Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Block\_\_\_\_\_\_\_\_\_\_\_\_

**Notes: What makes a planet habitable?**

**Circumstellar Habitable Zone (CHZ)** “Goldilocks Zone”– is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ around a star within which \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_-\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ objects with sufficient \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ can support \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ at their surfaces.

Sketch our CHZ

***Not too hot, not too cold (T\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_):***

 Liquid water is \_\_\_\_\_\_\_\_\_\_\_\_\_\_ to exist on the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of a planet.

 Too Close – Water \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_ the surface

 Too far – Water is \_\_\_\_\_\_\_\_\_\_\_\_, not allowing for molecules to \_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_

 Our solar system has \_\_\_\_\_\_ planet in the Goldilocks Zone (\_\_\_\_\_\_\_-\_\_\_\_\_\_\_ AU)

 \_\_\_\_\_\_\_\_\_\_\_\_ (But \_\_\_\_\_\_\_\_ had \_\_\_\_\_\_\_\_\_\_ water at one time)

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **habitable zone** (\_\_\_\_\_\_\_-\_\_\_\_\_\_\_ AU-extended to Ceres)

 Could Venus’s atmosphere be \_\_\_\_\_\_\_\_\_\_\_ to allow liquid water to exist?

Why is “liquid” water important instead of ice/steam?

***Not to big not too small (\_\_\_\_\_\_\_\_\_)***

 Planets need to have sufficient \_\_\_\_\_ to hold onto its \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, Mars \_\_\_\_\_\_\_ most of its atmosphere. If planet is too big, \_\_\_\_\_\_\_\_\_\_\_\_\_\_ could limit the development of life.

***What type of star is it?***

 To determine the habitable zone you need to know total \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ a star emits.

 OBAFGKM- Our star is \_\_\_\_-class

 Massive stars- \_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_ with radiation, zone is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_.

 Live for \_\_\_\_\_\_\_\_\_\_time, not \_\_\_\_\_\_\_\_\_\_\_\_ time for life to \_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Smaller stars- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ belts than our sun, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to the star

 Live for \_\_\_\_\_\_\_\_\_\_ time, more \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ for life to evolve.

 Ex. Kepler-62f, takes \_\_\_\_\_\_\_\_ days to complete an orbit

 Best stars to search are \_\_\_\_\_\_-\_\_\_\_ class, \_\_\_\_\_-\_\_\_\_\_ don’t live long enough



How does the HZ change with difference star types?

***Is that star stable?***

 Solar \_\_\_\_\_\_\_\_\_\_\_ from a star could \_\_\_\_\_\_\_\_\_\_\_\_\_\_ a planet in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

 New stars/old stars- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in radiation

 Middle-aged star – radiation tends to be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Liquid water- \_\_\_\_\_\_\_\_\_\_\_\_ high amount of radiation, could \_\_\_\_\_\_\_\_\_\_\_\_\_ life underwater

***A planet’s chemistry?***

Would a white dwarf be a good place to look for life?

A planet’s atmosphere will \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ a certain amount of energy from starlight and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the rest back out.

Atmosphere- Tends to \_\_\_\_\_\_\_\_\_ heat, more CO2 or methane can \_\_\_\_\_\_\_\_\_\_\_\_\_\_ the greenhouse effect and \_\_\_\_\_\_\_\_\_\_\_\_\_ the zone.

 Energy that is trapped- difference between \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ sea vs. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ volcanoes

 Atmosphere- look for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (could indicate life).

Could Venus’ atmosphere be transferred to Mars? What would our HZ be like then?

**CHZ Controversy**- Other ways for liquid water -\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ by other non-atmospheric means, and basic conditions of life in interstellar \_\_\_\_\_\_\_\_\_\_ on \_\_\_\_\_\_\_\_\_\_ planets or their \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Non-water \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to hypothetical life based on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ biochemistries.

Why shouldn’t a super Jupiter out past a HZ be ruled out for harboring life?

**Galactic Habitable Zone :** Area in a galaxy where \_\_\_\_\_\_ has the best \_\_\_\_\_\_\_\_\_\_\_ of occurring.

 Too close to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, star density increases, greater chance of being taken out by a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ explosion.

 Too far out, less stars to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the heavier \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ necessary for planets and life to form.

Why is it necessary to have a 2nd generation solar system to harbor life vs. a 1st generation solar system?



Where is the best places to look for the possibilities of life in our solar system?