

Name \_\_\_\_\_

## Tiny Heroes of the Sea: The Role of Phytoplankton in Marine Ecosystems and Carbon Cycling

### Open-Ended Response Answer Key

1. As a marine biologist studying phytoplankton in an ocean acidification-affected region, I would collect water samples to measure the pH levels and the abundance of different phytoplankton species. I would also conduct experiments to assess how increased acidity affects their growth and photosynthesis. If my findings indicate negative impacts on phytoplankton, this could disrupt the entire food web, affecting zooplankton and higher trophic levels. It could also impact the carbon pump, potentially releasing more carbon dioxide into the atmosphere.
2. A decline in phytoplankton populations would have cascading effects on the marine ecosystem. With fewer phytoplankton, zooplankton would have less food, leading to a decline in their populations. This, in turn, would impact the fish and marine mammals that rely on zooplankton as a food source. Ultimately, it could lead to a decrease in fishery yields and disrupt the balance of marine ecosystems, affecting the livelihoods of coastal communities.
3. A significant increase in atmospheric carbon dioxide levels could stimulate phytoplankton growth initially, as they benefit from increased CO<sub>2</sub> availability. However, this could lead to shifts in phytoplankton species composition, favoring some over others. These changes might have implications for higher trophic levels and could affect the biological pump's efficiency. Additionally, it could lead to more carbon dioxide being released into the atmosphere, exacerbating climate change.
4. Public awareness and conservation efforts are crucial to protecting phytoplankton and their vital role in marine ecosystems and carbon cycling. Educating the public about the importance of phytoplankton in climate regulation and biodiversity conservation can lead to support for policies and actions that reduce carbon emissions and protect ocean health. Additionally, responsible coastal and ocean management practices can help reduce human impacts on phytoplankton habitats and ensure their continued contribution to a healthy planet.

