

Betelgeuse

Name _____

The sun may appear to be the brightest star in our sky, but beyond our solar system lies an even more massive red supergiant. Betelgeuse, a bright red star in the constellation Orion, is one of the most luminous stars in the sky, is 640 light years from our earth, and is 950 times as large as our sun. In fact, Betelgeuse is one of the largest stars we know: but it's also nearing the end of its life.

Betelgeuse is at a specific stage in its life: that of a red supergiant. Red supergiants are dying stars that are in the last segment of their stellar lives. As stars develop over time, they balance the inward pressure of their own gravity with the outward pressure of the fusion process creating energy. When stars grow older, fusion slows, and gravitational pressure causes the star to compress inward so that it becomes smaller and tighter. Eventually, the star's temperature increases, and its hydrogen shell heats up so that hydrogen fusion can begin again. Red giants are able to sustain themselves for anywhere from a few thousand to a million years, but eventually, they run out of chemicals for the fusion process. When that happens, the star shrinks, and an explosion in its core causes its outer layers to blow away in shells called planetary nebulae. Then, the star's core continues to collapse until it becomes a white dwarf. This process will eventually happen to Betelgeuse when it runs out of fuel and implodes under its own weight.

Over the last 100,000 years, Betelgeuse has been shedding shells of its mass, hinting at a potential transition to the next stage in its life. Betelgeuse is expected to explode soon: but in astronomical speak, soon could mean sometime in the next million years. When supergiants shed their matter and become white dwarves, that mass can fall onto a nearby white dwarf, producing a large and bright explosion called a supernova. This future is inevitable for Betelgeuse, but in the next few thousand years, it is also expected to crash into a wall of interstellar dust. The collision is predicted to happen at a speed of 66,960 miles per hour—potentially having consequences for Betelgeuse that may occur before it even has the chance to become a white dwarf. One of the largest and brightest stars might be on track for the cosmos' biggest car crash.

1. Which will happen to Betelgeuse first?

- a. Betelgeuse will shrink.
- b. Betelgeuse's core will collapse.
- c. Betelgeuse will run out of chemicals for fusion.
- d. Betelgeuse will implode under its own weight.

- 2. For which of the following durations could a red giant *not* sustain itself?**
- 3,000 years
 - 1,000,000 years
 - 5,000,000 years
 - 1,000,000,000 years
- 3. Which of the following describes Betelgeuse compared to the sun?**
- Both are located in the same solar system.
 - Both are red giants, but the sun is brighter than Betelgeuse.
 - Both are large stars, but Betelgeuse is larger and more luminous.
 - Both are bright, but Betelgeuse is closer to the Earth.
- 4. A star in the sky suddenly compresses so that its size decreases and its particles are more closely packed together. What could be the cause of this?**
- Fusion is no longer occurring, and the star's gravitational pressure is causing it to grow smaller and pack tighter.
 - Gravity is no longer affecting the star, and fusion is shrinking its size and packing it tighter.
 - Fusion and gravity are both no longer affecting the star, causing it to shrink until it disappears from existence.
 - The star is becoming a red supergiant, and the processes of fusion and gravity are occurring at too high levels to maintain its size.
- 5. Which of the following describes the formation of a supernova?**
- A red supergiant explodes, triggering a supernova explosion.
 - Shed mass from a white dwarf lands on a supergiant, causing a supernova explosion.
 - Shed mass from a supergiant lands on a white dwarf, causing a supernova explosion.
 - A red supergiant hits a wall of interstellar dust, causing a supernova explosion.
- 6. What are planetary nebulae?**
- Debris left over from a star that has imploded.
 - Layers of mass released from a shrinking star.
 - Remnants of a supernova explosion.
 - Materials that can form a new star.

7. Betelgeuse's collision with the wall of interstellar dust is described as "the cosmos' biggest car crash." What type of figurative language is found in that phrase?
- a. Simile
 - b. Metaphor
 - c. Onomatopoeia
 - d. Oxymoron