

20.3 Pollution

Name: _____ Class: _____ Date: _____ **Total: 22 marks**

KEY WORDS eutrophication 富营养化 • climate change 气候变化 • fish 鱼类 • oxygen 氧气
• methane 甲烷

Objective

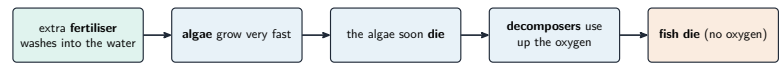
Build the skills to answer exam questions on **pollution** 污染 — water pollution and **eutrophication** 富营养化, plastics, and the **greenhouse effect** 温室效应.

You must be able to:

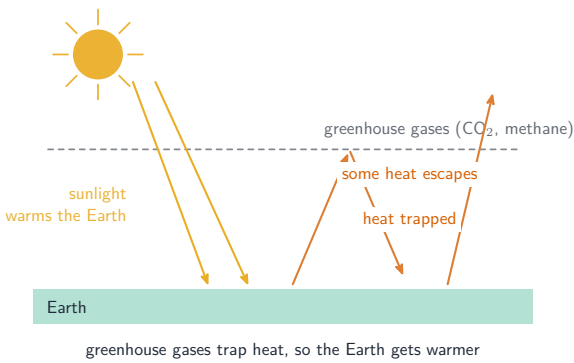
- describe the steps of eutrophication
- describe the problems caused by non-biodegradable plastics
- explain how greenhouse gases cause climate change

1 Worked examples

■ Eutrophication and the greenhouse effect



Eutrophication: extra fertiliser makes algae bloom, then the water loses oxygen and fish die



Greenhouse gases (CO₂, methane) trap heat → climate change

2 Practice

2.1 Name two greenhouse gases. [2]

2.2 State one problem caused by non-biodegradable plastics. [1]

3 Exam-style questions

3.1 In eutrophication, the fish die because: [1]

- A the water becomes too cold
- B decomposers use up the dissolved oxygen
- C the algae eat the fish
- D there is too much oxygen

3.2 Excess fertiliser runs into a river.

(a) Describe the steps of eutrophication that follow.

[4]

3.3 Fertiliser runs off farmland into a river. Over several weeks the river becomes cloudy, then the fish die.

(a) Name this process and describe, in the correct order, the **four** stages that lead to the fish dying.

[5]

(b) Explain why the fish die even though the plants were photosynthesising and making oxygen.

[3]

(c) Describe **two** problems caused by plastic waste in the sea.

[2]

(d) Explain how the greenhouse effect works, and name **two** greenhouse gases.

[4]

Solutions

2.1 carbon dioxide; methane.

2.2 they build up and harm wildlife (animals eat them or get trapped).

3.1 B. Decomposers use up the dissolved oxygen, so the fish die.

3.2 (a) fertiliser adds nitrate ions to the water; algae grow very fast then die; decomposers break them down and use up oxygen in respiration; the dissolved oxygen falls, so fish and other organisms die.

3.3 (a) Eutrophication. Nitrate and phosphate in the fertiliser make algae and water plants grow very quickly, forming an algal bloom; the bloom blocks the light, so the plants underneath die; decomposer bacteria feed on the dead material and multiply rapidly; the bacteria respire aerobically and use up the dissolved oxygen, so the fish suffocate.

(b) Most of the photosynthesis is happening in the surface bloom, not throughout the water; the bacteria decomposing the dead plants use oxygen faster than it is replaced; at night the algae respire too and add to the demand, so the dissolved oxygen falls too low for the fish.

(c) Animals swallow plastic, which fills the gut so they cannot eat and they starve, or they become entangled in it and drown; plastic does not decompose, so it stays for hundreds of years and breaks into microplastics that pass along food chains.

(d) Short-wave radiation from the Sun passes through the atmosphere and warms the Earth's surface; the surface re-radiates energy as longer-wave heat radiation; greenhouse gases absorb this outgoing radiation and re-radiate some back down, so the atmosphere stays warmer than it otherwise would. Carbon dioxide and methane.