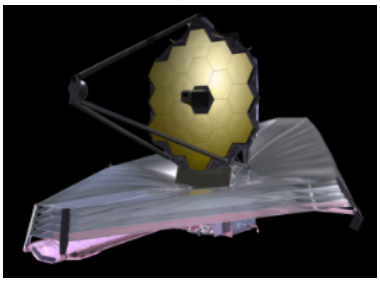
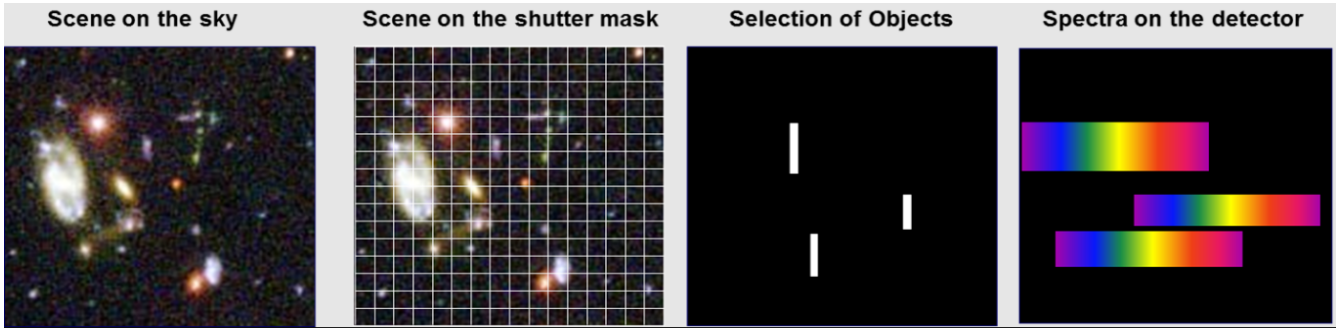
Astronomy – Final Exam

Name: _____ Hour_____Date: _____ Score:_____/_____

Directions: A 3x5 notecard with *handwritten* notes can be used. Underline required words in responses.



Background: The James Webb Space Telescope (JWST) has a significantly larger mirror, allowing for better image resolution and the ability to detect fainter and more distant objects. With its unprecedented capabilities, the JWST aims to expand our understanding of the formation of galaxies, the birth of stars, and habitable planets, and the history and evolution of our universe. (Image Source)



1. **An instrument on JWST called a spectrograph diffracts light. Summarize how diffracted light from planets, stars, and galaxies can be used to determine their chemical composition.** Include & underline the following: *electron, photon, absorption spectrum*. (Image Source)

Score
_____/3
□ Complete
□ Accurate
□ Precise

_____

_____

_____

_____

Comments:

JWST is positioned approximately 1.5 million kilometers (930,000 miles) away from Earth. At this point (called the Lagrange Point, or L2), the gravitational pull of the Earth and the Sun balance out. Finding this point required knowing the distance from the earth to the sun, as well as the size of both objects.

2. **Which of the following was originally used to determine the distance from the earth to the sun?**
   a. XXXX
   b. XXXX
   c. XXXX
   d. XXXX
   e. XXXX

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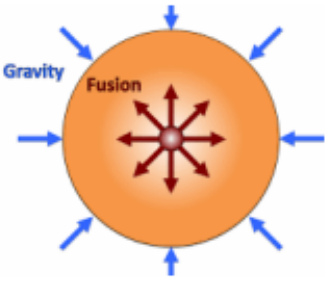
3. **Which of the following was originally used to determine the size of the sun?**
   a. XXXX
   b. XXXX
   c. XXXX
   d. XXXX
   e. XXXX

4. **Which of the following was originally used to determine the size of the earth?**
   a. XXXX
   b. XXXX
   c. XXXX
   d. XXXX
   e. XXXX

5. JWST investigates the rates at which reactions occur inside stars and the amount of energy released during each stage. This data helps scientists better understand the life cycles of stars. **Summarize how main sequence stars (like our sun) are able to release vast amounts of energy for billions of years without running out of fuel**. Include & underline the following: *proton-proton chain.*

Score
/3
□ Complete
□ Accurate
□ Precise

Comments:



6. **The largest stars tend to have the shortest lifespans despite the fact that they have the greatest amounts of matter to fuse. Why is this the case?** Include & underline the following: *hydrostatic equilibrium, gas laws.*

Score
/3
□ Complete
□ Accurate
□ Precise

Comments:

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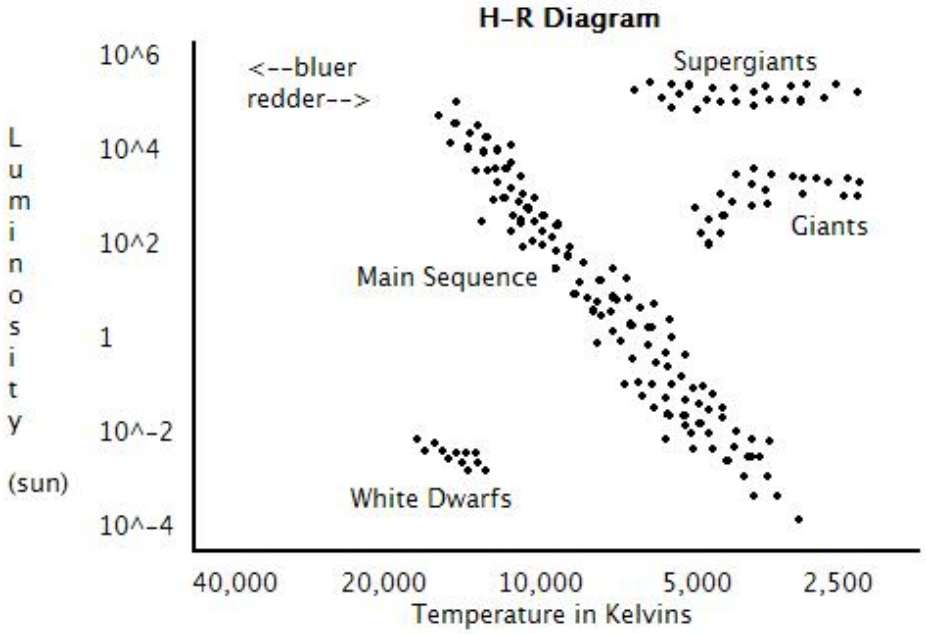
A simplified HR Diagram is shown here. This diagram categorizes stars based on their luminosity and their temperature. Use this to answer the questions below. (Image Source)



7. **Based on this diagram, these tend to be the hottest stars.** /1
   a. XXXX
   b. XXXX
   c. XXXX
   d. XXXX

8. **Based on this diagram, these tend to be the brightest stars.** /1
   a. XXXX
   b. XXXX
   c. XXXX
   d. XXXX

9. **These stars primarily fuse hydrogen into helium.** /1
   a. XXXX b. XXXX c. XXXX d. XXXX

10. **These stars will most likely become black holes or neutron stars.** /1
    a. XXXX b. XXXX c. XXXX d. XXXX

11. **These stars will form planetary nebulae in their next phase of their life cycle.** /1
    a. XXXX b. XXXX c. XXXX d. XXXX

12. **These stars primarily form the elements that are heavier than oxygen but lighter than nickel.** /1
    a. XXXX b. XXXX c. XXXX d. XXXX

13. **Our sun is currently a ____ star.** /1
    a. XXXX b. XXXX c. XXXX d. XXXX

14. **Our sun is or will become all of the following except for _____.** /1
    a. XXXX b. XXXX c. XXXX d. XXXX

15. **All of the following have active fusion occurring except for _____.** /1
    a. XXXX b. XXXX c. XXXX d. XXXX

16. **Which of the following is most likely to form a supernova?** /1
    a. XXXX b. XXXX c. XXXX d. XXXX

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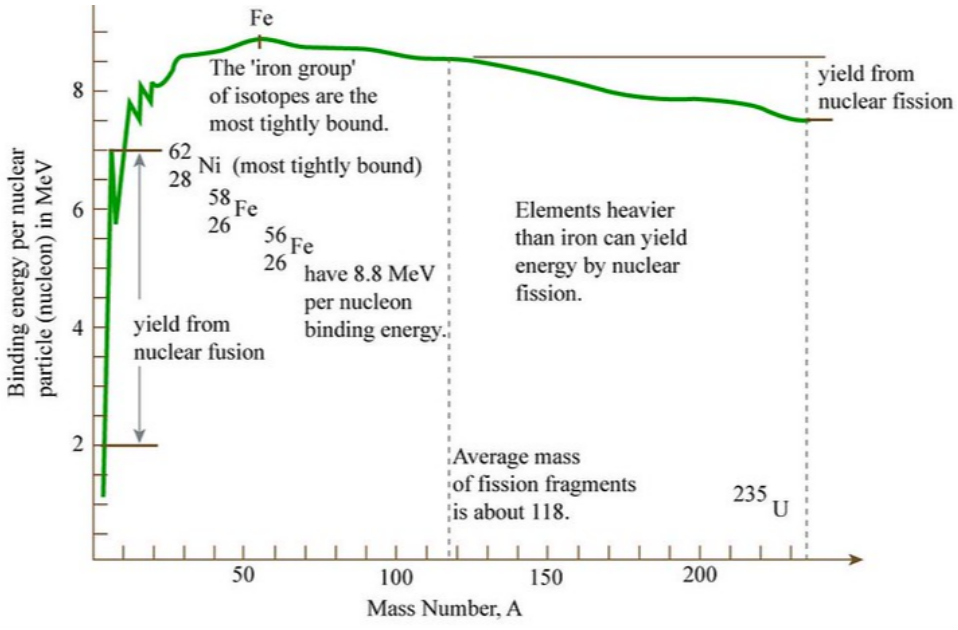
17. **Which of the following claims is supported by the data shown here?** (Image Source)
    a. XXXX
    b. XXXX
    c. XXXX
    d. XXXX



18. **Nuclear fusion and fission are opposite processes. Why can both cause a release of energy?**
    a. XXXX
    b. XXXX
    c. XXXX
    d. XXXX

/1

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

Score
/3
□ Complete
□ Accurate
□ Precise

Comments:

20. JWST has provided insights on the first galaxies formed after the Big Bang. **What evidence indicates the Big Bang occurred?** Summarize the following: *redshift; CMBR; helium ratios.*

Score
/3
□ Complete
□ Accurate
□ Precise

Comments:

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