# Earth Motions

## *WHERE ARE WE?* DISTANCES IN ASTRONOMY

• _____ (AU)

• average distance from _____

• about 150 million km

• _____ (ly)

• the distance light (@ 300000 km/s) travels in one year

• about 9.5 trillion km

• _____ (pc)

• about 3.26 ly
• from “parallax second”

## OUR PLACE IN THE UNIVERSE

_____

• made of _____

• almost perfectly round and smooth

• slightly flattened (at the poles)

_____

• ___ major (and many minor) planets orbiting one star (the sun)

• orbits are _____ , but very nearly circular

• Earth is the _____ planet from the sun, between 147 million and 152 million km away

_____

• sun is about 2/3 of the way (35 kly) from center of our galaxy, called the _____

• our galaxy is about _____ across

• contains about _____ stars

• nearest star to sun is _____, 4.3 ly away

• almost nothing (some gas & dust) is between stars

(BTW - at 100,000 km/hr you would reach the moon in less than 4 hours, but it would take 11,000 years to get to Proxima Centauri at that speed!)

_____

• the Milky Way is in a cluster of about 20 galaxies called the _____

• the nearest galaxy is about 160,000 ly away

• very little visible matter is between galaxies

• there are clusters of clusters of galaxies called _____

    • the Local Group is in the _____

• there are estimated to be _____ galaxies in the known universe

## EARTH MOTIONS

_____

• Earth turns on its axis once every _____ (toward the _____)

• axis is tilted _____ from “vertical”

• north end of axis points toward _____ (aka the North Star)

• axis wobbles (_____) once every 23,000 years

• rotation causes _____ cycle

• rotational speed is 1670 km/hr at the equator

_____

• one orbit of the sun every _____

• shape of orbit is _____ (nearly circular)

• _____: when Earth is closest to sun (in *winter*)

• _____: when Earth is farthest from sun (in *summer*)

• Earth’s path is slightly wavy due to moon's gravitational pull as it revolves around the Earth

• orbital speed = 107,160 km/hr

Also:

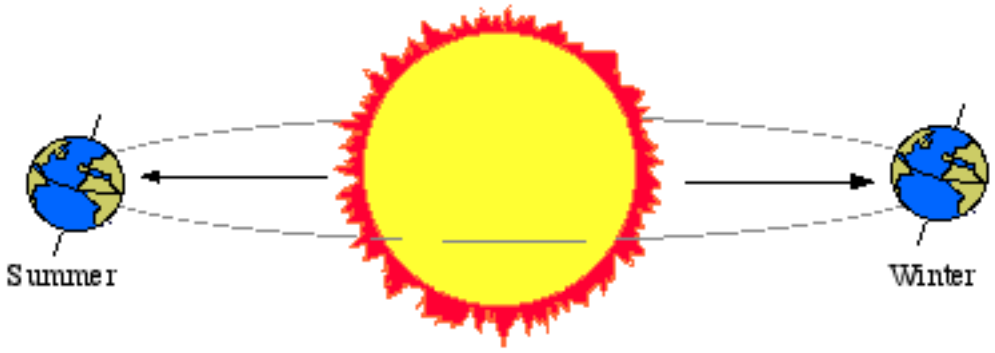
• sun revolves around center of Milky Way every 250 million years

• galaxies are rushing apart as if the universe were exploding (it is!)

## SEASONS

Solar energy is most concentrated where Earth faces sun most directly (near _____ )

Seasons change as Earth orbits the sun (with _____ tilted axis):




• sun is never directly overhead except between tropics of _____ (23.5° N)

and _____ (23.5°S)

• sun never rises more than _____ above horizon at the poles

• poles have 2 days of 12 hrs light and 12 hrs dark, separated by a 6-month day and a 6-month night

• there is 1 day of 24 hr light and one day of 24 hr dark at the _____ (66.5° N)

and _____ (66.5°) Circles

(note: 90°- 23.5° = _____)

## 4 DAYS THAT MARK THE SEASONS

**1.** _____
• shortest day of year
~ Dec. 21

**2.** _____
• 12 hour day and 12 hour night everywhere on Earth
~ March 21

**3.** _____
• longest day of year
~ June 21

**4.** _____
• day = night
~ Sept. 21