**TEST #1**
**Sep 29, 2021**

1. What does it take for a hypothesis to be considered "scientific"? Building on that, how does Occam's razor apply to Newtonian vs. Einsteinian gravity?

2. Why did the geocentric system maintain such strong footing for 2 millenia? Did it constitute a valid scientific model? Why?

3. Name Kepler's 3 laws of planetary motion; what is the connection between Kepler's 3rd law and Newton's law of gravity?

4. Drake's equation is used to estimate the number of concurrent communication-capable civilizations in our galaxy.

    a) Write out Drake's equation. What variables we know, and what variables we presently do not know?

    b) Explain the logic behind Drake's equation.

    c) How could Drake's equation be modified to estimate the number of concurrent communication-capable civilizations in another galaxy?

    d) How would you write an equation that would estimate the number of habitable moons in the galaxy?

5. In class, we mentioned astrology as a typical example of pseudo-science. We kind-of eliminated magnetic coupling as a possibility to explain the influence of planetary positions on us; let's figure out if gravity can be used to explain it!

    a) What *is* pseudo-science?

    b) Mars revolves around the Sun with an orbital period of 687 days. What is its distance from the Sun?

    c) The mass of Mars is $6.4 \times 10^{23}$ kg. What is the gravitational pull of Mars on *you* at the time that Mars is nearest to Earth?

    d) Based on that number, what can you say about gravitational force being able to explain astrology?

6. How do we define life using the six-prong test? How do biologists define life? Name an exception that fails the six-prong test but can be considered alive and explain why.