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ENS 1001 - The Whole Earth Course

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Cosmosphere Homework

**1. List the main differences between the terrestrial and jovian planets.**

* Terrestrial planets are smaller in size and mass than jovian planets.
* The atmosphere of jovian planets is thicker, containing hydrogen and helium while the atmosphere of terrestrial planets is thinner and contains carbon dioxide or nitrogen.
* Terrestrial planets are close to the sun, jovian planets are further away.

**2. Now that Pluto is no longer considered a planet, the number of planets in the Solar System has dropped from 9 to 8. Does this mean that the nebular theory of the Solar System was incorrect? Justify your answer in a sentence or two.**

Pluto is considered an odd planet because it theorized that it was a planet from another solar system or simply an icy object of the Kuiper Belt. Pluto was not involved in the creation of the solar system, hence why the nebular theory will still be correct, even after Pluto was declassified.

**3. Why did astronomers originally classify Pluto as a planet after its discovery? Why was it reclassified?**

Pluto was discovered in 1930 and was considered a planet as it orbited the sun instead of the other planet. In 2003, a small object called Eris was discovered orbiting further out than Pluto and was larger in size. This discovery brought uncertainty that these small objects would also need to be defined as planets, hence Pluto was reclassified to avoid future uncertainties.

**4. Explain in 2-3 sentences how did the became Sun hot enough for nuclear fusion.**

A cloud of gas floating in space began to collapse under the force of gravity. The sun continues to compress and the gravitational potential energy is converted into thermal energy that became so hot that it could sustain nuclear fusion.

**5. Two stars, Ben and Milan, have the same spectral type. Ben is in the main sequence, Milan is a supergiant. Which star has a much higher surface temperature? Which star is bigger? Which star is more luminous? Briefly justify your answers.**

Using the Hertzsprung-Russell diagram, since both stars have the same spectral type, both Ben and Milan will have around the same surface temperature. Milan is a bigger star in size as it’s a supergiant when compared to Ben which is much smaller because it is the same spectral type. Milan will have a higher luminous intensity than Ben as supergiants rank higher on the Hertzsprung-Russell diagram than Ben’s location on the main sequence.

**6. The Kepler mission searches for Earth-like planets by looking for the dip in the brightness of a star when a planet moves in front of it. Why does this technique actually miss most of the planets?**

It must be taken into account that the planet needs to cross the star for it to be observed in the first place. The majority of planets will not cross the star from our perspective from the earth.

**7. Suppose that you have a meteorite that contains a small amount of potassium-40, which has argon-40 as its decay product and it has a half-life of 1.3 billion years. You find that in the meteorite sample 1/16 of the original potassium-40 is left, the remaining 15/16**

**has decayed into argon-40. Estimate the age of the meteorite and briefly justify your answer.**

Using the Half-Life formula we can calculate that the meteorite is 5.2 billion years old. Using the formula, , we know the initial quantity and remaining quantity of potassium-40, alongside the half-life which will allow us to find the age of the meteorite. Filling in the values we get 1.3 \* log(16/1)/log(2) which gives us the age of 5.2 billion years.

**8. Briefly discuss what caused the differences in the compositions between the terrestrial and the gas giant planets.**

Terrestrial planets have a solid surface and an atmosphere, while gas giants have no solid surface but instead have a small rocky core. Terrestrial planets are closer to the sun, which allows the planets to have a solid surface due to the heat they receive from the sun. In comparison, gas giants don’t receive large amounts of heat from the sun leaving them no solid surfaces and instead as gaseous planets.

**9. What's the difference between the formation of our Moon and Jupiter's Galilean moons?**

The formation of the moon was caused when the earth collided with another smaller planet, the debris from the impact gathered to form the moon. It is theorized that the Galilean moons are formed from the dust that was leftover from the formation of Jupiter.

**10. if we wanted to locate intelligent life in the universe, what spectral types of stars should we study? Briefly justify your answer.**

If we want to find intelligent life like ours, we would need to study the G spectral type, as our sun lies within this type. Human life has been able to exist because the sun is perfect for us, hence any stars within the G spectral type will be able to support other intelligent life.