Pyramids of Biomass

Answer the following questions:

1. State the definition of a producer.
   An organism that makes food (glucose) using sunlight, for example green plants.
2. Draw a food chain to show the feeding relationships between a lion, a zebra and grass.
   Grass → Zebra → Lion
3. Identify the apex predator in your food chain from Q2.
   Lion
4. What do the arrows in a food chain represent?
   The direction of energy transfer
5. Convert the number 12000 into standard form.
   1.2×10^4

Do Now

Taking It Further: Pyramids of Biomass

B3.2.7

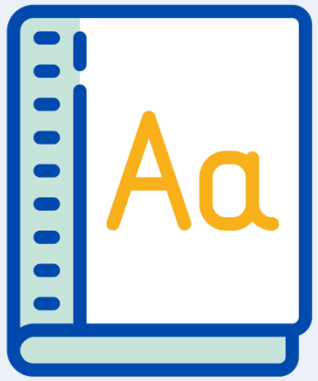
Science Mastery

B3.2.1 Prior Knowledge Review
B3.2.2 Biodiversity
B3.2.3 How Humans Affect Biodiversity
B3.2.4 How Humans can Preserve Biodiversity
B3.2.5 The Effect of Pollution on Biodiversity
B3.2.6 Global Warming
➢ **B3.2.7 Taking It Further: Pyramids of Biomass**
B3.2.8 Taking It Further: Farming and Biotechnology
B3.2.9 Taking It Further: Food Security

Following this lesson, students will be able to:

- Identify the levels of a pyramid of biomass in terms of producers and consumers
- State the approximate efficiency biomass transfer between trophic levels
- Explain the energy losses between trophic levels

Key Words:



biomass **trophic level**

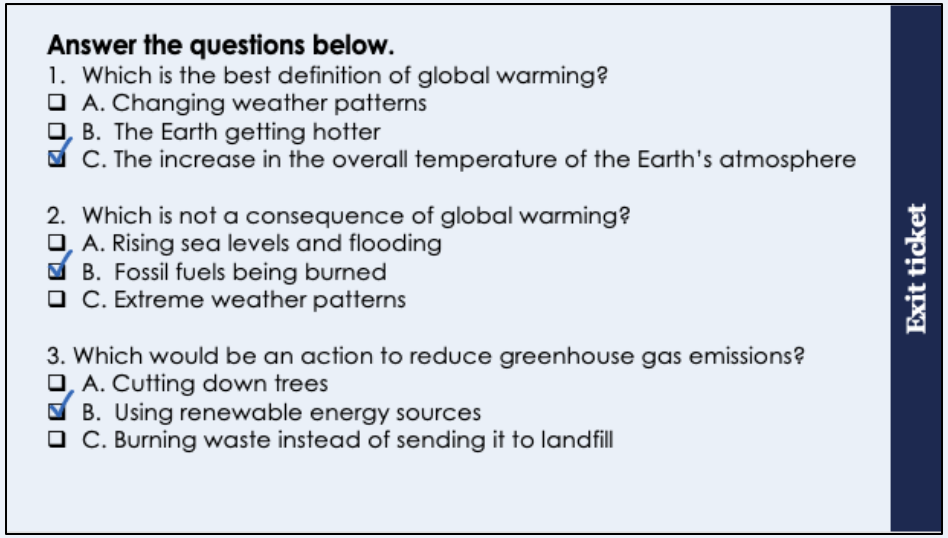
thermoregulation **efficiency**

Lesson Objectives

This is the fix-it portion of the lesson

The **fix-it** is an opportunity to respond to gaps in knowledge, especially those identified by the previous lesson's exit ticket.

- The teacher should customise this slide as needed, to facilitate
  - **reteach**, **explanation, demonstration** or **modelling** of ideas and concepts that students have not yet grasped or have misunderstood.
  - **practise** answering specific questions or of key skills.
  - **redrafting** or **improving** previous work.



Fix-it

Word: *Bio***mass**

Comes from: *Bio-* *-mass*

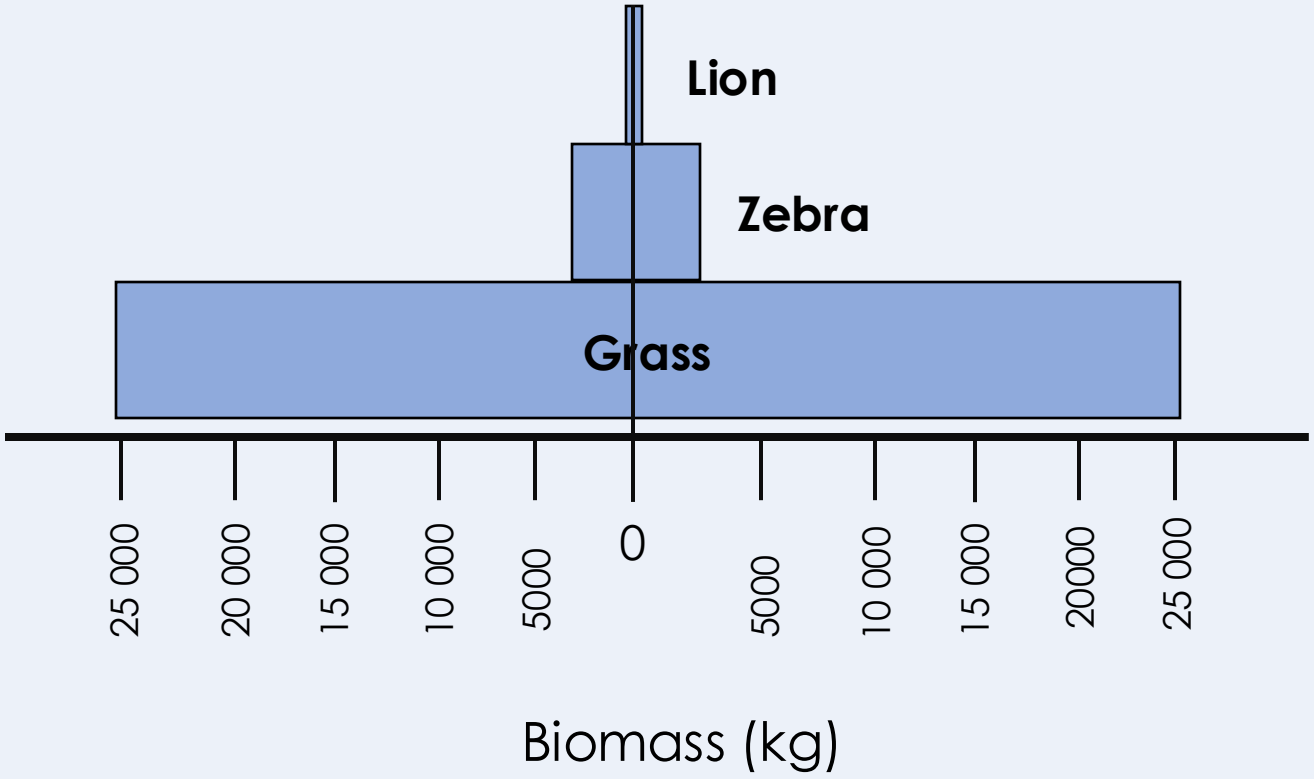
'living' *'amount of matter'*

Definition: **Biomass** is a measure of the total quantity of organic (living or recently dead) material

Pyramids of Biomass

A pyramid of biomass is a graphical representation of biomass at each **trophic level**

Biomass is **lost** between trophic levels as energy is lost between levels



Lion = 2 x 300 kg
Biomass of lion = 600 kg

Zebra = 25 x 200 kg each
Biomass of zebra = 5 000 kg

Grass = 10 000 000 blades x 5 g each
Biomass of grass = 50 000 kg

Pyramids of Biomass

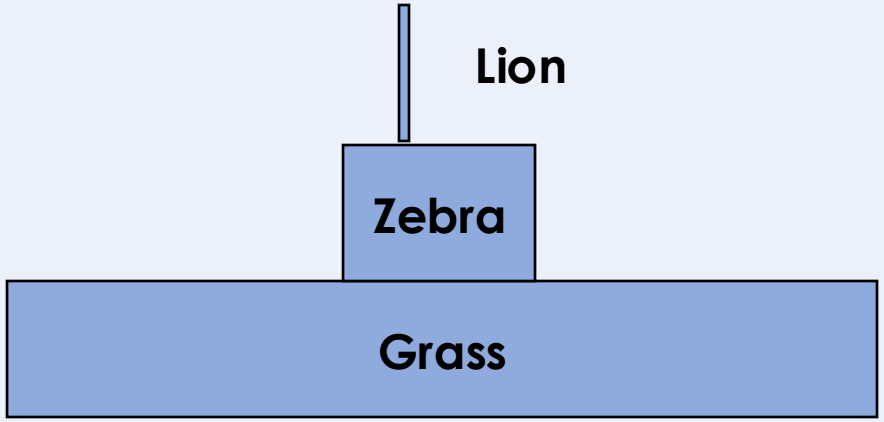
Producers are always at the bottom of a pyramid of biomass

Producers are mostly plants and algae, which transfer approximately **1 %** of the light energy they absorb for photosynthesis

Only around **10 %** of the biomass from each level is transferred to the next level

Biomass is lost through:

- Not all material is **ingested** or absorbed
- Some absorbed material is lost as **waste**
- Some is lost because energy is used for life processes
  - **Movement**
  - **Thermoregulation**



1. How many key science words can you add to this diagram?
2. What information can you get from it?

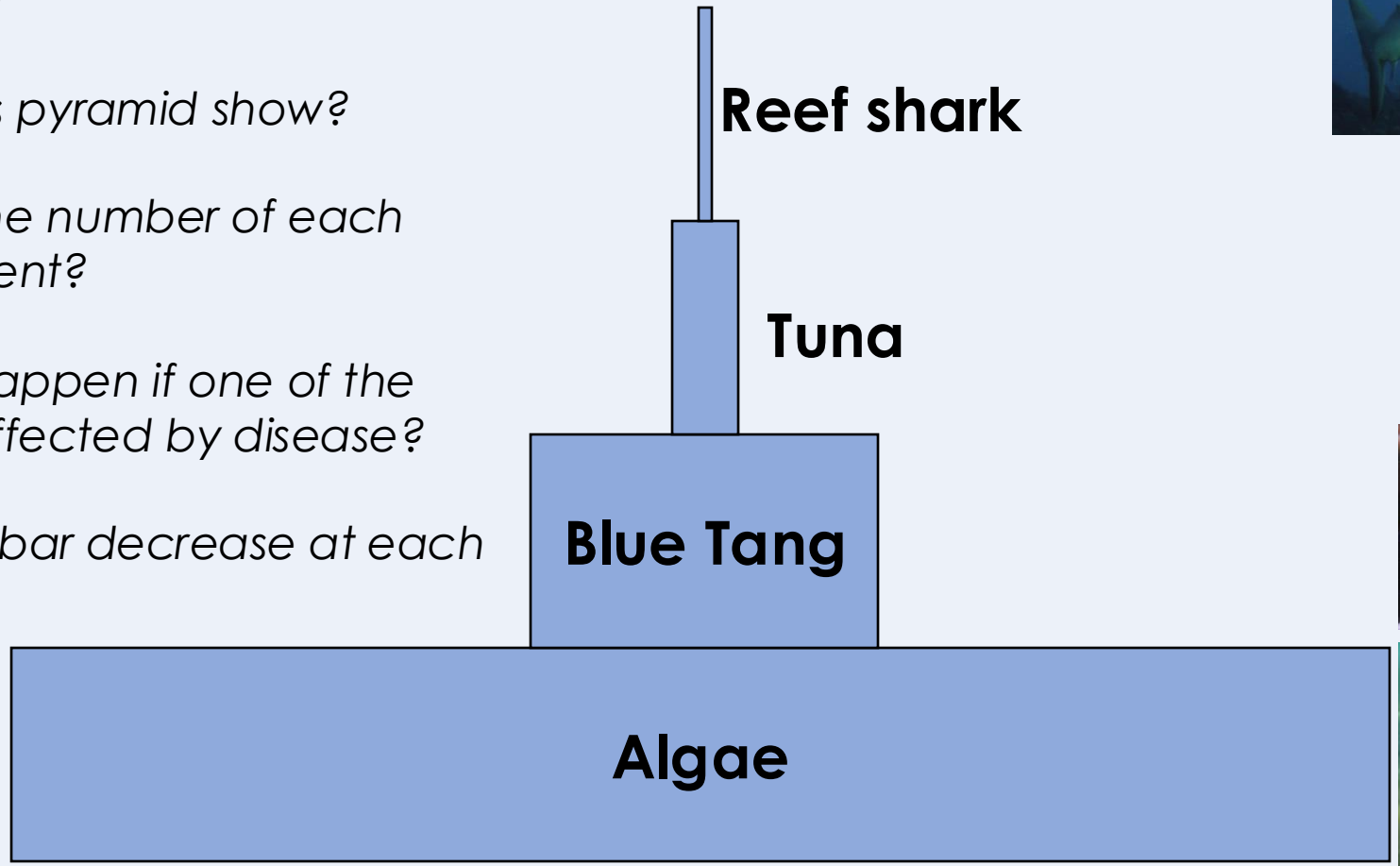
What terms can be used to describe each species?

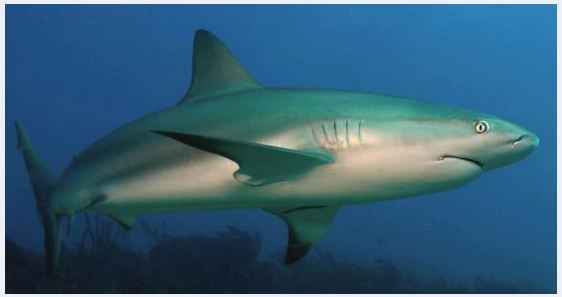
What does this pyramid show?

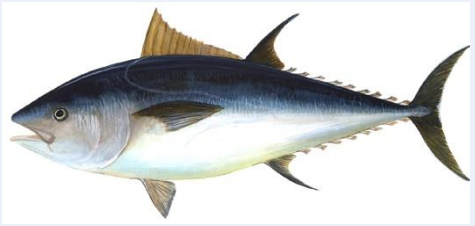
Can you tell the number of each organism present?

What would happen if one of the species was affected by disease?

Why does the bar decrease at each level?







Talk Task

Quick Quiz

Determine if the following statements are true or false:

True

False

a. Producers are found at the top of pyramids of biomass **False**

b. Producers are organisms that make their own food using sunlight **True**

c. Approximately 10 % of biomass is lost between trophic levels **False**

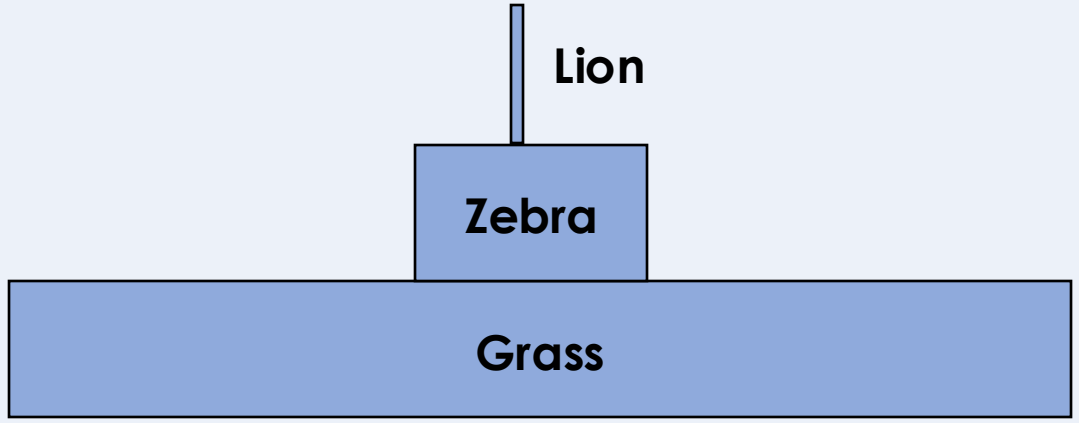
d. A pyramid of biomass is a representation of the number of each. organism present in the food chain **False**

Check for understanding

Efficiency of Biomass Transfers

The **efficiency of biomass transfers** is a measure of how much biomass has been transferred from one trophic level to another (and how much has therefore been wasted)

$$\text{Percentage efficiency transfer} = \frac{\text{biomass in higher trophic level}}{\text{biomass in lower trophic level}} \times 100$$



Efficiency of Biomass Transfers

Percentage efficiency transfer = $\frac{\text{biomass in higher trophic level}}{\text{biomass in lower trophic level}}$ x 100

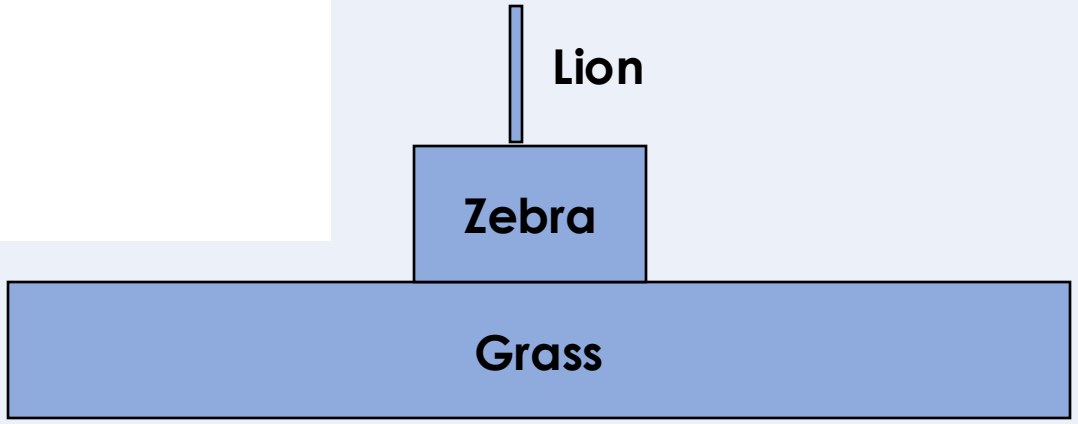
Example: Calculate the percentage efficiency transfer between zebra and lion.

Biomass of Zebra = 5000 kg Biomass of Lion = 600 kg

Percentage Efficiency Transfer = $\frac{\text{biomass in higher trophic level (lion)}}{\text{biomass in lower trophic level (zebra)}}$ x 100

$= \frac{600}{5000}$ x 100

= 12 %



Drill

1. Define biomass
2. What is a pyramid of biomass?
3. State what happens to the biomass between each trophic level.
4. Approximately how much biomass is transferred between each tophic level?
5. Give one reason as to why this happens
6. What is a producer?
7. State where producers are always found in a pyramid of biomass

Check for understanding

Drill answers

1. Biomass is a measure of the total quantity of organic (living or recently dead) material
2. A graphical representation of biomass at each trophic level
3. Biomass is lost between trophic levels as energy is lost between levels
4. Approximately 10%
5. Not all material is ingested/absorbed, some absorbed material is lost as waste, some is lost because energy is used for life processes like movement.
6. Producers are organisms that make their own food (plants).
7. Producers are always at the bottom of a pyramid of biomass

Check for understanding

I: Explain using *scientific understanding to make something clear or state the reason for something happening*

Example question:

Birds eat insects.

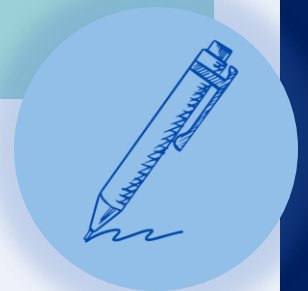
Explain why the biomass of the insects eaten by birds does not all become biomass of the birds.

Model answer:

- Not all material is ingested/absorbed
- Some biomass is lost as waste
- Some biomass is lost because energy is used for life processes
  - E.g. Movement or thermoregulation

To 'explain' your answer should:

- Begin with a **scientific statement**.
- Use 'this means that', 'because' or 'so' **to link your statement to the question**.



Writing like a scientist

We: Explain using *scientific understanding to make something clear or state the reason for something happening*

Example question:

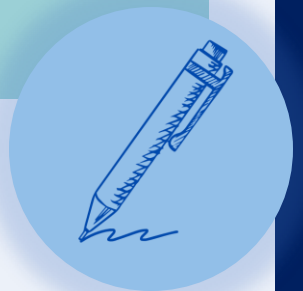
Explain as fully as you can, what eventually happens to energy from the sun which is captured by the plants in a woodland.

Model answer:

- Some energy stored in cells/used to make other molecules
- Some energy used for movement
- Some energy lost as head
- Some energy passed up food chain
- Less energy stored at each stage in food
- Some energy lost in waste
- Some energy transferred to detritus feeders
- All returned to environment

To 'explain' your answer should:

- Begin with a **scientific statement**.
- Use 'this means that', 'because' or 'so' **to link your statement to the question**.



Writing like a scientist

You: Explain using *scientific understanding to make something clear or state the reason for something happening*

Example question:

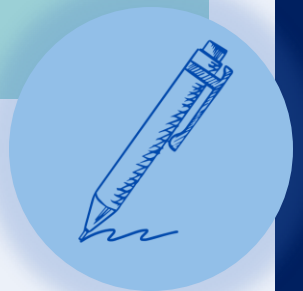
Explain why farmers make more profit from keeping pigs indoors than keeping pigs outdoors

Model answer:

- Less energy wasted on movement or less heat lost
- So, pigs grow more/get bigger

To 'explain' your answer should:

- Begin with a **scientific statement**.
- Use 'this means that', 'because' or 'so' **to link your statement to the question**.



Writing like a scientist

Answer the questions below.

1. Which is the best description of a pyramid of biomass?

- ❑ A. A representation of the number of organisms in each trophic level
- ❑ B. A diagram to show how big each organism is compared to others
- ☑ C. A representation of the amount of biomass in each trophic level

2. Which best explains why only approximately 10 % of biomass is passed on to the next trophic level?

- ❑ A. The rest of the biomass is released as waste urine and faeces
- ☑ B. Biomass is lost at each trophic level through waste and life processes
- ❑ C. Each trophic level needs to keep the rest of the biomass for themselves

3. Which best explains why food chains rarely have more than 5 levels?

- ❑ A. The apex predators cannot get any bigger
- ☑ B. Only approximately 10 % of biomass is passed on to the next trophic level
- ❑ C. Only half the biomass is passed on so it will eventually run out

Exit ticket

Feedback

Lesson B3.2.7	
What was good about this lesson?	What can we do to improve this lesson?

Send us your feedback by clicking this link
or by emailing sciencemastery@arkonline.org
Thank you!