Name _____

From Stellar Endings to Cosmic Mysteries: Can a Star Turn into a Black Hole?

Open-Ended Response Answer Key

1. A star's mass is a critical factor in determining whether it can transform into a black hole. Stars with masses exceeding approximately three times that of our Sun have the potential to become black holes. Our Sun, with a mass of about one solar mass, does not possess enough mass to undergo black hole formation.
2. The event horizon of a black hole is a theoretical boundary surrounding the black hole beyond which nothing can escape, not even light. It is significant because it marks the point of no return, where the gravitational pull of the black hole becomes so intense that any object or radiation that crosses it is inexorably drawn into the black hole's singularity.
3. Black holes continue to be a subject of fascination and mystery in astrophysics. Challenges include understanding the precise mechanisms of core collapse and the physics near a black hole's singularity. Astronomers employ various methods, including X-ray and radio observations, numerical simulations, and gravitational wave detectors like LIGO and Virgo, to study black holes and uncover their secrets. These efforts provide valuable insights into the nature of spacetime and the extreme conditions near black holes.