to study Kuiper's Belt and Pluto that reached Pluto on July 14, 2015

Light-years

- Once _____ start to study the outer _____ of our solar system, _____ end up being really large numbers
- _____ -_____ – a unit of _____ equal to the distance that _____ travels in one _____
    - 2.998×10^{8} _____ (actually its 299,792,458 m/s)
    - This is _____ a unit of _____ … a light-year is how _____ something is away

The Milky Way

- _____ _____ _____ – cloud of several hundred billion _____ with a _____ shape like the solar system
- The _____ that the Sun and our system belong to
- Other _____ _____ of our galaxy can be seen from Earth and look milky in the night sky
- spans about _____ ly across
- The _____ orbits about 27,000 ly from the center at about 150 _____! (woah….)
- Some _____ in the Milky Way are _____ larger than the Sun, others _____ smaller
- Stars intermingle with _____ and _____ clouds ← much bigger than our solar system!
    - Size comparison: our solar system to the galaxy is a grain of _____ to an entire coastline
- The stars of the galaxy are extremely _____ out
    - The closest is _____ ly away (25 trillion miles)
    - Distance comparison: both the Sun and the nearest star are both the size of a pinhead, they would be 35 miles apart and the space in between them would be nearly empty!

Galaxy Clusters and the Universe

- _____ _____ – a group of _____ held together by their _____ gravity
    - The Milky Way belongs to the _____ _____
    - The local group is the "local" group of several dozen _____
    - These can still be a few _____ light years in diameter
- _____ _____ – the cluster of _____ clusters in which the Milky Way is located
- _____ – the largest astronomical _____ we know of which contains all _____, all _____, and encompasses all _____
- Astronomers think that the visible universe is about _____ years old
    - That's the _____ from the most _____ visible galaxies that takes nearly the age of the _____ to reach us , so what we see is them when they first _____
- Even though we have a figure for the _____ universe, that doesn't mean we know the extent of the full _____
- Astronomers _____ fully understand how the orderly structure of the universe _____, they do know it is _____ related

Forces and Matter

- _____ – the force of _____ that is between two bodies and is generated by their _____
    - You experience this _____ in multiple ways even though you may not realize it
    - The same _____ that pulls a falling book to the floor is the same force that keeps _____ in orbit

The Still Unknown Universe

- _____ shows astronomers that the bulk of the universe is full of _____ matter
- _____ _____ – matter that emits no detectable _____ but whose presence can be deducted by its _____ attraction on other bodies
    - Got its name because it gives off a type of _____ astronomers have never seen _____ around us or territories that we know of
    - Its completely _____ and non _____
    - Seems to outweigh _____ matter 5 to 1!
- _____ much larger than our protons, neutrons, and electrons are what astronomers think _____ be out there
    - This justifies the high _____ explanation
- _____ in the universe are moving _____ through the great cosmic expansion
- _____ _____ – an _____ event that created the _____
    - Occurred about _____ years go and generated the _____ motion that we observe today!
    - Full _____ theory (just like the cell theory)
- The rate of _____ is _____ up
    - Something stronger is overtaking the _____ between the _____ and causing them to spread apart
- _____ _____ – a form of _____ detected by its effect on the expansion of the _____
    - The _____ and _____ (characteristics) are unknown
- After _____, the _____ mass we can detect only accounts for 1% of the universe as we know it
    - What we see of the universe is like footprints of an invisible creature: a being who leaves tracks, but whose build and nature we don't know