

Exercise walk-through

9.6

Ocean Warming

AP Environmental Science

Ocean warming and acidification

The ocean absorbs $>90\%$ of the extra heat and much of the CO_2 .

- heat $\Rightarrow$ coral bleaching + thermal expansion
- $\text{CO}_2 \Rightarrow$ carbonic acid, lower pH

Ocean acidification dissolves shells of calcifying organisms.



Coral bleaching from ocean heat stress

Ocean acidification

the cause

the ocean absorbs about a **quarter** of our CO₂, which forms carbonic acid

the effect

pH falls – **ocean acidification**

who it hits

corals, shellfish and plankton, which build shells and skeletons from **calcium carbonate**

and warming

warmer water bleaches coral and expands, so **sea levels** rise even before ice melt is counted

Acidification and warming come from the **same** CO₂ and hit the same organisms twice over.

Exercises 2.1-2.3

2.1 Why are ocean temperatures rising?

[1]

2.2 What happens to corals when water gets too warm?

[1]

2.3 How does ocean warming contribute to sea-level rise?

[1]

Exercises 2.1-2.3

2.1 Why are ocean temperatures rising? [1]

2.1

- They absorb most of the extra heat from the enhanced greenhouse effect
-

2.2 What happens to corals when water gets too warm? [1]

2.2

- They bleach (expel their symbiotic algae) and can die
-

2.3 How does ocean warming contribute to sea-level rise? [1]

2.3

- Warm water expands (thermal expansion)

Exercise 3.1

3.1 Coral bleaching happens when corals expel their

[1]

☐

A symbiotic algae due to heat stress

B skeletons

C predators

D eggs

Exercise 3.1

3.1 Coral bleaching happens when corals expel their

[1]

☐

A symbiotic algae due to heat stress

B skeletons

C predators

D eggs

3.1 A

- symbiotic algae due to heat stress

Exercise 3.2 (a)

3.2 A reef experiences a prolonged marine heatwave.

(a) Explain how bleaching occurs and why it can kill the reef.

[3]

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(a) Explain how bleaching occurs and why it can kill the reef.

[3]

(a)

- Heat stress makes corals expel their symbiotic algae, so they lose their food source and color (bleach); if the heat persists they starve and die

Exercise 3.2 (b)

3.2 A reef experiences a prolonged marine heatwave.

(b) State one wider consequence of losing the reef.

[1]

Exercise 3.2 (b)

3.2 A reef experiences a prolonged marine heatwave.

(b) State one wider consequence of losing the reef.

[1]

(b)

- Loss of habitat/biodiversity (or fisheries, coastal protection)

Exercise 3.3

3.3 Explain how thermal expansion of the ocean raises sea level.

[2]

Exercise 3.3

3.3 Explain how thermal expansion of the ocean raises sea level. [2]

3.3

- As seawater warms it expands and takes up more volume, so the same amount of water rises higher, adding to sea-level rise