

# Visualizing aqueous equilibria: microalgae cultures for teaching CO<sub>2</sub>-driven pH changes

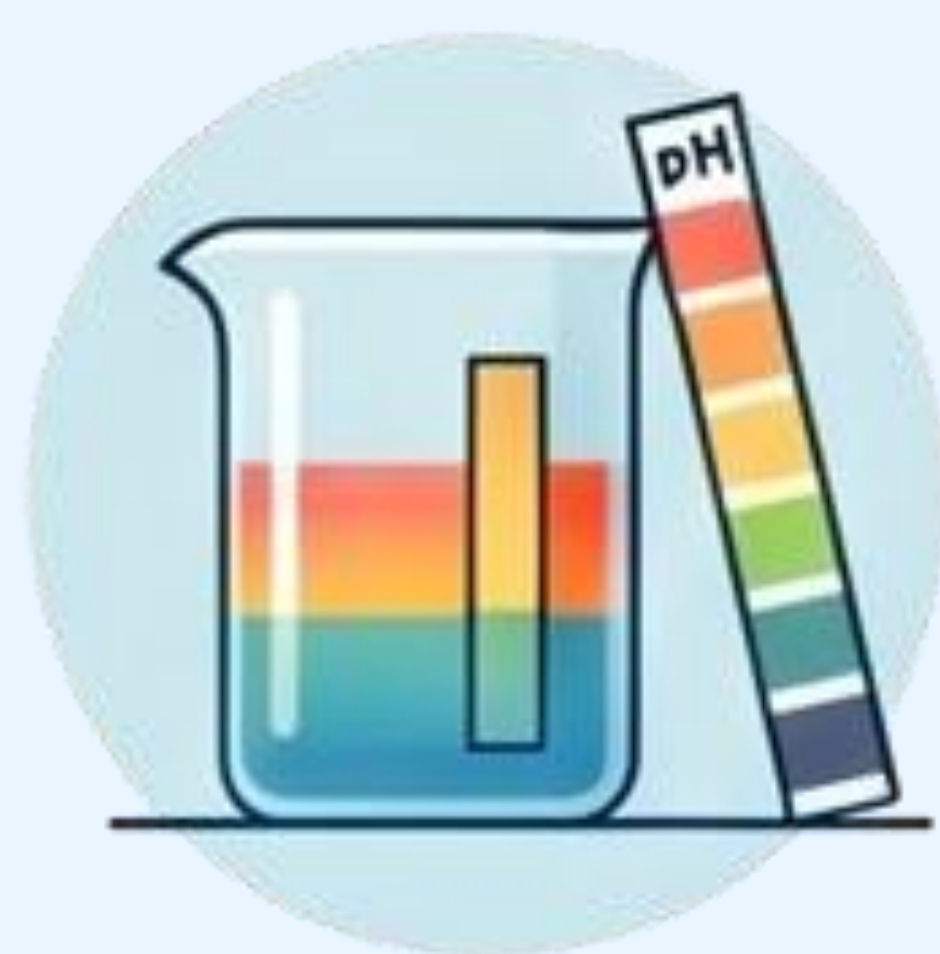
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## Introduction



### Conventional method

Traditional acid-base experiments often simplify equilibrium systems and rarely incorporate biological or environmental dynamics



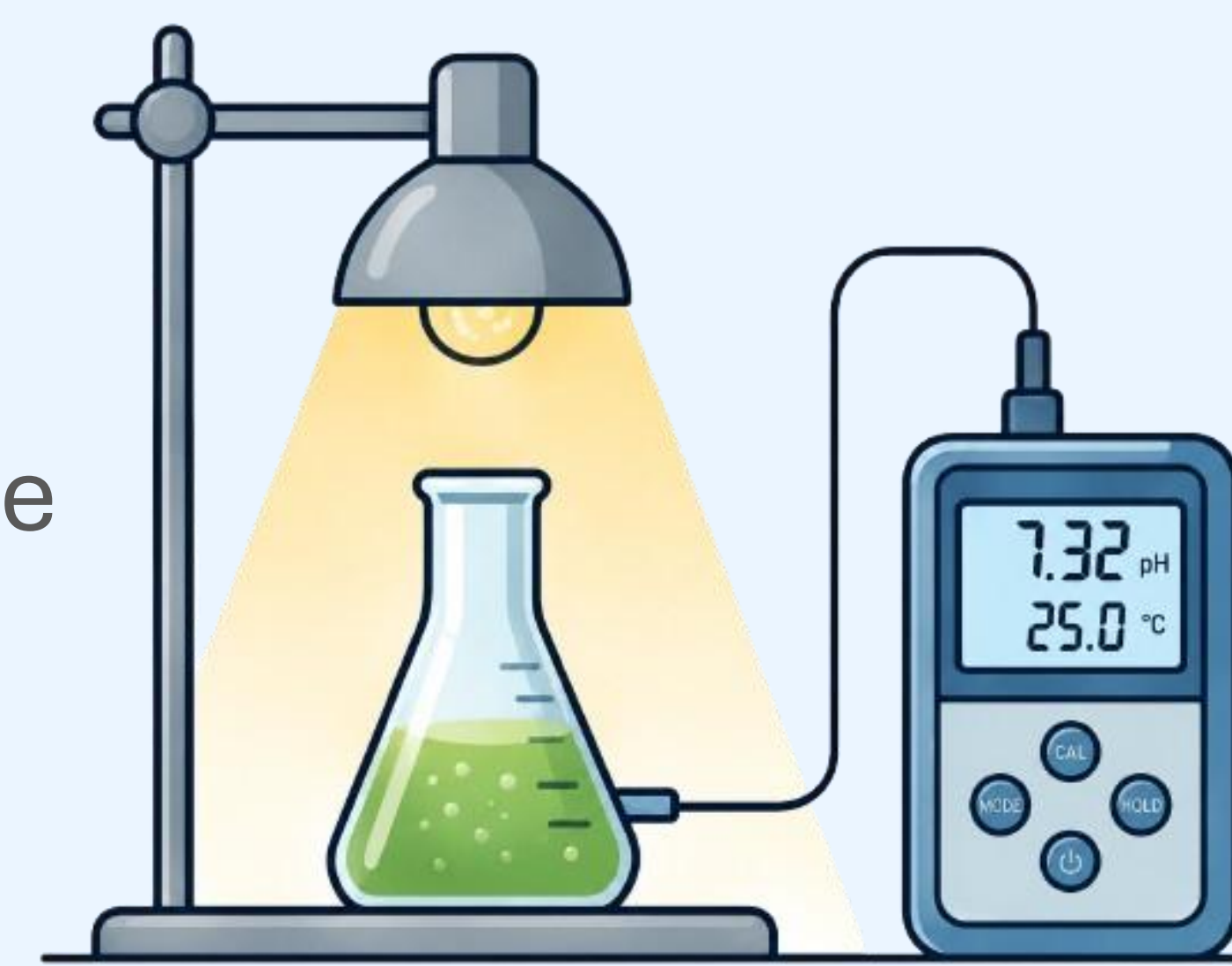
### Biological system as a model

The use of microalgae cultures is proposed as a dynamic system for studying CO<sub>2</sub>-driven pH changes

## Methodology

### Cultivation and monitoring

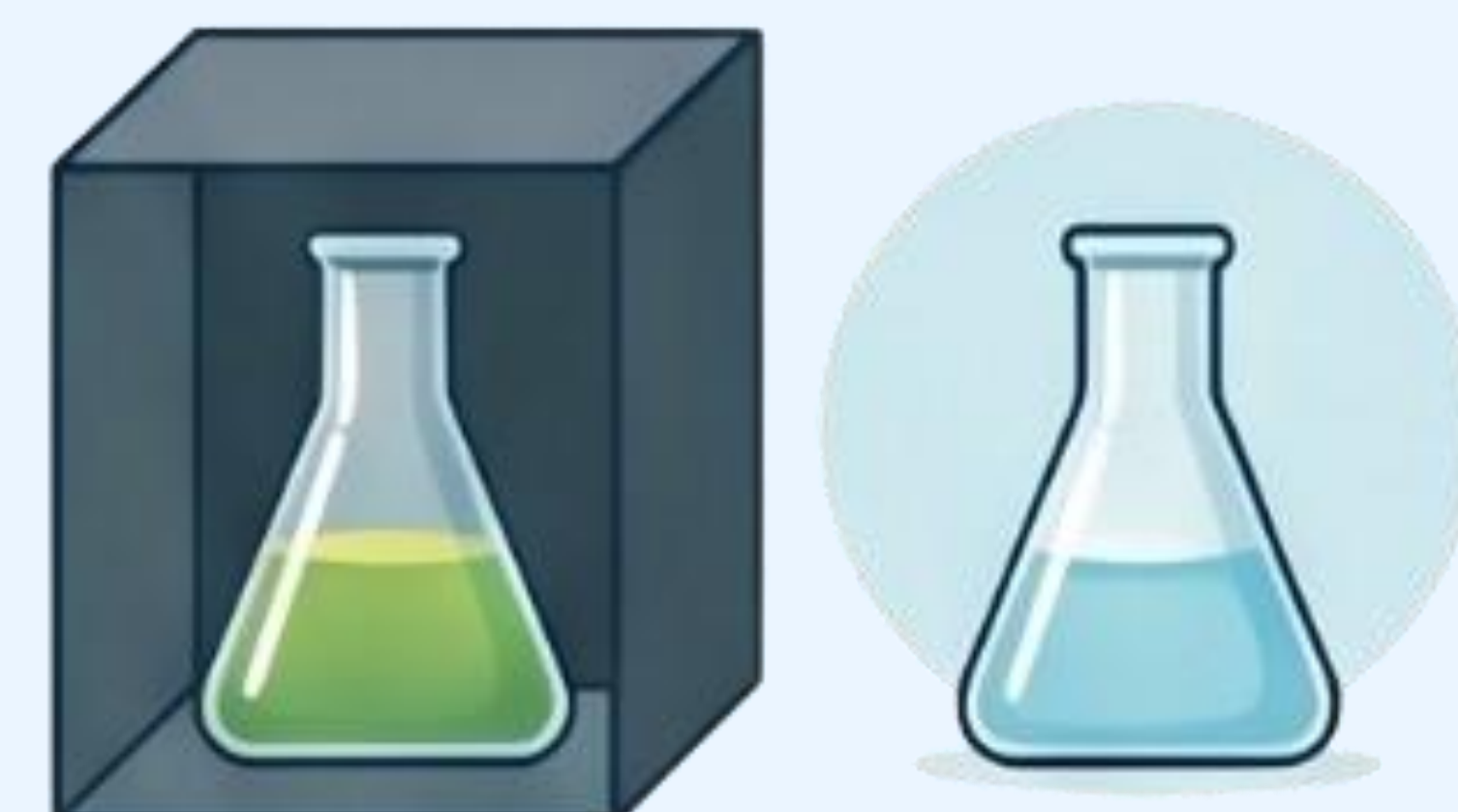
The microalgae cultures are exposed to light, and pH changes are monitored using a pH meter



pH meter

### Use of controls

Two control groups are used: microalgae in darkness and nutrient medium only

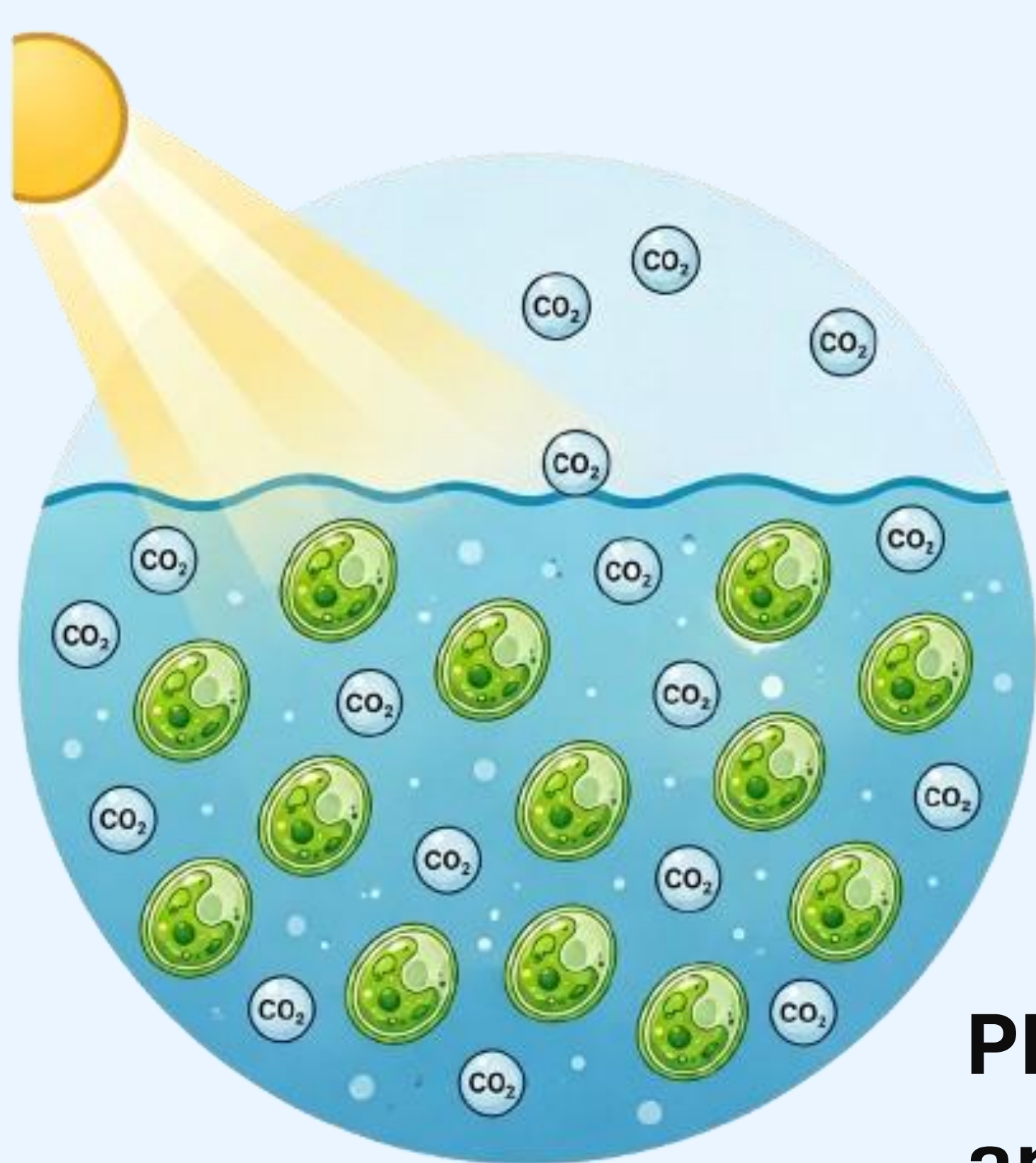
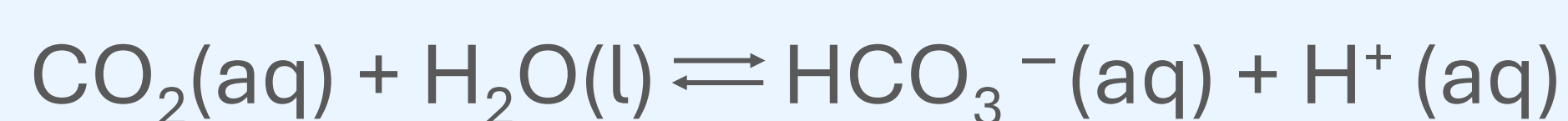


Gentle aeration was applied to maintain suspension while minimizing alterations in dissolved CO<sub>2</sub> equilibrium

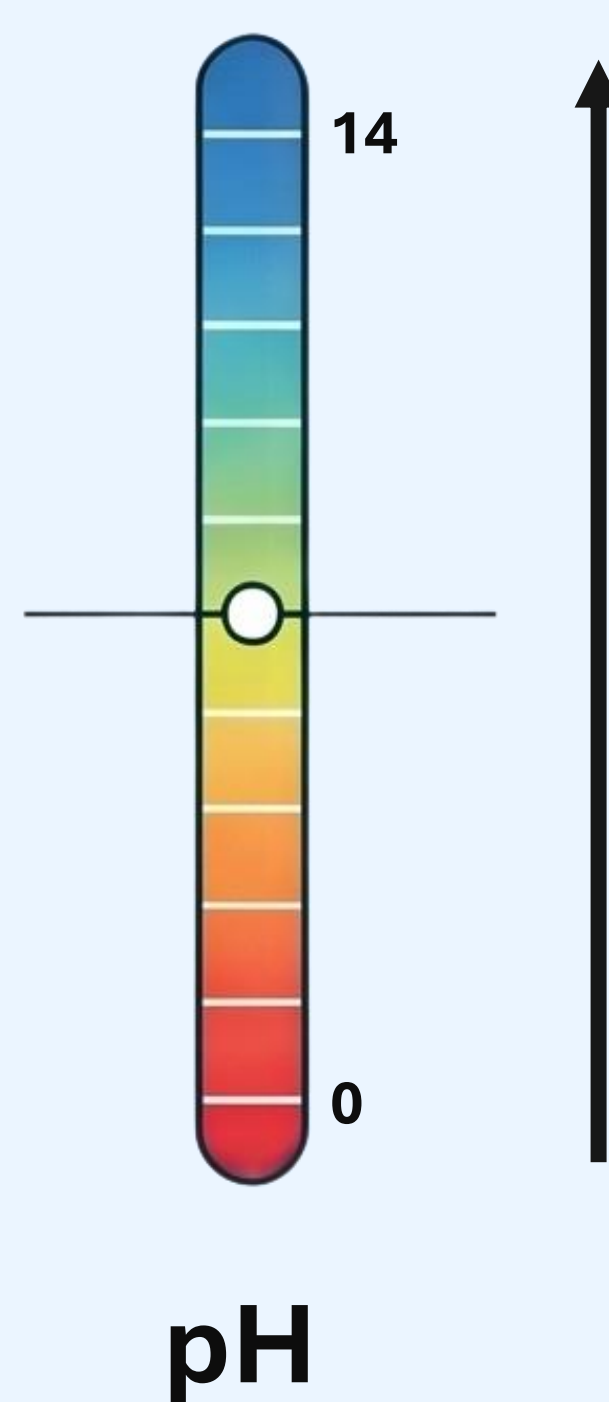
## Results

### Shifting of equilibrium

Simplified representation of the carbonate equilibrium



Photosynthesis and CO<sub>2</sub> uptake



pH

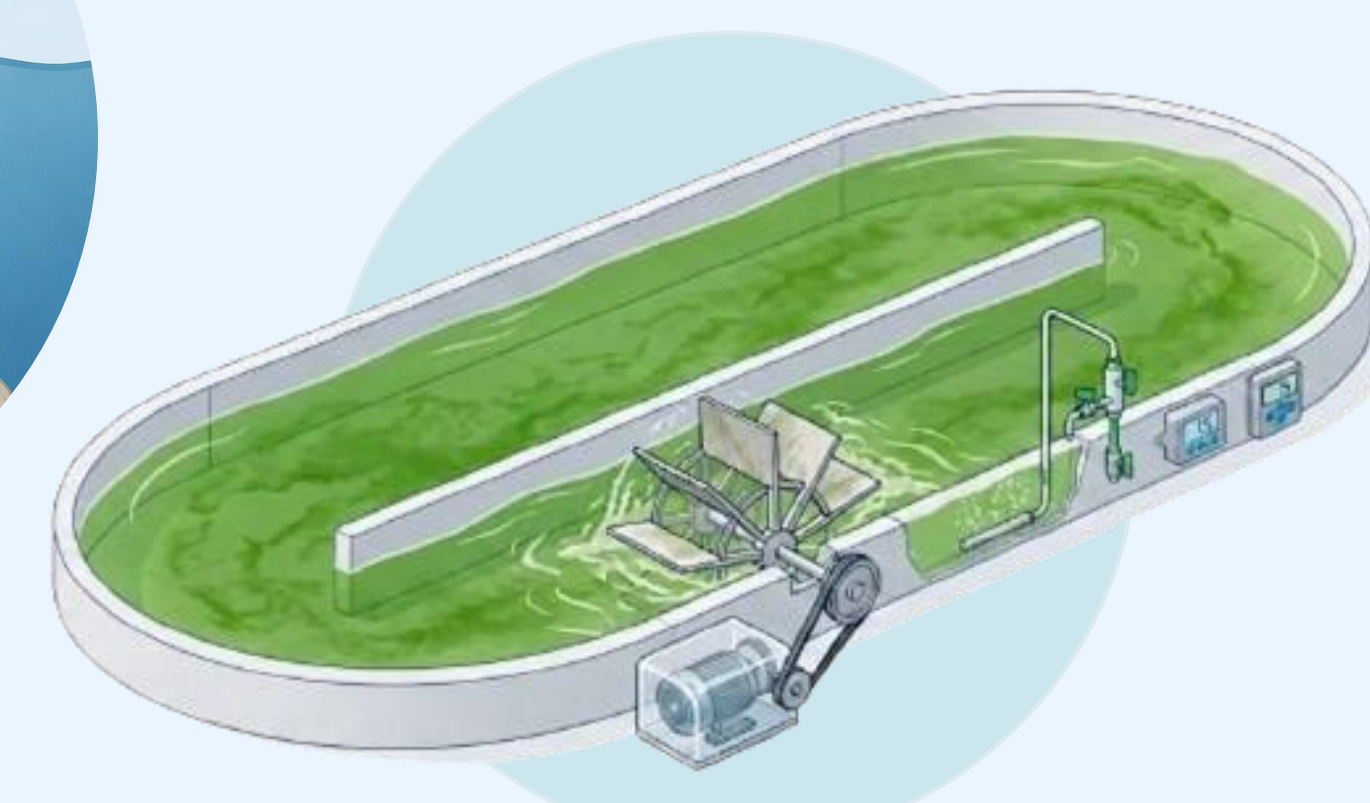
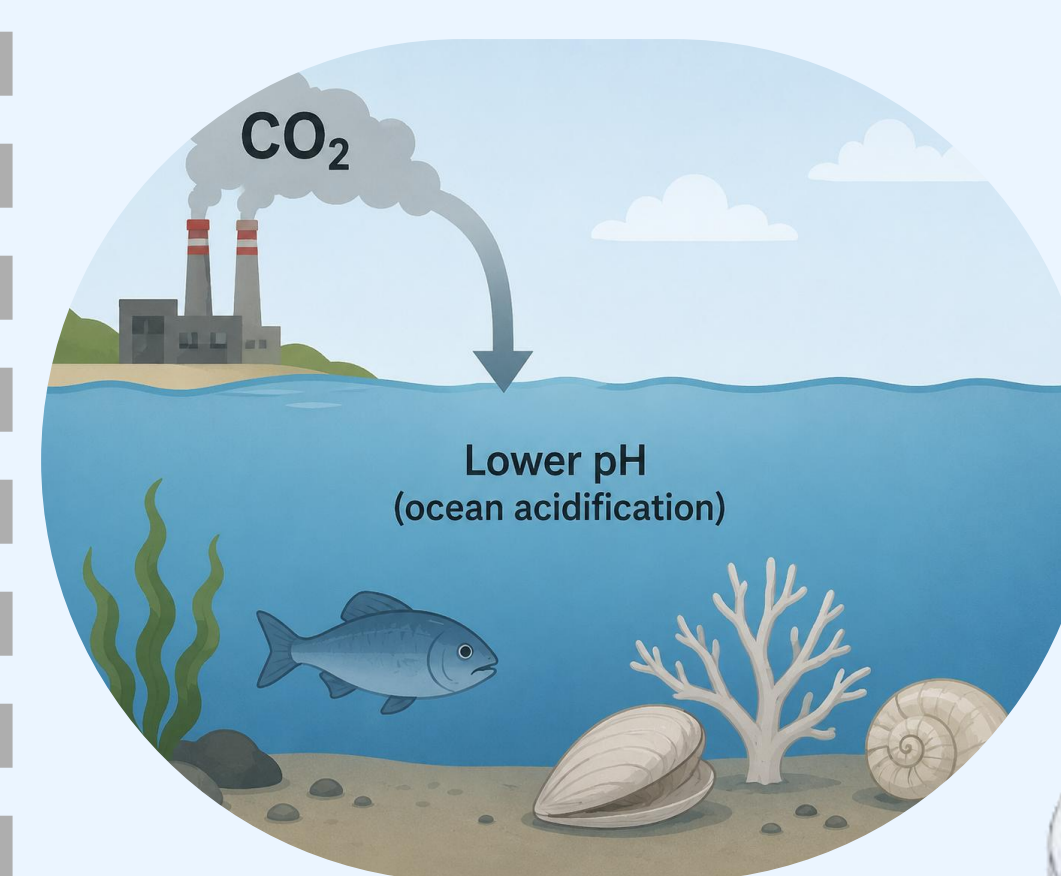
## Conclusion

### Multidisciplinary concepts

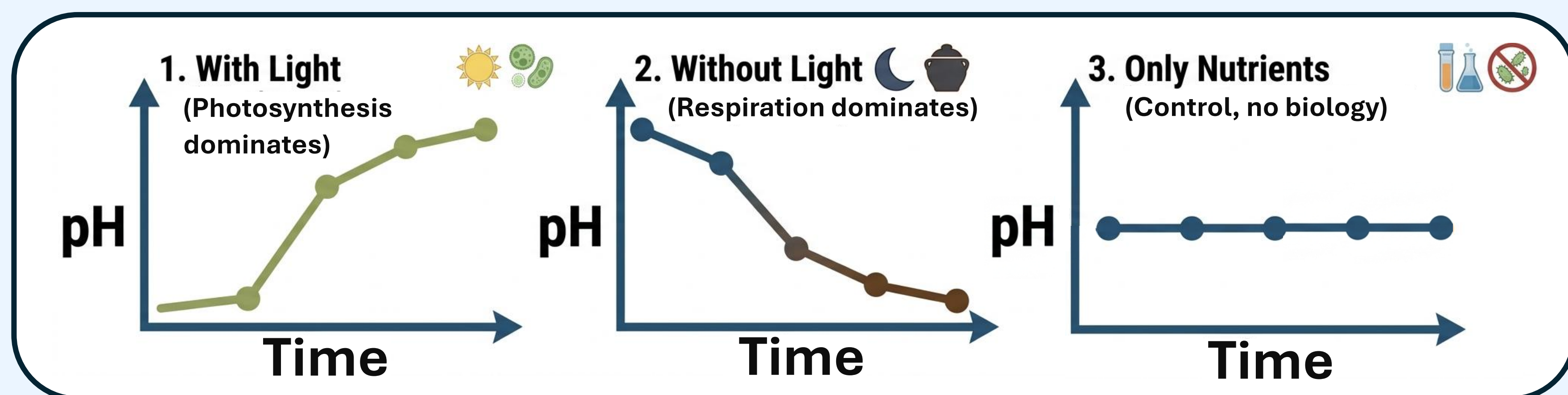


The activity integrates photosynthesis, chemical equilibrium, and environmental processes within a real-world, applied context

### Real-world applications



Discuss strategies for regulating pH



## Acknowledgement



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