

9.7 Ocean Acidification

Name: _____ Class: _____ Date: _____

Total: 10 marks

KEY WORDS calcium carbonate 碳酸钙 • ocean acidification 海洋酸化

Objective

Build the skills to answer exam questions on **ocean acidification**.

You must be able to:

- explain how CO_2 causes **ocean acidification** 海洋酸化
- describe the effect on **shell-building** organisms
- link it to the carbon cycle

1 Worked examples

Study these first. Each one shows the method for a question type used later — follow the steps and you can do the Practice and Exam-style questions yourself.

■ How it happens

The ocean absorbs about a quarter of human CO_2 . Dissolved CO_2 reacts with water to form **carbonic acid**, **lowering the ocean's pH** (making it more acidic).

■ Effect on shells

Acidification reduces the **carbonate ions** that organisms need to build shells and skeletons of **calcium carbonate** — corals, shellfish, and plankton struggle to form or maintain their shells, which can even dissolve.

■ Wider impact

Because shelled plankton are the base of many food webs, acidification threatens whole marine ecosystems and fisheries.

■ A worked link

More atmospheric CO_2 → more dissolves in the ocean → more carbonic acid → lower pH → harder for oysters and corals to build shells.

2 Practice

Now apply the methods above.

2.1 What gas dissolving in the ocean causes acidification? [1]

2.2 What acid forms when CO₂ dissolves in seawater? [1]

2.3 Which organisms are most harmed by acidification? [1]

3 Exam-style questions

3.1 Ocean acidification makes it harder for organisms to [1]

- **A** swim
 - **B** build calcium carbonate shells
 - **C** photosynthesize on land
 - **D** breathe air
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3.2 Rising atmospheric CO₂ is acidifying the ocean.

(a) Explain the chemistry linking CO₂ to lower ocean pH. [3]

(b) State one consequence for marine food webs. [1]

3.3 Explain why ocean acidification and ocean warming are both caused by rising CO₂ but are different problems. [2]

Solutions

2.1 Carbon dioxide (CO_2).

2.2 Carbonic acid.

2.3 Shell-building organisms (corals, shellfish, plankton).

3.1 B — build calcium carbonate shells.

3.2 (a) The ocean absorbs CO_2 ; it reacts with water to form carbonic acid; this lowers the ocean's pH (makes it more acidic). (b) Harm to shelled plankton at the base of the food web disrupts the whole web/fisheries.

3.3 Both come from extra CO_2 , but warming is heat trapped by CO_2 in the air, while acidification is CO_2 dissolving into the water and lowering its pH — different mechanisms and effects.