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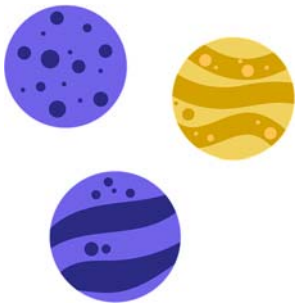

The Big Fascination

Reading Passage: Black holes are among the most fascinating and extreme objects in the universe. Their study intersects many fields, including physics, astronomy, and mathematics. A black hole forms when the gravitational collapse of a massive star compresses matter into an infinitely dense point known as a singularity. The surrounding boundary, the event horizon, represents the point of no return—any object crossing it will inevitably be pulled into the black hole.

While small black holes originate from dying stars, the universe also contains supermassive black holes millions or even billions of times more massive than the Sun. These giants reside at the centers of galaxies and may play a crucial role in galaxy formation and evolution. Their origins, however, are still unclear—some scientists suggest they grew from smaller black holes over billions of years, while others propose they formed directly in the early universe.

In recent years, the detection of gravitational waves has added a new method to study black holes. When two black holes spiral together and merge, they create ripples in space-time that can be detected on Earth. These signals, first observed by LIGO in 2015, confirmed a major prediction of Einstein's theory of general relativity and opened a new era in astrophysics.

Despite these discoveries, much remains unknown. What lies inside the singularity? Can information escape a black hole, or is it lost forever? These questions lie at the heart of a scientific puzzle known as the **black hole information paradox**, a topic that continues to challenge and inspire physicists today.

Questions:

1. **What causes the formation of a black hole's singularity?**
2. **Explain the function of the event horizon in a black hole.**
3. **Why are supermassive black holes important in understanding galaxies?**
4. **List two possible theories about how supermassive black holes formed.**
5. **What are gravitational waves, and how are they connected to black holes?**
6. **What major theory was confirmed by the detection of gravitational waves?**
7. **What is the black hole information paradox?**
8. **Why is studying black holes considered important in physics?**
9. **Based on the passage, how has our understanding of black holes evolved in recent years?**
10. **Do black holes currently raise more answers or more questions in science? Support your answer with evidence from the passage.**