Starter

Getting started

Words and meanings

Draw lines to match each word with its meaning.

Words	Meanings
ecosystem	poisonous
habitat	spreading uncontrollably
bioaccumulation	a network of interactions between organisms and their environment
toxic	the build-up of substances in an organism's body
invasive	the place where an organism lives

Answer

Worksheet 4.2

Words and meanings

ecosystem – a network of interactions between organisms and their environment

habitat – the place where an organism lives

bioaccumulation – the build-up of substances in an organism's body

toxic – poisonous

invasive – spreading uncontrollably

ECOSYSTEMS 生态系统

4.4 Bioaccumulation 生物富集

L2 What is Biomagnification? 什么是生物放大作用?

LO: 4.4 Bioaccumulation		
Find out about DDT 了解 DDT	Explain what happens to DDT in a food chain. 解释食物链中 DDT 会发生什么变化。	Learn what biomagnification is, and why it happens. 学习什么是生物放大作用，为什么会发生生物放大作用?

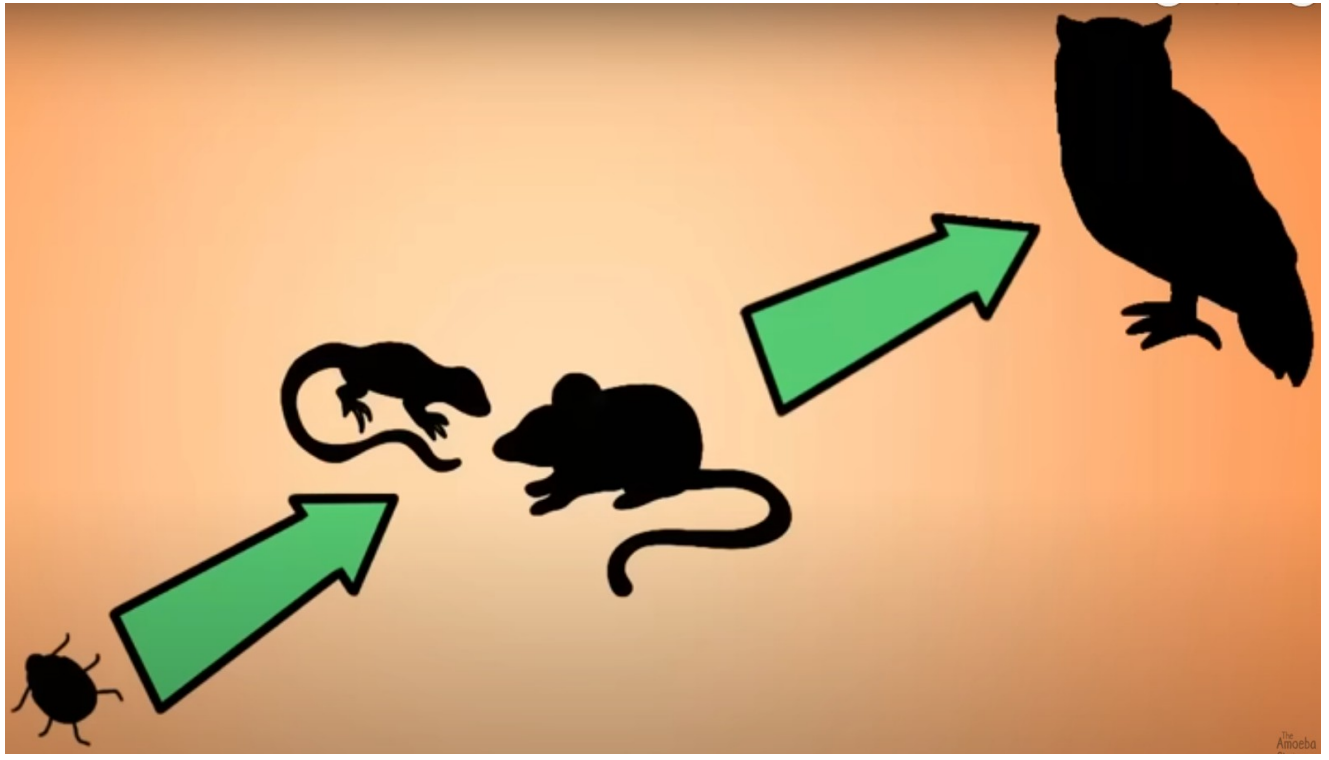
Key words

accumulate
bioaccumulation
biodegradable
biomagnification
insecticide
persistent
toxic

- 富集
- 生物富集
- 可生物降解的
- 生物放大作用
- 杀虫剂
- 持久性
- 有毒的

What is Biomagnification? Let's Watch
(Watch from 1:50 – 6:20)

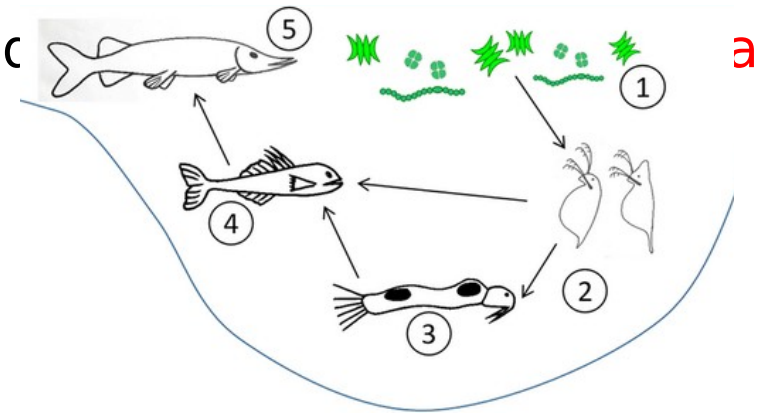
- https://www.youtube.com/watch?v=TZk6vcmLcKw



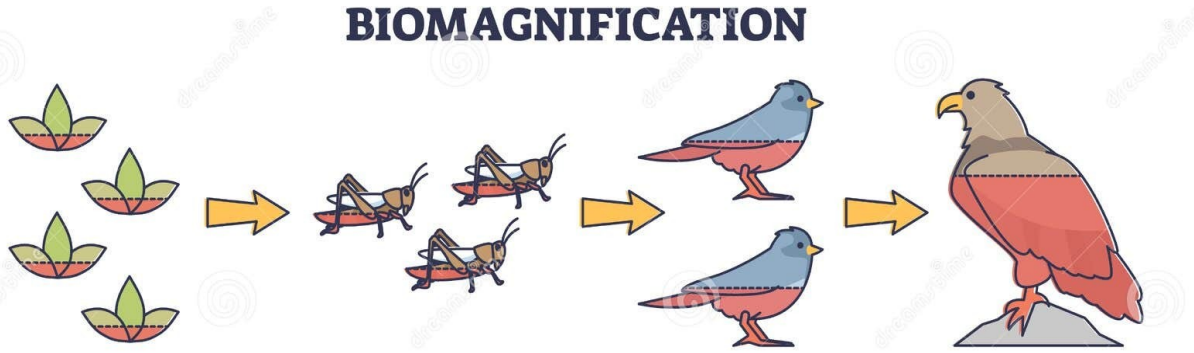
What is Biomagnification? 什么是生物放大作用?

DDT In food Chains

- Tiny algae take up some of the DDT when DDT has been sprayed onto some water.
- Shrimps eat algae, all the DDT in all of the algae that a shrimp eats over its lifetime accumulates in its body.
- All of the DDT in all of the shrimps that a fish eats accumulates in the fish's body. Eventrually, all the DDT in all of the fish that a cormorant eats in its lifetime in the cormorant's body.
- This means that the concentration of DDT in an animal's body increases as you go up the food



agnificati



Food chain

Think like a scientist

You can do this practical lesson in the classroom instead of outside

Think like a scientist

Modelling DDT in a food chain

You will need:

- at least 25 people to do this activity – it's even better with 30
- at least 200 tokens, some blue, some yellow, and some red
- a stopwatch
- a cup or small bag for each person, to put tokens in
- one card with 'eagle' written on it
- about eight cards with 'small bird' written on them
- about 21 cards with 'insect' written on them
- one bag, big enough to hold all the cards
- a method of marking out an area of ground outside, for example, traffic cones (you could borrow something from the sports department, or you might be able to use a marked-out part of a pitch used for sports)
- a clipboard and paper so that someone (the teacher, or the eagle) can record results

Method

1 Mark out an area big enough for people to run around. It could be 25 m by 25 m, but the exact size does not matter.

2 Spread all of the coloured tokens randomly in the marked-off area.

3 Put all of the cards into the large bag. Each person puts a hand into the bag and takes one card.

4 Everyone takes a small bag, and then stands on the edge of the marked-off area.

5 One person (it could be your teacher) starts a stopwatch and says: 'Go!' Each 'insect' goes and 'feeds' in the area. They do this by picking up tokens and putting them into their bags. Only one token can be picked up at once!

6 After 15 or 20 seconds, the timer shouts: 'Stop!' The insects stop feeding. Each 'insect' counts the tokens in their bag. They count how many tokens of each colour they have. The recorder writes down the results for each 'insect'.

7 The timer starts the stopwatch again, and the 'small birds' go and feed on the 'insects'. They do this by tapping an 'insect' on the shoulder. The captured insect transfers their tokens into the small bird's bag. A 'small bird' can only eat one 'insect' at a time.

Continued

8 After 15 or 20 seconds, the timer shouts: 'Stop!' The 'small birds' stop feeding. The 'insects' (whether or not they have been eaten) move outside the marked area. Each small bird counts the tokens in their bag. The recorder writes down how many tokens of each colour each small bird has.

9 Now repeat steps 6 and 7, but this time the 'eagle' feeds on the 'small birds'.

10 Go back into your classroom. The recorder can now write all of the results onto the board.

Questions

1 a Calculate the mean number of red tokens that an 'insect' collected.

b Calculate the mean number of red tokens that a 'small bird' collected.

c How many red tokens did the 'eagle' collect?

2 Copy and complete this 'food chain', using your results.

insects	→	small birds	→	eagle
… red tokens each		… red tokens each		… red tokens each

3 Explain why the mean number of red tokens that each animal has increases as you go along the food chain.

4 Now imagine that the red tokens represent DDT. What happens to the quantity of DDT in an animal's body as you go up the food chain? Why does this happen?

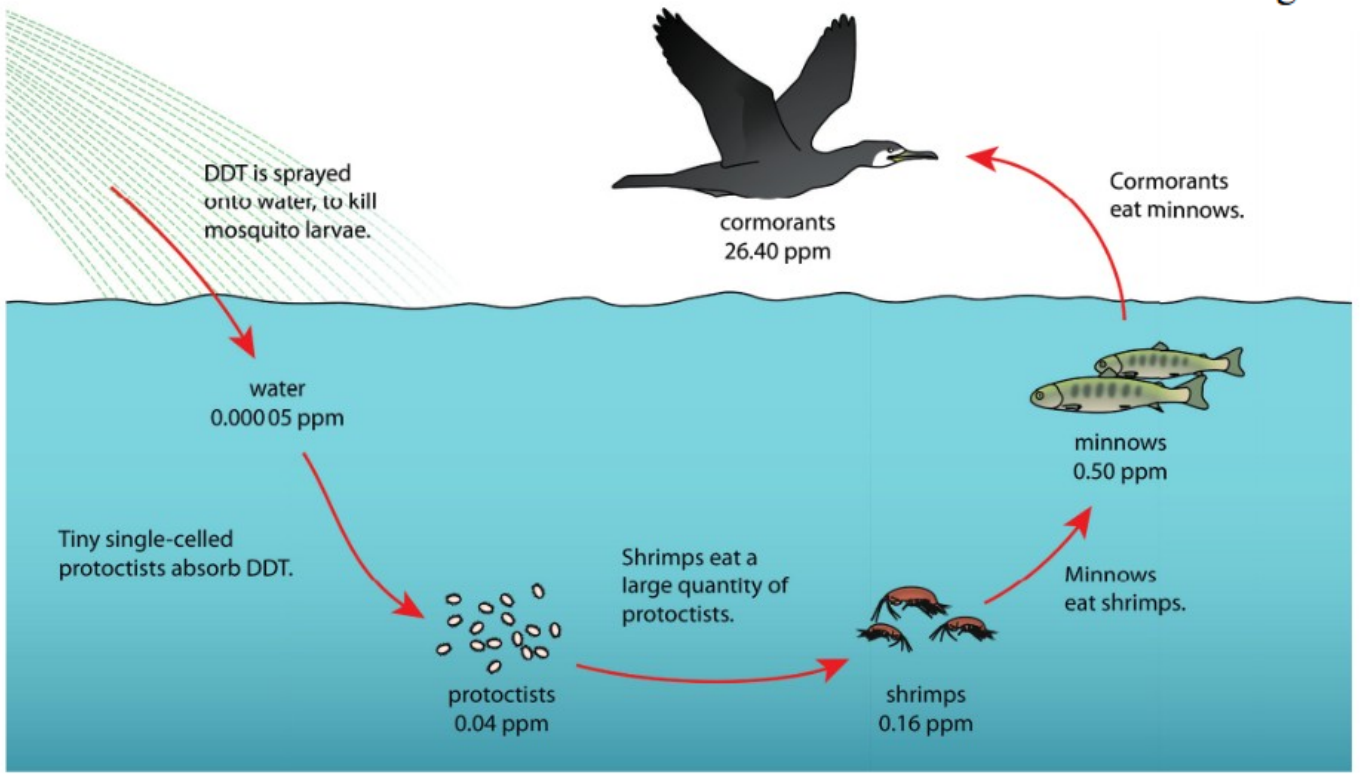
5 In this activity, you modelled what happens to DDT in a food chain. Do you think this is a good model of what happens in a real ecosystem? Explain your answer.

Task 1: What is biomagnification? 什么是生物放大作用?

Read the handout and complete the questions:

This means that the concentration of DDT in an animal's body increases as you go up the food chain. This is called **biomagnification**.

The next diagram shows how the concentration of DDT in the bodies of species in a food chain increases along the chain. The concentration is measured in parts per million (ppm). This is the number of grams of DDT in one million grams of the organisms.



Questions

1 How many times greater is the concentration of DDT in a cormorant's body than in a minnow's body?

2 Explain, in your own words, why the concentration in the cormorant is greater than in a minnow.

1.鸬鹚体内的 DDT 浓度比小鱼（米诺鱼）体内的浓度高多少倍？

2.用你自己的话解释，为什么鸬鹚体内的 DDT 浓度比小鱼（米诺鱼）体内的浓度更高。

Mark with a green pen

Questions

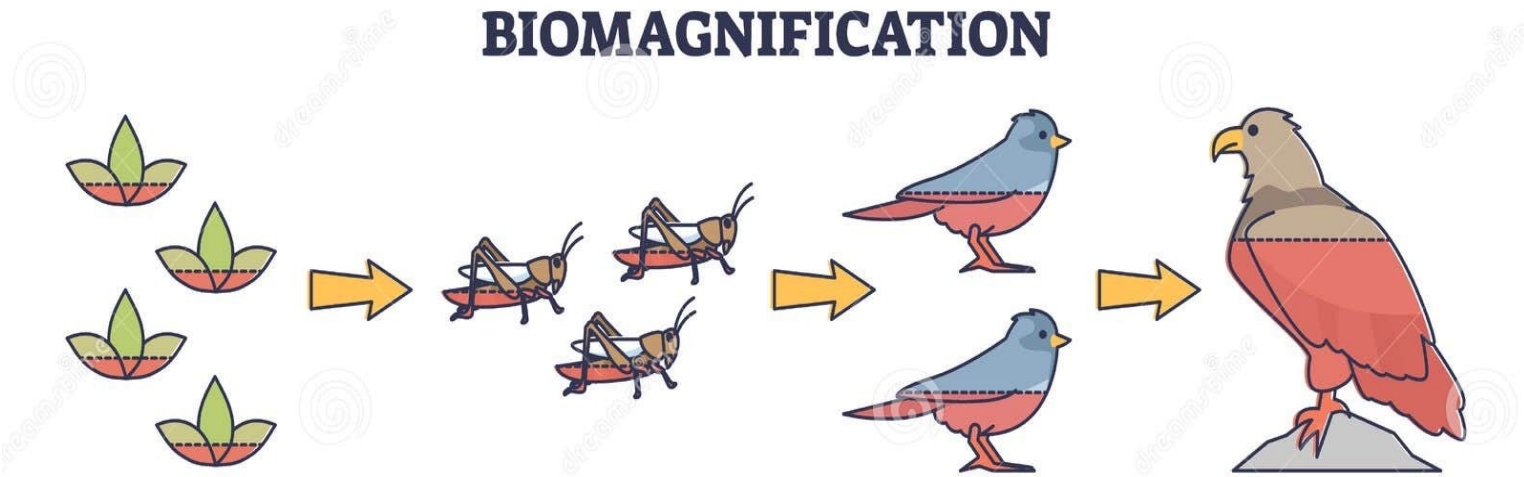
1 Minnow concentration is 0.50 ppm; cormorant concentration is 26.40 ppm. The cormorant concentration is 52.8 times greater than the minnow concentration.

2 DDT does not break down inside the cormorant's body, so all the DDT that the cormorant eats in its lifetime builds up in its body. Cormorants eat a lot of minnows, so all the DDT from all the minnows accumulates in its body.

Plenary

In your own word,write a definition of biomagnification

biomagnification: the increase in the concentration of a substance along a food chain; biomagnification happens because of bioaccumulation in the bodies of organisms at each step of the food chain



Food chain

1.画一张带标签的图，来解释“生物积累”（Bio-accumulation）。

2. 画一张带标签的图，来解释“生物放大”（Bio-magnification）。