

Astronomy Final Exam

Name: _____ Hour _____ Date: _____ Score: _____ / _____

1. The image at the right indicates that the sun is roughly 91% hydrogen atoms, 9% helium, and a small percentage of heavier elements like oxygen, carbon, etc. **The sun is about 93 million miles (150 million kilometers) from the earth – how could we possibly know what atomic elements are found in the sun?** Include and underline the following: *spectral signature*; *electron*; *photon*.

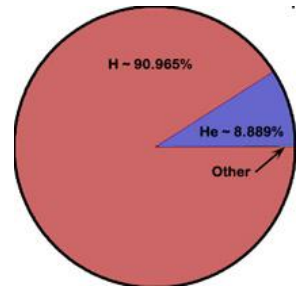
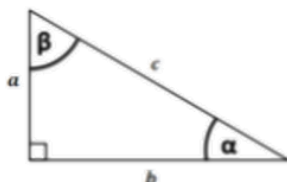


Image Source: https://teachmean.com/images/sun_atmosphere_composition.jpg

Score: _____ Comments: _____

2. Knowing the sun's distance from earth, the sun's size, and its temperature was critical for understanding how the sun functions. **How can the sun's a) distance, b) size, and c) temperature be determined without leaving the planet?** When possible, reference the image below in your explanation. Include and underline the following: *parallax*; *arcsecond*; *blackbody radiation*.

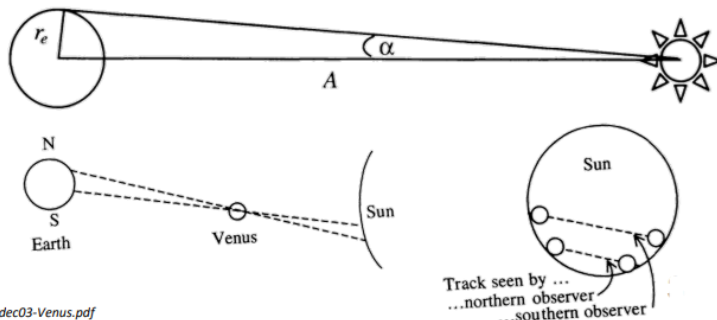
Score: _____ Comments: _____



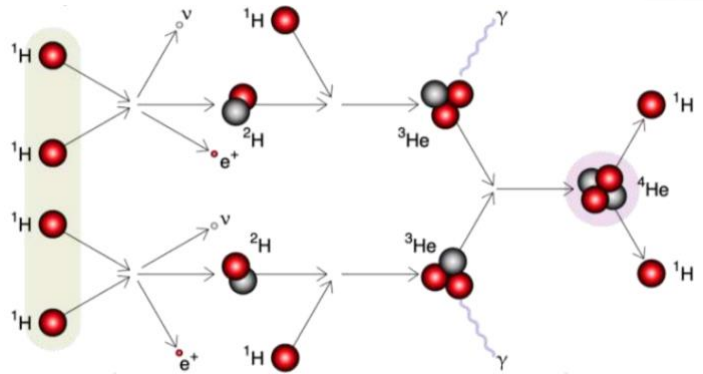
$$b = a * \tan(\beta)$$

$$\beta = 90 - \alpha$$

Source: https://www.maa.org/sites/default/files/pdf/pubs/mm_dec03-Venus.pdf

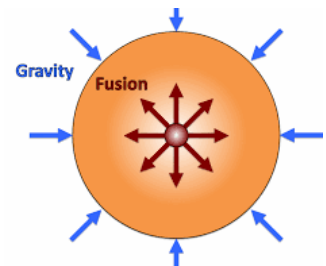


3. Early scientists, like Lord Kelvin, were puzzled how the sun could ‘burn’ for billions of years without running out of fuel. **Explain the processes that enables stars like our sun to release vast amounts of energy for billions of years.** When possible, reference the image below in your explanation. Include and underline the following: *Coulomb barrier*, *proton-proton chain*, *gamma radiation*.



Score: _____ Comments:

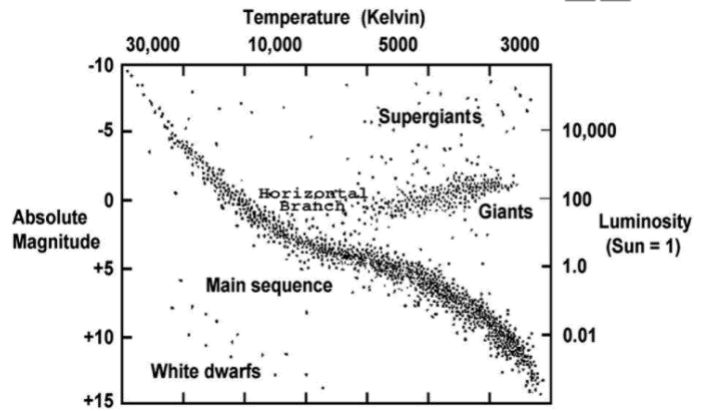
4. The relationship between gas pressure and temperature is a primary determinant of whether nuclear fusion can occur within a ball of gas. This also determines the lifespan of a star. **In the space below, explain how gravitational pressure affects nuclear fusion.** Include and underline the following: *gas laws*; *Coulomb barrier*; *hydrostatic equilibrium*.



Score: _____ Comments:

5. How can the H-R Diagram below be used to determine a star's internal structure, lifespan, and final stages? When possible, reference the image below in your explanation. Include and underline the following: *main sequence; low-mass stars; giants; white dwarfs; high-mass stars; supergiants.*

Image source: https://chandra.harvard.edu/graphics/edu/formal/variable_stars/HR_diagram.jpg



Score: _____ Comments:

6. The life cycles of most stars ultimately end in three possible outcomes. **Briefly summarize each of these three outcomes and explain how each outcome occurs.** Include and underline the following: *planetary nebula; supernova.*

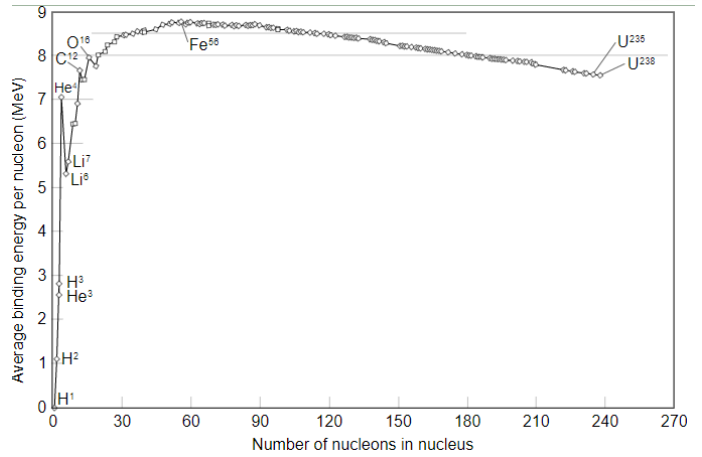
White Dwarf:

Neutron Star:

Black Hole:

Score: _____ Comments:

7. As high mass stars age, their cores eventually accumulate greater and greater proportions of iron. **Why does this limit the lifespan of stars?** When possible, reference the data at the right in your explanation. Include and underline the following: *mass-defect; binding energy; atomic stability.*



Score: _____ Comments:

8. **First explain the basic premise of the Big Bang Theory. Then summarize how each of the following provide evidence for the Big Bang:** *redshift & Hubble's Law; cosmic microwave background radiation; and hydrogen & helium ratios.*

Score: _____ Comments: