How the Universe Works: Stars Video Worksheet

1. What is a nebula, and how does it contribute to the formation of stars?

2. Explain the process of gravitational collapse in the formation of a protostar.

3. Describe the main sequence stage of a star's life cycle. Why is it the longest stage?

4. What happens to a star like our Sun after it exhausts its hydrogen fuel?

5. Compare and contrast supernovae and neutron stars.

6. Define a black hole and explain how it forms.

7. What factors determine the brightness and luminosity of a star?

8. Explain the significance of spectral classification in identifying stars.

9. How does a star's mass affect its lifespan?

10. Differentiate between open clusters and globular clusters.

11. What role do stars play in the structure and evolution of galaxies?

12. Write the primary nuclear fusion reaction that occurs in a star's core. How does this process release energy?

13. Discuss how energy is transported within a star (e.g., radiation and convection).

14. What tools are used to observe stars, and how do they help scientists understand star properties?

15. How does the light spectrum of a star reveal its temperature and composition?

Solutions

1. A nebula is a cloud of gas and dust in space, serving as the birthplace of stars. Gravity pulls the material together to form a protostar.

2. Gravitational collapse occurs when the force of gravity causes a dense region in a nebula to contract, increasing temperature and pressure, leading to a protostar.

3. The main sequence is the longest stage in a star's life cycle, during which it fuses hydrogen into helium in its core, producing energy.

4. After hydrogen fuel is exhausted, a Sun-like star expands into a red giant, then sheds its outer layers and becomes a white dwarf.

5. Supernovae are explosive deaths of massive stars, while neutron stars are dense remnants left after such explosions.

6. A black hole forms when the core of a massive star collapses under its gravity, creating a region where not even light can escape.

7. Brightness depends on a star's distance and luminosity. Luminosity is determined by size and temperature.

8. Spectral classification categorizes stars based on temperature and light absorption lines, providing information about their composition and age.

9. Larger stars burn their fuel faster and have shorter lifespans compared to smaller stars.

10. Open clusters contain young stars and are loosely bound, while globular clusters are tightly bound groups of older stars.

11. Stars are the building blocks of galaxies, providing light and energy that influence galactic evolution.

12. The primary nuclear fusion reaction is $4H \rightarrow He + energy$, where hydrogen nuclei fuse to form helium, releasing energy.

13. Energy is transported via radiation in the core and convection in outer layers, moving heat outward.

14. Telescopes, spectrometers, and satellites are used to observe stars.

These tools analyze light, providing data on stars' properties.

15. The spectrum shows absorption lines indicating elements present, while its color reveals temperature.