S2 Biodiversity and Microbiology Topic

- Please work your way through the activities in this presentation.
- If you have any problems or questions please contact Miss Ayton on gw11aytonalyson@glow.ea.glasgow.sch.uk
- Remember to share your work with us on Twitter @HillheadhighScience

Lesson 1 Food Chains

1. Log into glow and search for the ”Twig” tile and add it to your launch pad. When you have done this search for and watch the Twig clip on “food chains”.
2. Copy the information on slides 3 and 4 (following 2 slides) into your jotter or notepad.
3. Use the information on slide 5 to create your own food chain and lable each organism as a producer, primary consumer, secondary consumer or tertiary consumer.
4. Play the food chain challenges through BBC bitesize https://www.bbc.co.uk/bitesize/topics/zbnnb9q

Can you identify producers and consumers from the challenges?

5. Create flash cards of the key definitions on slide 6. Click the link below to see how to make flashcards:

https://www.youtube.com/watch?v=mzCEJVtED0U

Remember you can share your completed flash cards with us through Twitter!

Food Chains

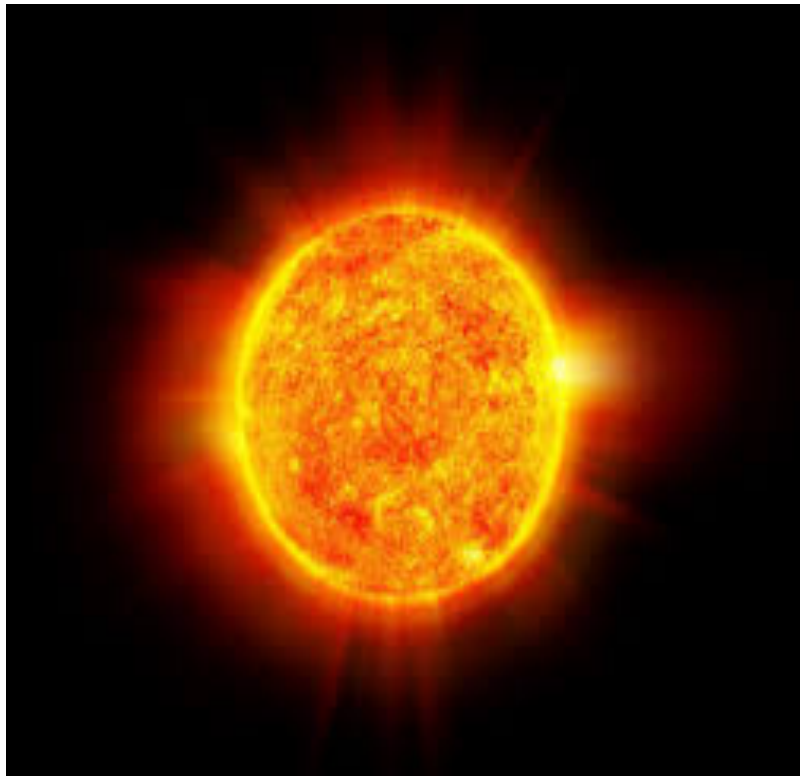
- Food chains show which organisms eat other organisms.

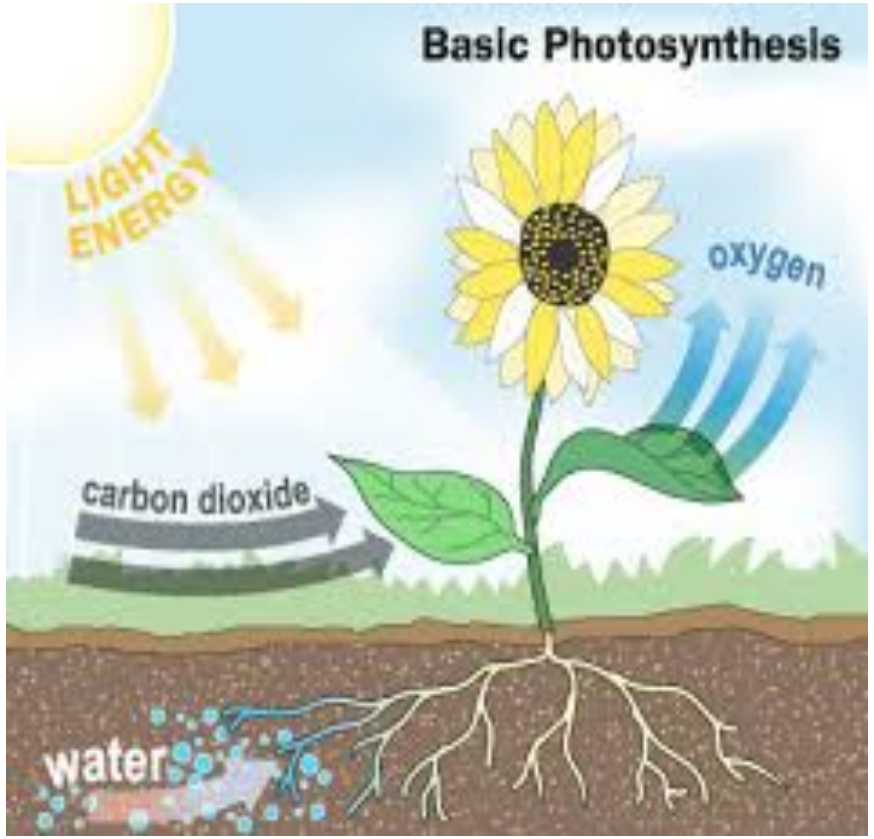
Grass → Rabbit → Fox

- The arrows show the **transfer of energy** from one organism to the next.

Where do Plants get their energy?

All plants get their energy from the sun via a process called photosynthesis.





Food Chain Activity

Create a food chain from the following organism and assign each organism as a:

- **Producer**
- **Primary consumer**
- **Secondary consumer**
- **Tertiary consumer**

What do you think these words mean?

grass

shrew

grasshopper

Barn owl

Key definitions
Create flash cards

- **Producers** - organisms which can make their own energy from carbon dioxide and water using sunlight for energy (plants)
- **Primary consumer** - organisms which eat producers (herbivores)
- **Secondary consumers** - organisms which eat primary consumers (carnivores)
- **Tertiary consumers** - organisms which eat secondary consumers (carnivores)

Lesson 2 Food Webs

1. Watch the clip from Finding Nemo (if you have the whole movie why not watch it all?!) and think of what food chains you can observe. Remember to share your ideas with us via Twitter!

https://www.youtube.com/watch?v=XWuPGKLJXe8

2. Look at the food web on the following slide and answer the questions on slide 10 “Food web questions.”

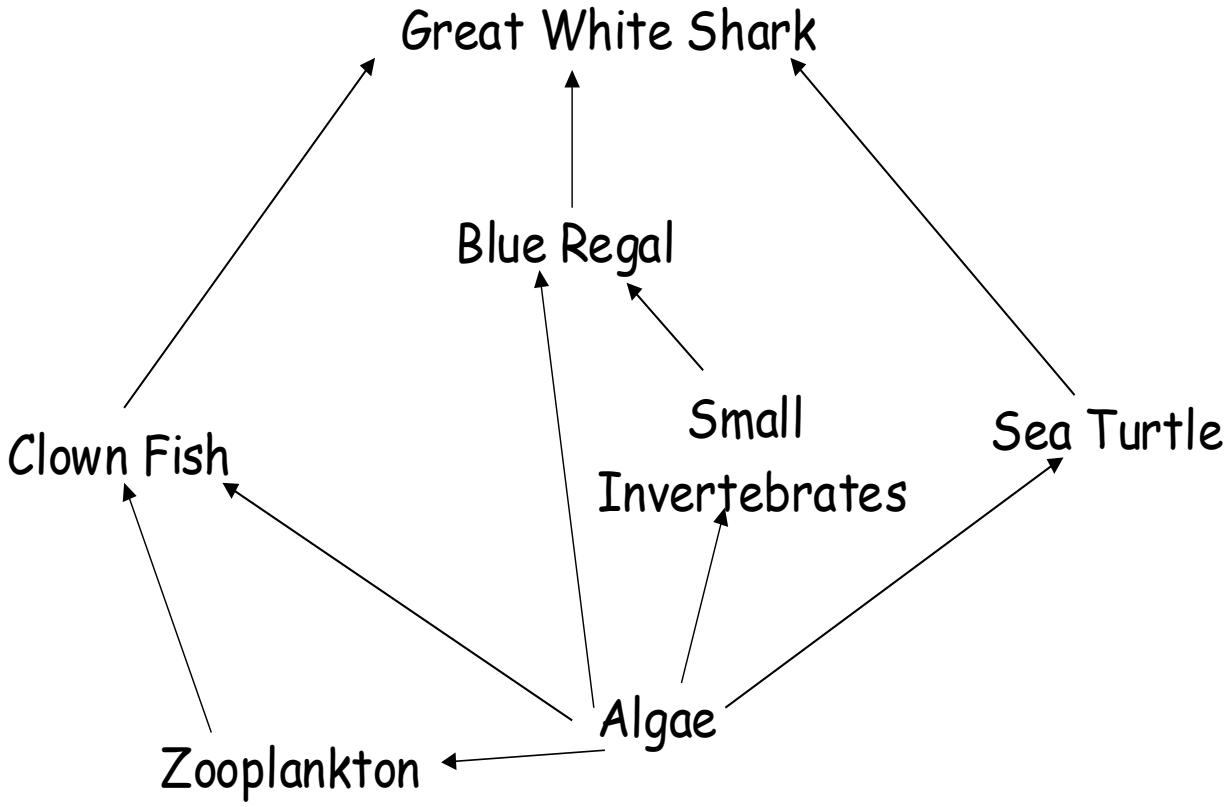
3. Visit BBC bitesize and revise the topic and complete the test bite

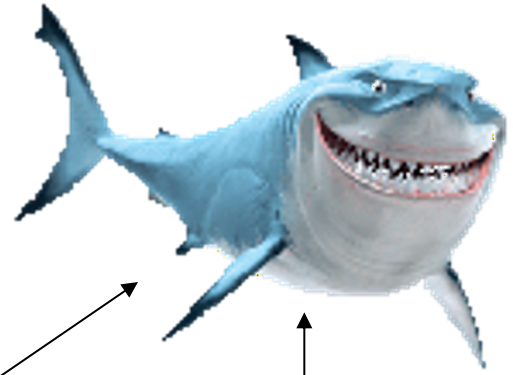
https://www.bbc.co.uk/bitesize/guides/zq4wjxs/revision/5

4. Answer the questions relating to food chain 2 (slide 11).

Food Web- example 1

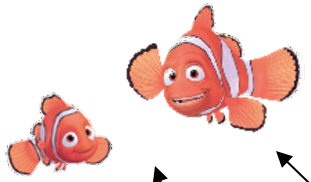
Glue the example of a food chain below into your jotters then answer the question which follows.



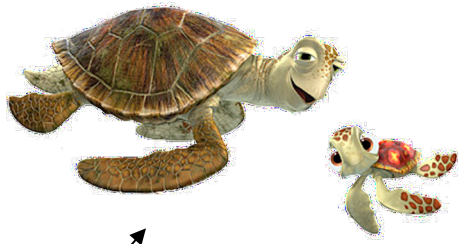


‘Bruce’ Great white shark

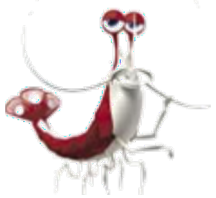
‘Nemo ‘Clown fish



Blue tang fish ‘Dory’



Sea turtle ‘Crush’’



Other fish leftovers, algae.

Shrimp ‘Jacques’

Zoo plankton

Food web Questions

Glue in the Finding Nemo example of a food web and answer the following questions on it:

1. Write down 3 separate food chains that you can spot in this food web.

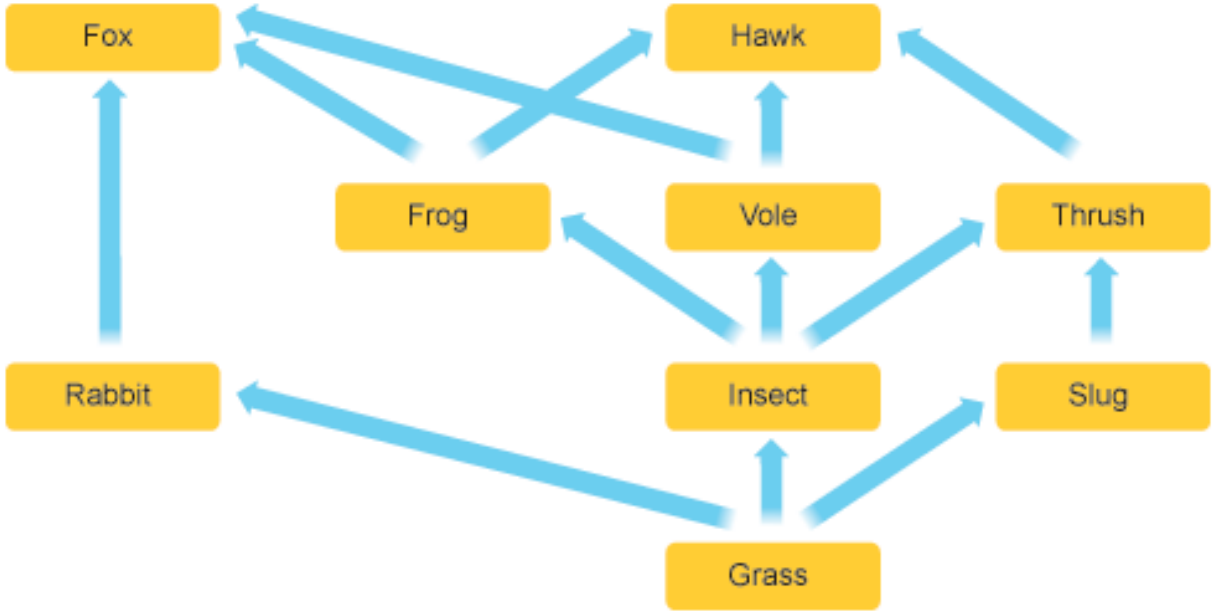
2. Name 3 organisms that eat the algae.

3. Name 2 organisms that Nemo eats.

4. How many different organisms does Bruce the shark eat?

5. From this food chain, which organism would be considered to be the top of the food chain? Explain your answer.

Food web 2



1. How many different food chains can you spot in the food web above?
2. Explain what would happen to the number of Hawks if the population of insects decreased?
3. Explain what would happen to the population of frogs if the slug population decreased?

Lesson 3 Pyramids of Numbers

1. Read slide 13 (‘Pyramids of Numbers’).
2. Copy the information on slide 14 in your jotter or into a notepad.
3. Watch the following video

https://www.youtube.com/watch?v=Qx0mz0rxe0k

4. Draw pyramids of numbers for the food chains on slide 15.
5. Read and copy down the information from slides 16 and 17.
6. Read through the information on BBC Bitesize

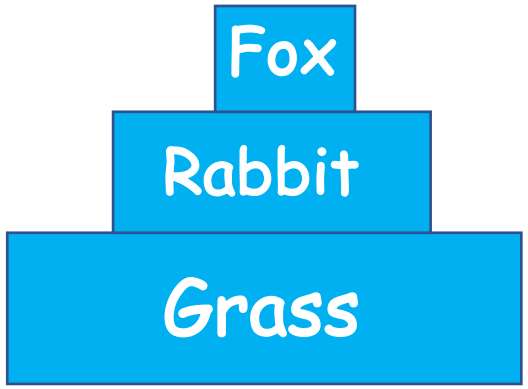
https://www.bbc.co.uk/bitesize/guides/zwnxtyc/revision/3

Pyramids of Numbers

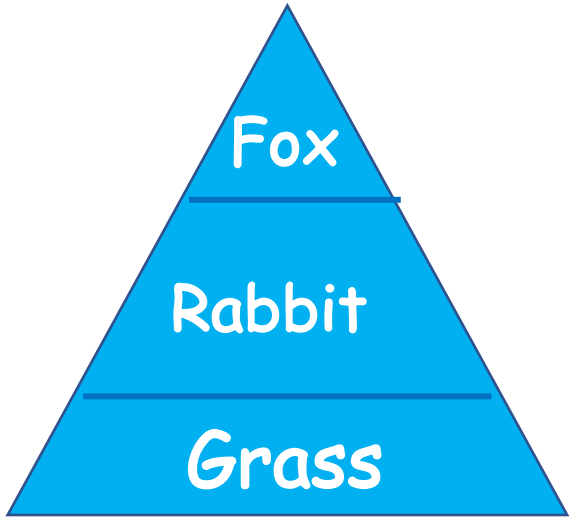
A food chain tells us what eats what but a pyramid of numbers tells us the **quantity of each organism involved** in the food chain.

There are 2 ways of presenting a pyramid of numbers:

1.

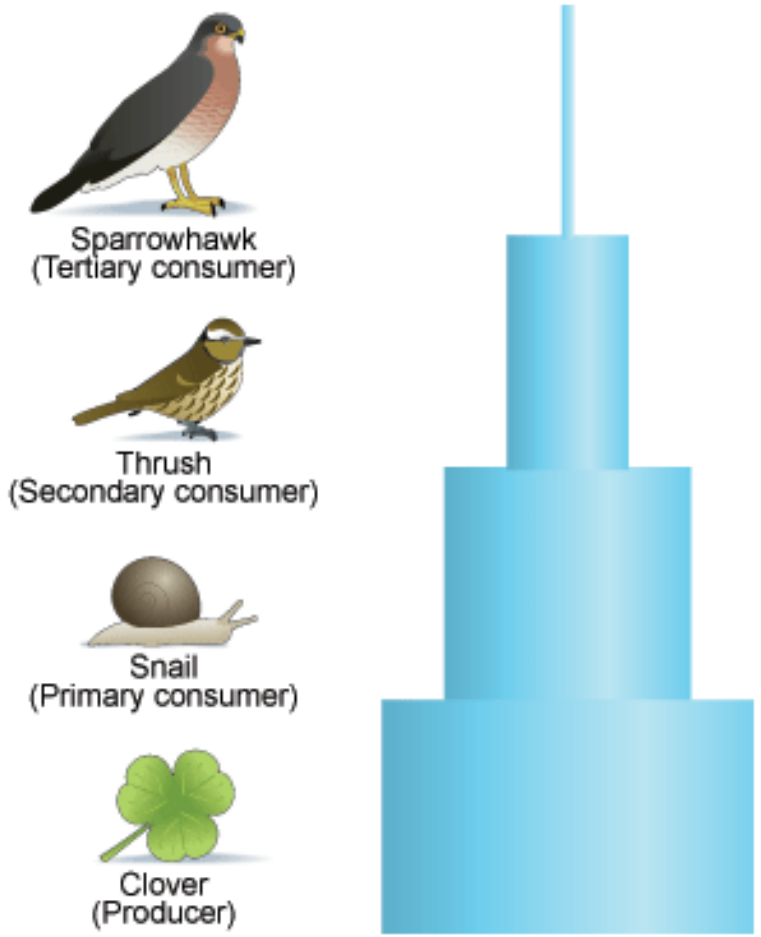


2.



Grass → Rabbit → Fox

Copy the food chain below and this example of a pyramid of numbers into your jotter.



Clover ⟶ Snail ⟶ Thrush ⟶ Sparrowhawk

Presenting food chains as pyramids of numbers

For each of the food chains below, present them as a pyramid of numbers.

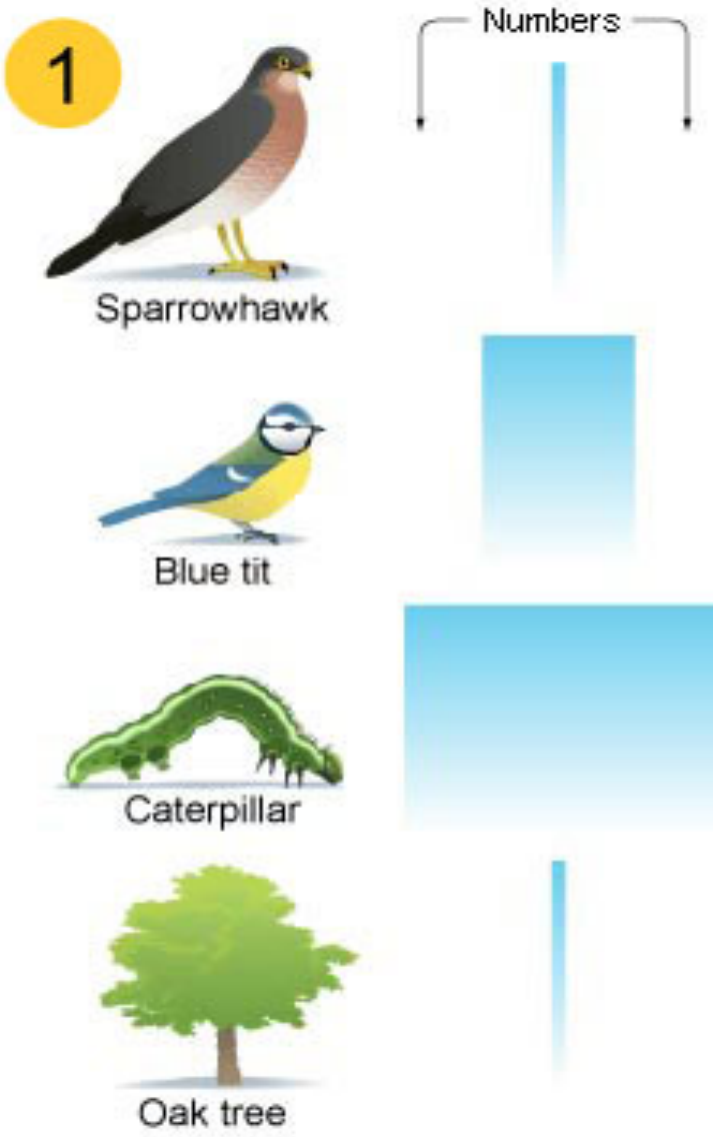
1. Grass ⟶ Grasshopper ⟶ Mouse ⟶ Snake ⟶ Eagle

2. Algae ⟶ Insect ⟶ Vole ⟶ Hawk

3. Plankton ⟶ Herring ⟶ Tuna ⟶ Human

Not all pyramids of numbers are pyramid shape.

- Copy this example of a pyramid of numbers into your jotter.



Oak Tree → Caterpillar → Blue Tit → Sparrowhawk

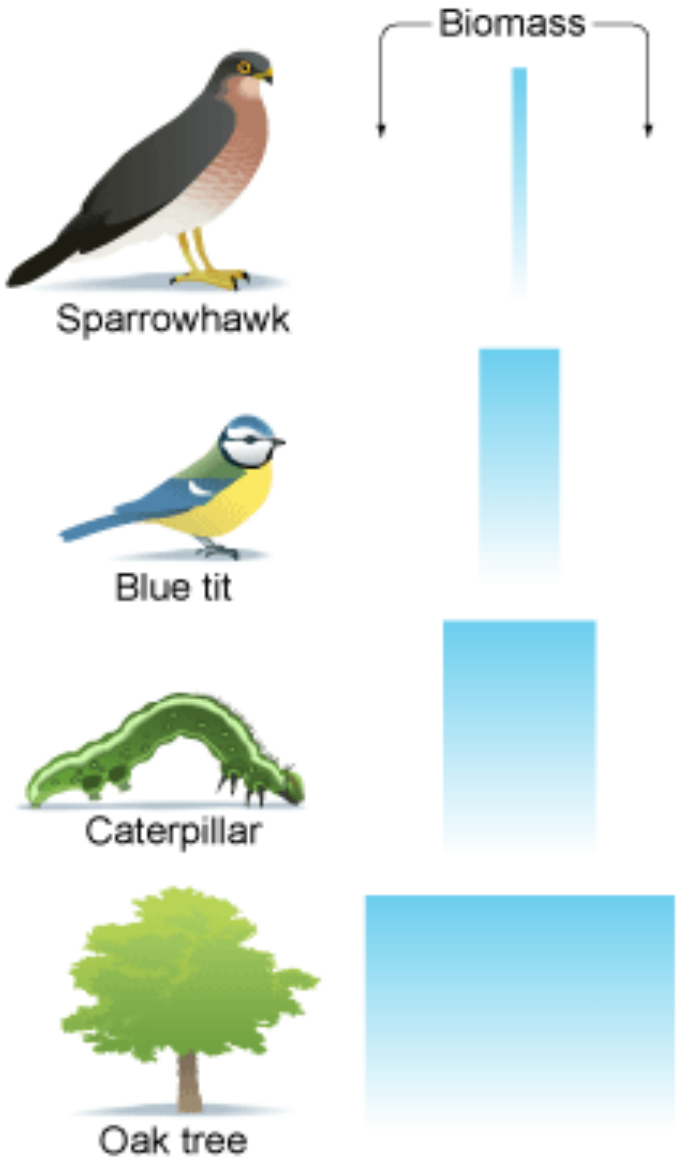
Lesson 4 Pyramids of Biomass

1. Read slides 18-19 (what is biomass?) and write a definition for biomass in your jotter.
2. On slide 20 assign the labels on the right of the horse to the correct arrow. (be careful that the arrow is going in the correct direction!). Check you work with the answers on slide 21.
3. Read slide 22 and copy the pyramid of biomass into your jotter.
4. Answer the questions on slides 23 and 24 “Pyramids of biomass summary”.

What is biomass?

Radiation from the Sun (solar or light energy) is the main source of energy for all living things. The Sun's light energy is captured and used by green plants and algae during photosynthesis, **to make new biomass**.

- **Biomass is the dry mass of living material in an animal or plant.**

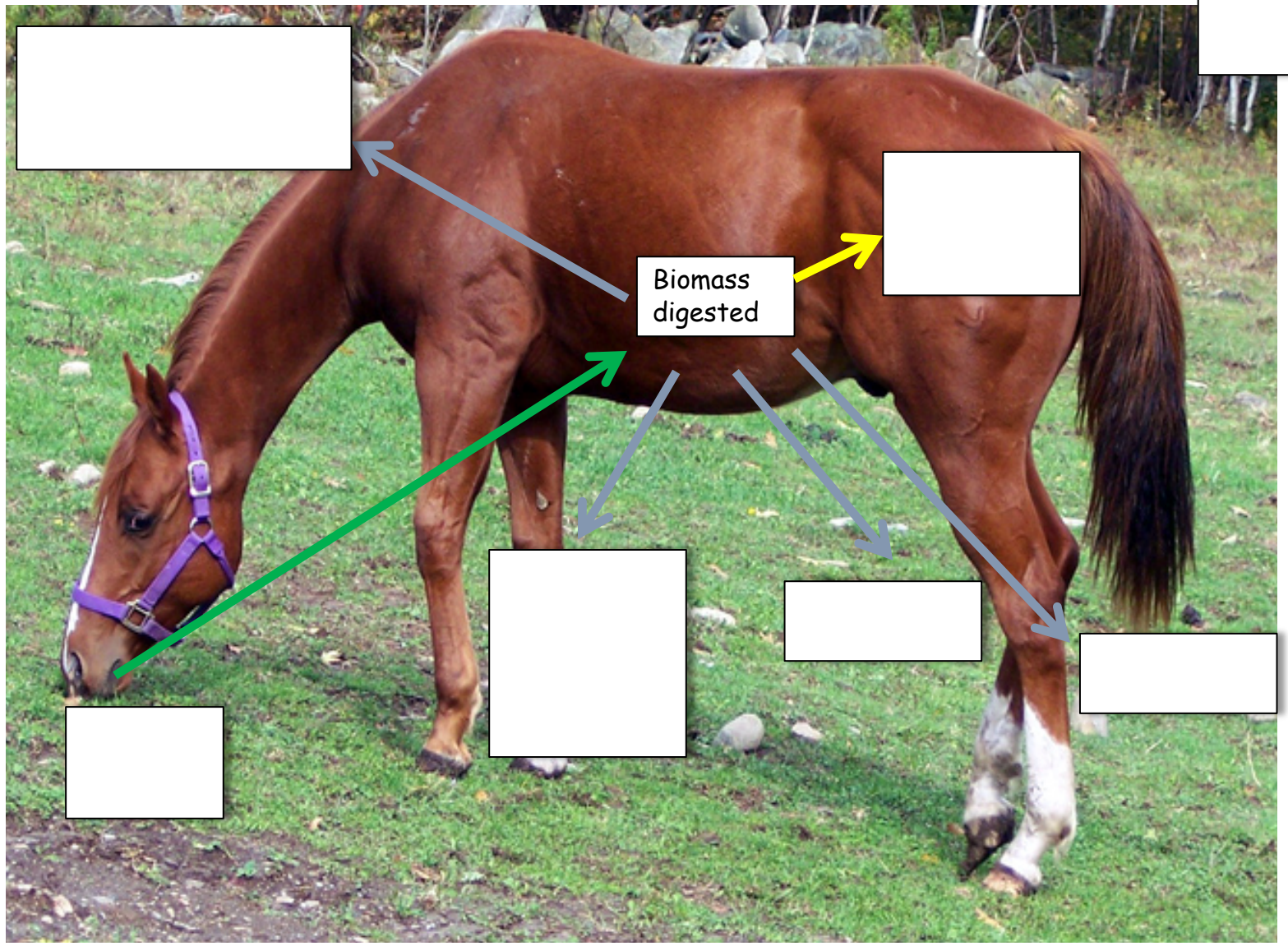


- A pyramid of biomass is a chart showing the **biomass** at each stage in a food chain.
- This pyramid of biomass is for the food chain below:

oak tree → caterpillar → blue tit → sparrowhawk

- Note that you do not need to draw the organisms. But you must draw your pyramid of biomass to scale.
- Each bar should be labelled with the name of the organism.

Energy and Biomass loss



Energy from cellular respiration is transferred by heating the surroundings

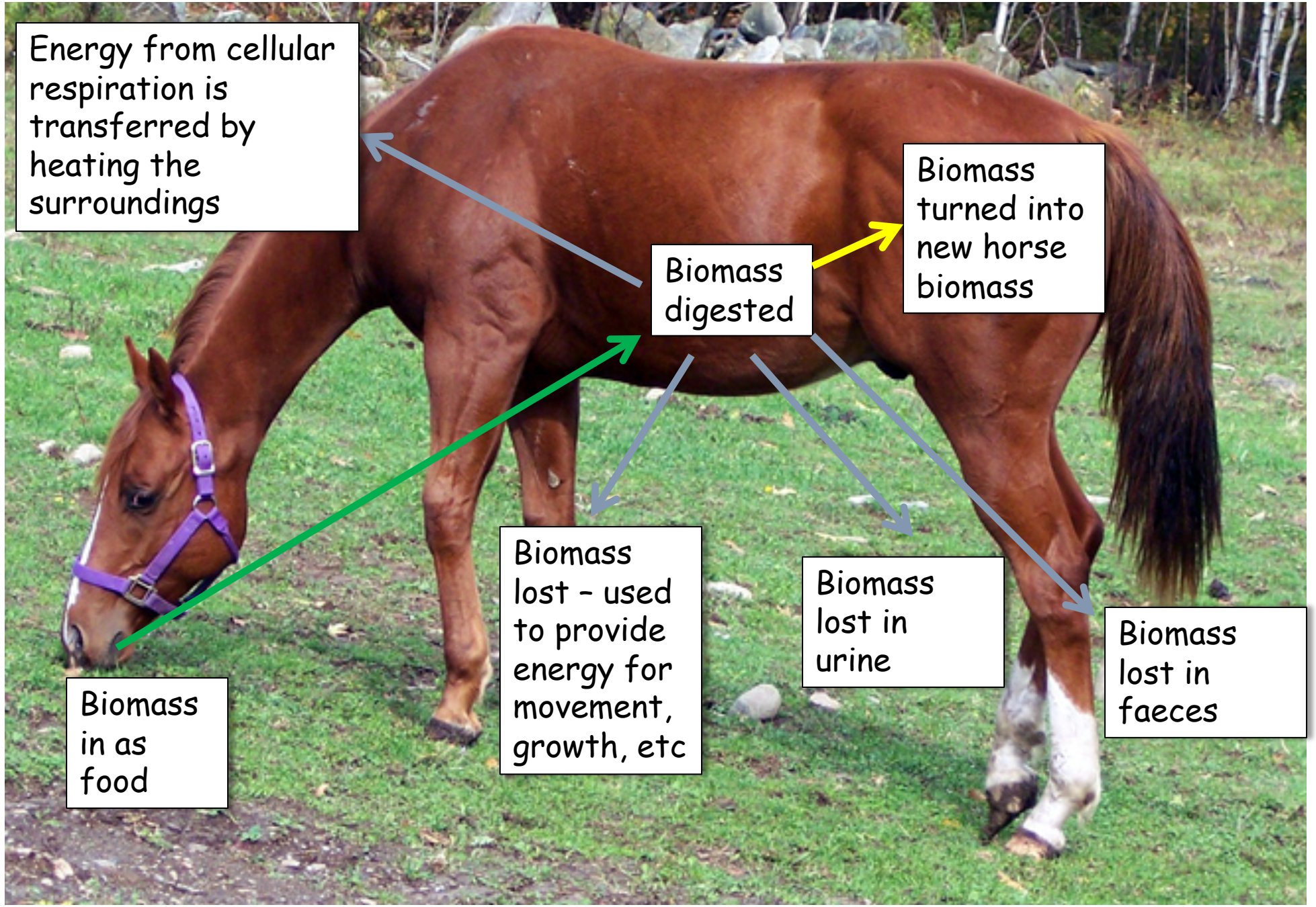
Biomass in as food

Biomass lost – used to provide energy for movement, growth, etc

Biomass lost in urine

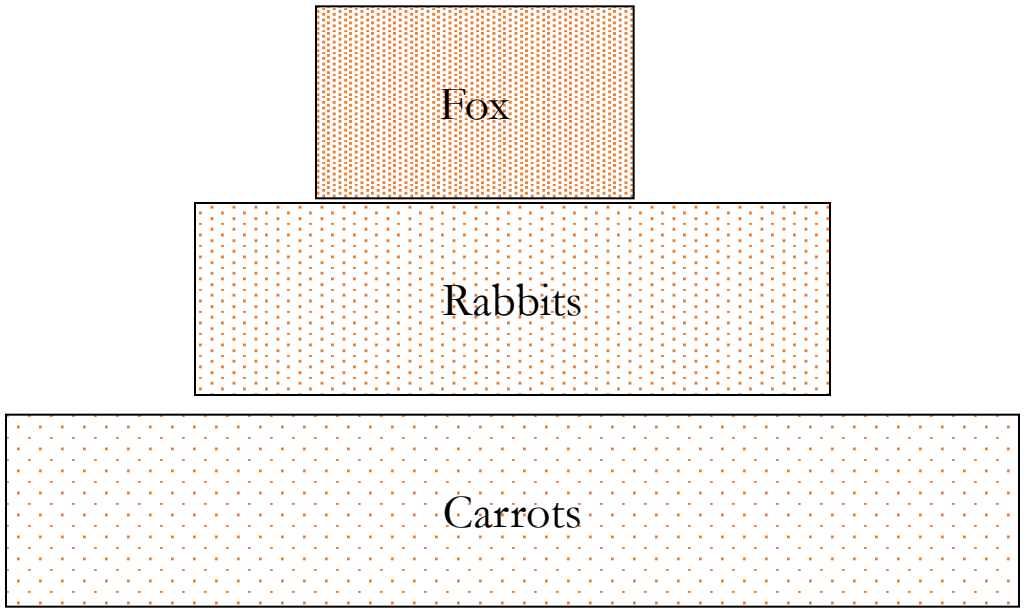
Biomass lost in faeces

Biomass turned into new horse biomass


Energy from cellular respiration is transferred by heating the surroundings
Biomass digested
Biomass turned into new horse biomass
Biomass lost - used to provide energy for movement, growth, etc
Biomass lost in urine
Biomass lost in faeces
Biomass in as food

Energy and Biomass loss:

- Energy is reduced at each level so a pyramid of biomass is always a pyramid shape.



WHY?

Respiration

Heat loss

Moving

Faeces

Not all material consumed

Pyramids of Biomass - Summary

The amounts of _____ and _____ contained in living things always gets less at each stage of a food _____ from _____ onwards. Biomass is lost as _____ products and can also be lost in the following ways: Movement, _____ and _____.

biomass energy heat loss chain
producers waste respiration

Construct your own pyramid of biomass

Organism	Biomass, dry mass (g)
Grass	10000
Sheep	5000
Sheep ticks	1000

1. Plot a **bar chart** that shows the biomass of each organism.

2. Cut out each coloured bar and stick it into your book to create a scaled pyramid of biomass – starting with grass at the bottom, then sheep, then sheep ticks at the top.

Answer these questions that **interpret** your pyramid:

a) What percentage of the biomass of the grass is passed on to the sheep?

b) What percentage of the sheep is passed on to the sheep ticks?

Lesson 5 Photosynthesis

1. Watch the photosynthesis song by clicking this link

https://www.youtube.com/watch?v=wj8TGhcCnxs

2. Read and copy the information on the following slide “Photosynthesis”.

Read slide 27 “Chloroplasts”

3. Watch the experiment “Testing food for starch” through the link below:

https://www.youtube.com/watch?v=SgDeHXWm8Hk

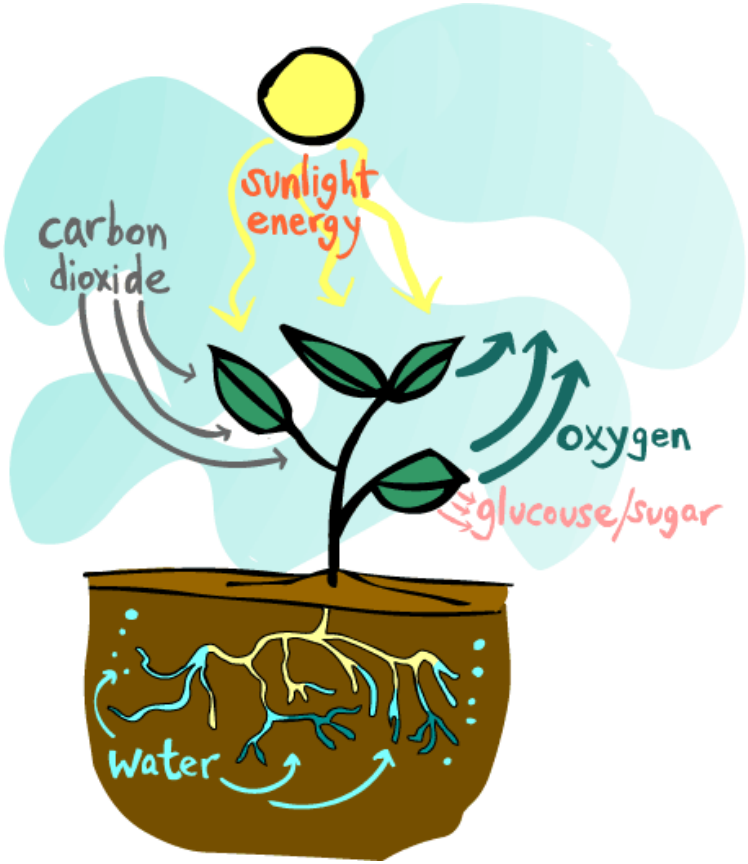
4. Copy and complete the results table on slide 29 “ Testing for starch – results”.

5. Complete the summary statements on slide 30 by filling in the missing word from the word bank.

Photosynthesis

- Plants make their own energy via a process called **photosynthesis**.

- **Carbon dioxide** and **water** are converted to **Glucose** (sugar) and **Oxygen**.
- **Sunlight** is required for the reaction to take place.



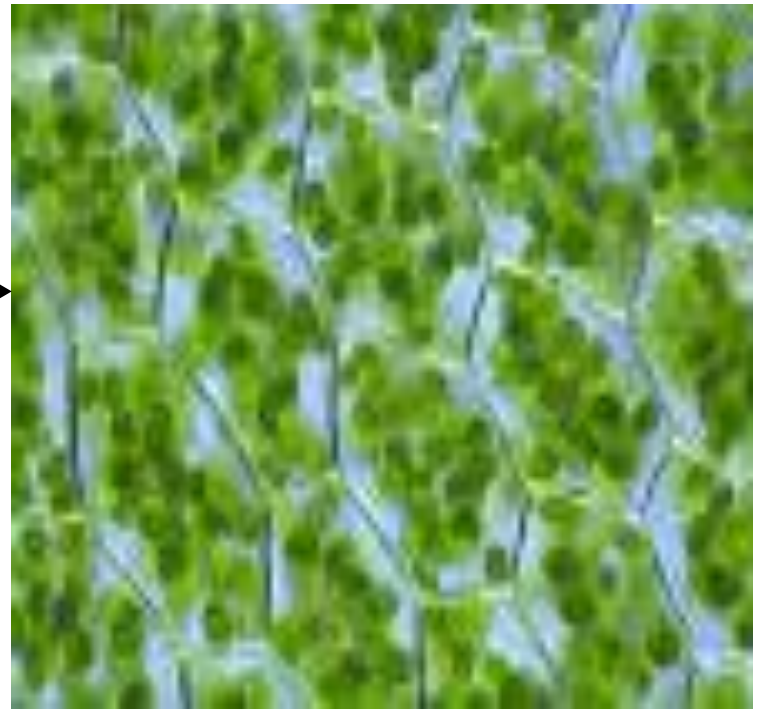
Chloroplasts

•Plants can't control how much sunlight they get so this can lead to more sugars being produced than they need.

•The excess sugar is stored in **chloroplasts** in the leaves as a substance called **Starch**.

• Chloroplasts contain a green pigment called Chlorophyll – this is what makes leaves green!

This is what chloroplasts look like under a microscope.



Testing for Starch

We can test for starch by adding an indicator to substances we want to test.

The indicator is Iodine solution.

Iodine changes colour from brown to blue/black **in the presence of Starch.**

Testing for Starch - Results

Watch the experiment video and copy and complete the table. The results for potatoes has been done for you.

Food Stuff	Colour of Iodine	Starch present? (yes/no)
potatoes	blue-black	yes

Photosynthesis summary

- Plants make their own energy via a process called……
- During photosynthesis …… and water is converted into sugar and ……
- Sunlight is absorbed by the ……
- As plants can't control how much sunlight they get they sometimes make more …… than they need.
- This excess sugar is stored in the leaves as……
- Starch can be tested with …… which turns from brown to ……

Starch	sugar	photosynthesis	carbon dioxide
	oxygen	chloroplasts	
iodine	black	sugar	

Lesson 6 Testing a Leaf for Starch

1. Watch the experiment video

https://www.youtube.com/watch?v=Uz7JnVUWCZQ

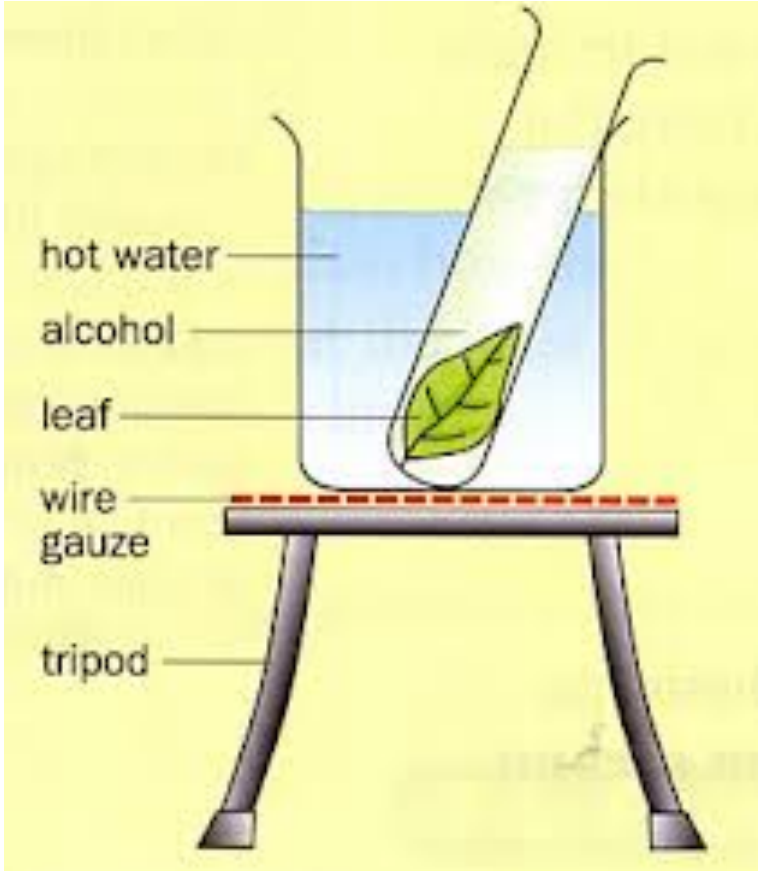
2. Copy the experimental diagram (slide 32) into your jotter/notepad.

3. From the information in the experiment video copy and complete the table on slide 33 and answer the questions.

4. Observe the results on slides 34 and 35.

Testing for Starch in Plant's Leaves

Aim: To test a leaf for Starch to see if photosynthesis has occurred.

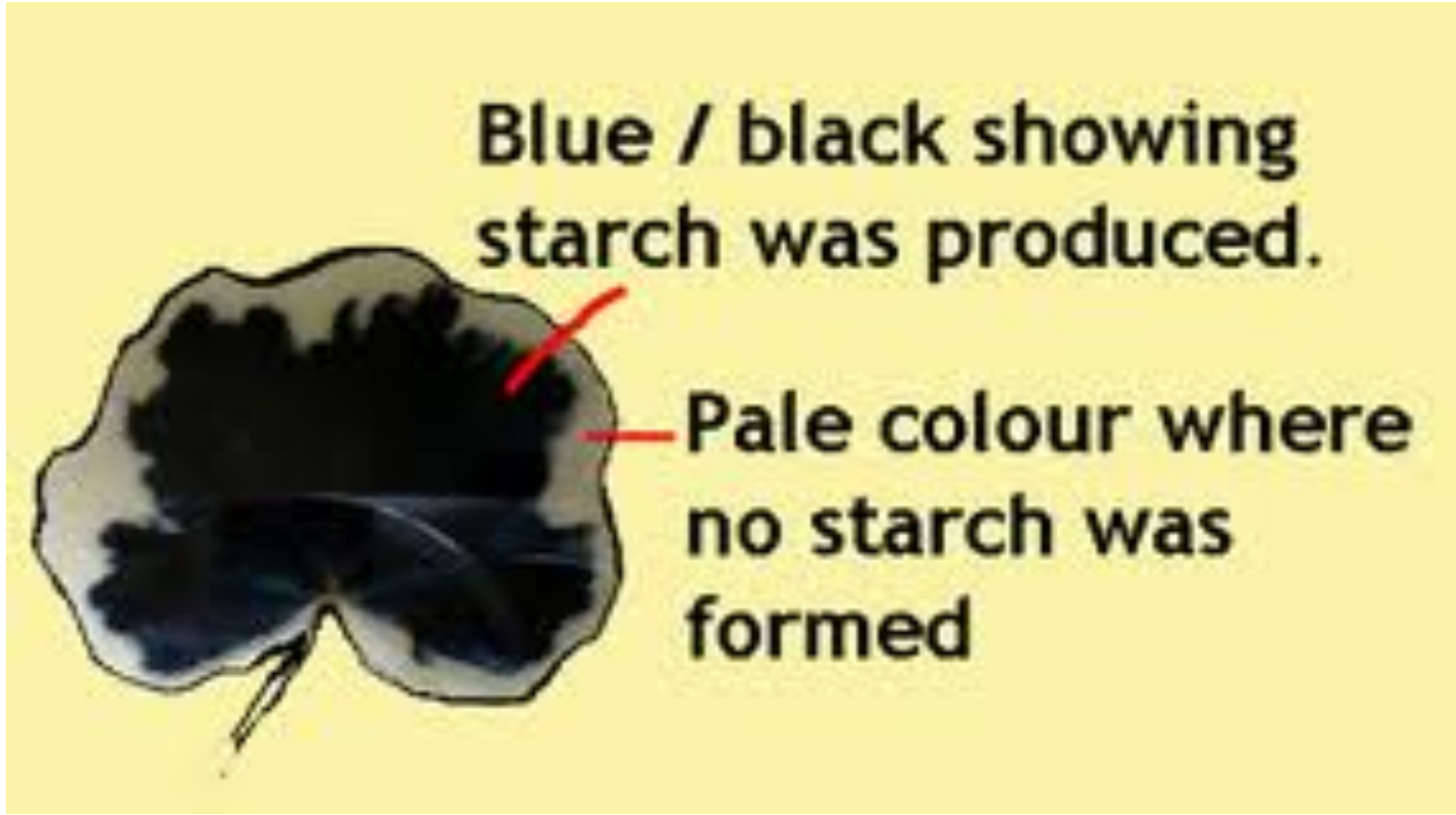


1. Copy and complete the table explaining the different stages of the experiment.

Stages in Starch test	Reason
Boil leaf in water	
Boil leaf in ethanol	
Wash leaf	
Cover leaf in iodine	

2. What safety precaution must be taken during this experiment?
3. How did we know starch was present in the leaf?

The blue/black areas show where the starch is stored in the leaf.


Blue / black showing starch was produced.
Pale colour where no starch was formed

Lesson 7 Factors Affecting Photosynthesis

1. Watch the following video and listen out for the four things that impact a plants ability to photosynthesis:

https://www.youtube.com/watch?v=J0KxRX3fyoI

2. Copy down the factors which are on slide 37.

3. Consider the apparatus on slide 38 and plan an investigation into how light intensity will impact the rate of photosynthesis.

4. Watch the experiment video (click the link below) and answer the questions on slide 40 “Experiment video questions”

https://www.youtube.com/watch?v=hITp-60mqzg

5. You could write up the experiment in the form of a scientific report with a: title, aim, method, results, conclusion and evaluation and share your report with us through Glow or Twitter.

Factors affecting photosynthesis

- Light intensity
- Temperature
- Carbon dioxide concentration
- Acidity of soil

Investigation

In your groups design an experiment to investigate how the intensity of light affects the rate at which photosynthesis will occur.

Glass filter funnel

lamp

Beaker of water

elodea

ruler

Investigation - method

Count the number of bubbles produced per minute with the lamp at different distances from the elodea.

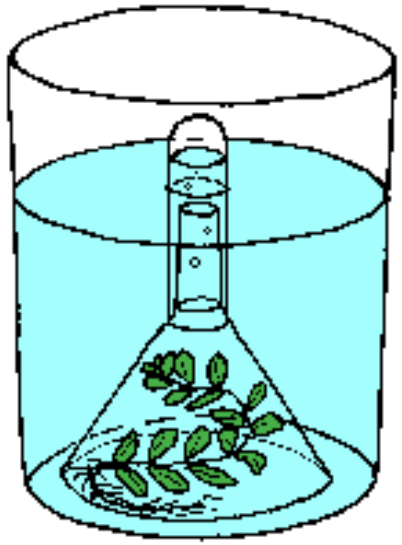


Figure 15 - How to show the production of oxygen by plants.

Experiment video questions

1. What plant was used?
2. How was the rate of photosynthesis measured?
3. How was the light intensity increased?
4. How was the temperature maintained during the experiment?
5. Why was sodium hydrogen carbonate added to the water?
6. What was the conclusion of the experiment?
7. What is the “saturation point”?

Lesson 8 Fertilisers

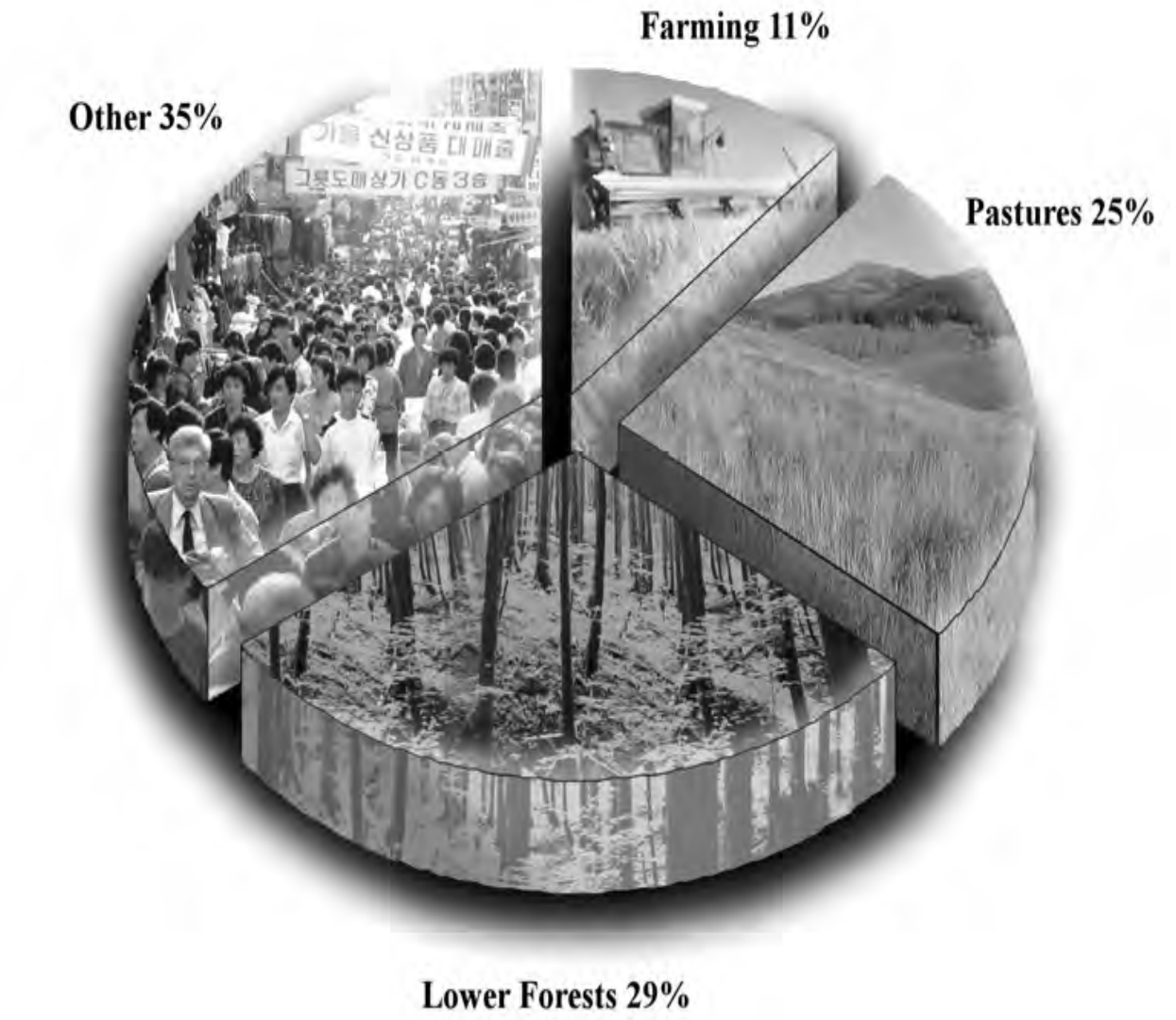
1. Look at the following slide and use the pictures to predict the main uses for land.
2. Write the main uses for land down in your jotter.
3. Try and create a bar graph to display the percentage of land used by each use using the data from the pie chart on slide 44.
4. Read slides 45-47.
5. Create a short report in the advantages and disadvantages of organic and commercial fertilisers.

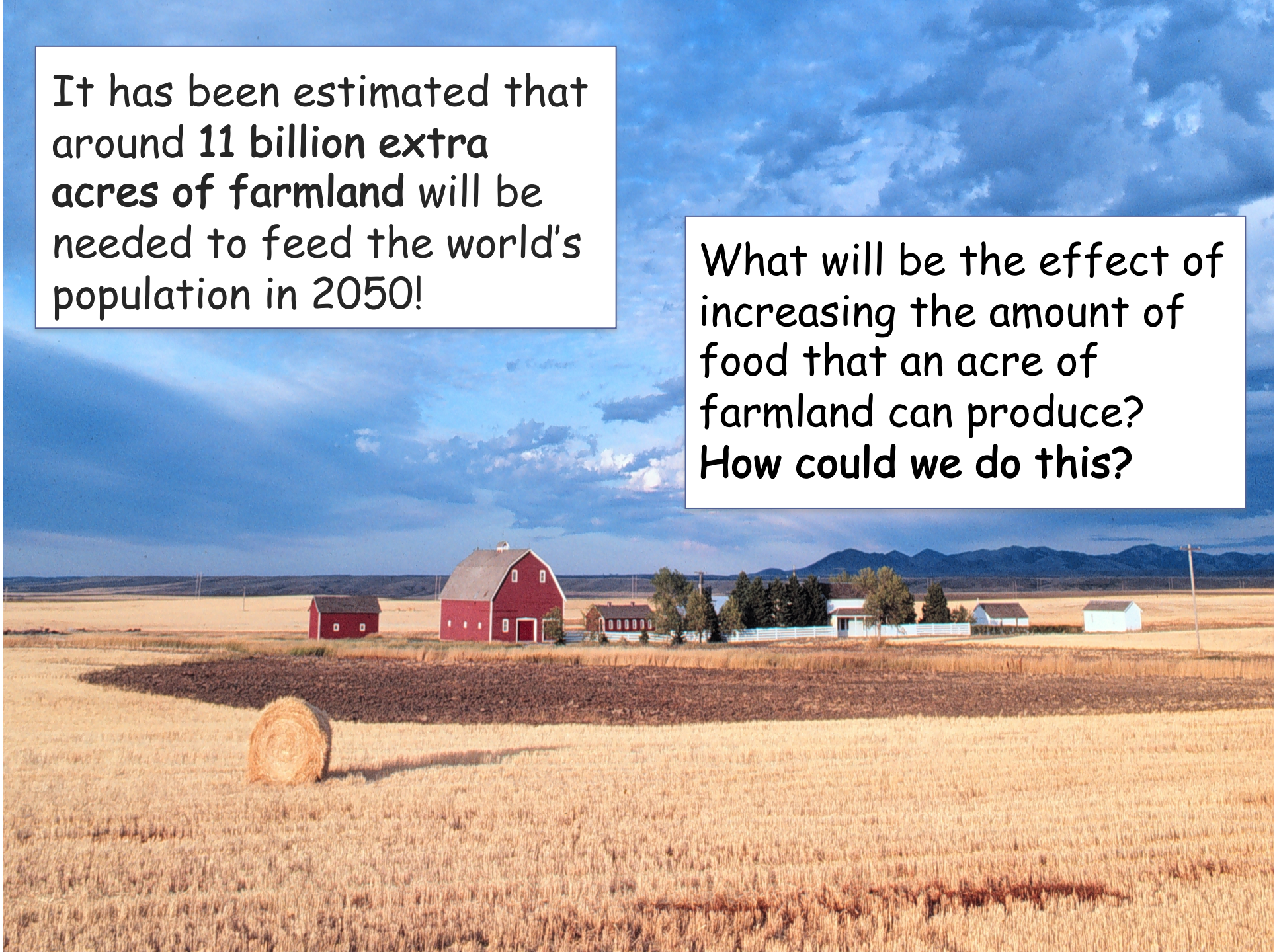
What are some of the most important uses for land?

What are some of the most important uses for land?

1. Farming
2. Homes
3. Industries (places we work)
4. Pastures or land for livestock
5. Recreational use like parks
6. Wildlife habitats

World land use




It has been estimated that around **11 billion extra acres of farmland** will be needed to feed the world's population in 2050!
What will be the effect of increasing the amount of food that an acre of farmland can produce? **How could we do this?**

Your role: Agricultural expert

Proper use of fertiliser:

- **Right time:** apply fertiliser during the part of the plant's life cycle when nutrients are needed.
- **Right place:** apply fertiliser where the plant's root system can easily absorb it and far from waterways to minimize pollution.
- **Right rate:** apply fertiliser at the rate the plant can use it.

Organic V Commercial

Fertilisers project: Short paper

Instructions: Research and write a short paper describing the advantages and disadvantages of organic and commercial fertilisers.

For each type of fertiliser, include information about:

- The fertiliser's composition
- The fertiliser's application
- Its influence on crop yields
- Its impact on the environment
- Its role in agriculture globally.

Microbiology Lesson 1 Microbes

1. Watch the video clip below on you tube

https://www.youtube.com/watch?v=JZjzQhFG6Ec

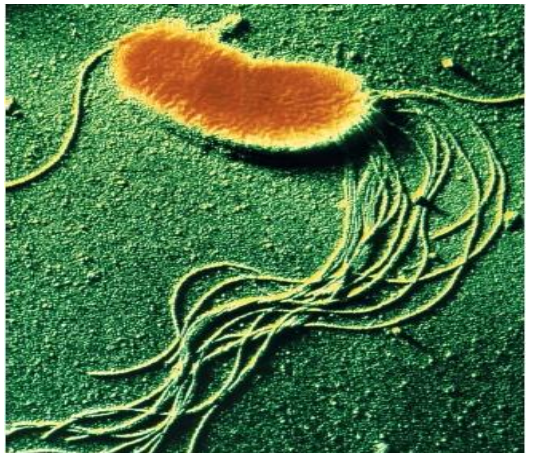
2. Copy the information on the following slide “Three types of microorganism…”.

3. Try and answer the questions on bacteria, viruses and fungi on the following slides.

The 3 types of microbe we will learn about:

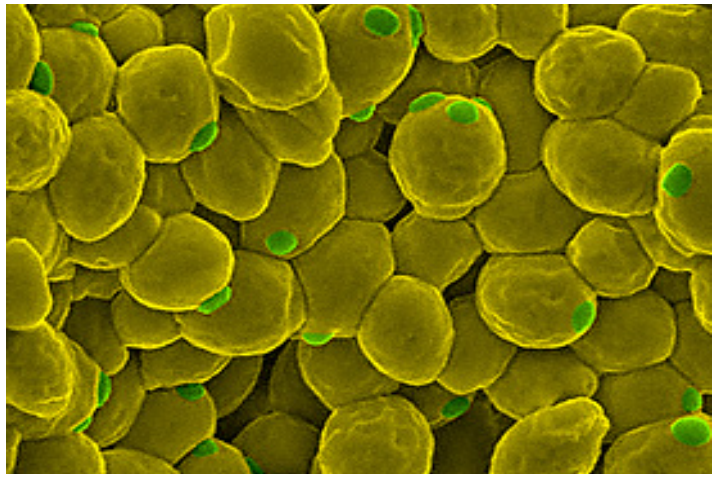
1. Bacteria
2. Virus
3. Fungus

Can you tell which one is which??



Bacteria in soil

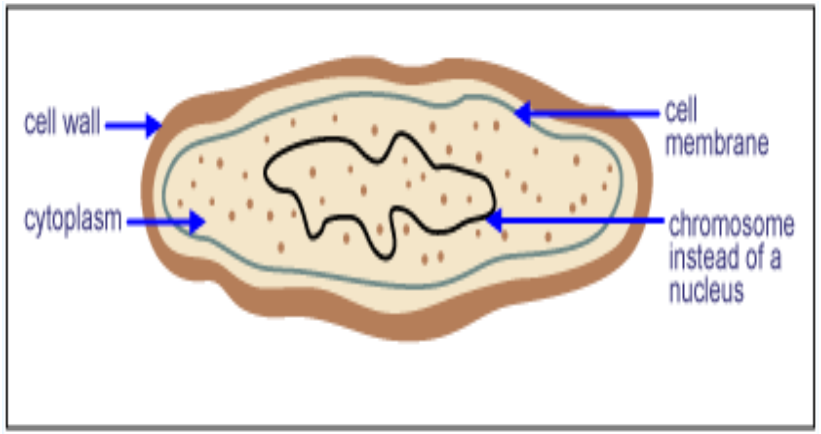
Virus

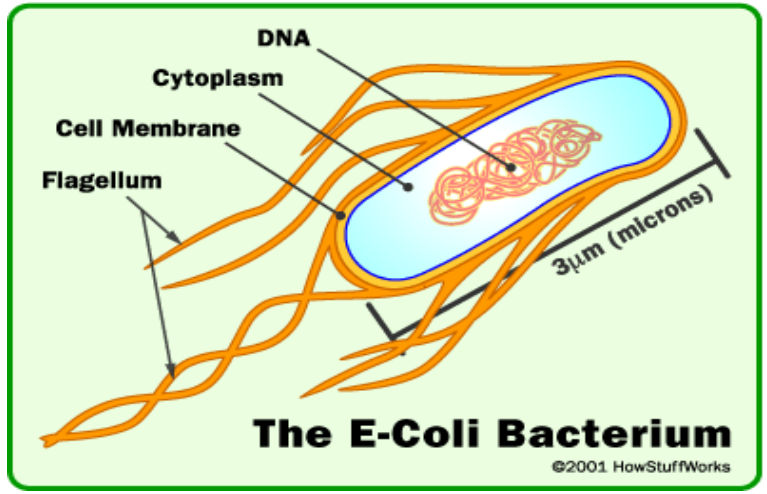


Fungus – yeast cells

Bacteria

1. What are they? Organisms made up of only a single cell. They can be good or bad for you.
2. Where are they found? Everywhere!
3. How do they get around? Some have tails to swim, others make slime and some stay on one spot.



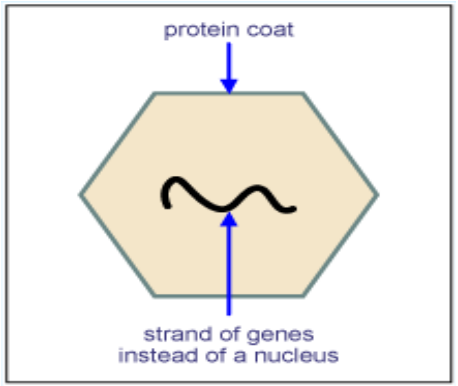


Virus

1. What are they? They are the smallest microbe – they need another creature to reproduce and survive.

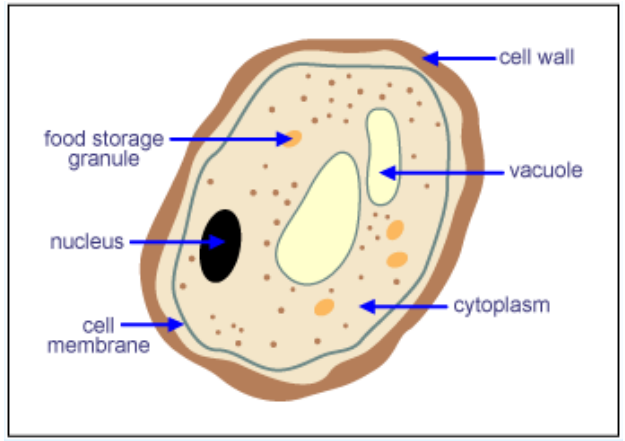
2. Where are they found? Everywhere and can infect every living thing.

3. How do they get around? They need another creature to move around and reproduce.



Fungi

1. What are they? They are the biggest microbe and can be good or bad.
2. Where are they found? In acidic places like soil, seawater and body parts.
3. How do they get around? Individual fungi don't move but their spores are carried by the wind.



Lesson 2 Investigating Microbes

1. Watch the following video:

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

2. Create a presentation on a disease caused by a microorganism. Some ideas that you could choose from are:

- Food poisoning
- Tuberculosis
- Influenza
- Chicken pox
- Ring worm
- Athletes foot
- HIV

Or you can choose any other you are interested in!

Further instructions are on the next slide.

Remember to share your work with us via Twitter or through Glow email.

Task

You are to create a poster presentation on your selected disease. Use the internet to help you.

Your poster must contain:

- The **name** of the microbe.
- A **description of the disease** and the **symptoms**.
- How is the disease **transferred** from person to person?
- What can be done to **treat** the disease?

Antibiotic Resistance

- Antibiotics are medicines used to treat harmful infections caused by bacteria.
- One of the biggest problems faced by humans today is antibiotic resistance. You can find out more about it here

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

Lesson 3 Uses of Mircobes

1. Look at the images on the following slide and decide which food and drinks were made using microbes and which were not. For the answers click onto the next slide. Do any surprise you?

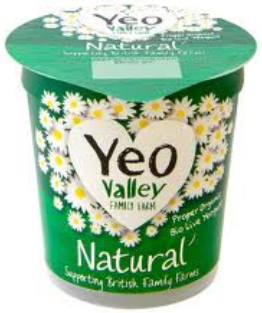
2. Read the slide on fermentation and watch the BBC clip

http://www.bbc.co.uk/learningzone/clips/the-use-of-microbes-in-the-food-and-drink-industry/4198.html

3. Making bread dough uses a fermentation reaction, so you could make dough at home (if you have the ingredients and your parents/guardians give you permission).

4. Try the fermentation quick quiz on slide 61.

Uses of Microbes



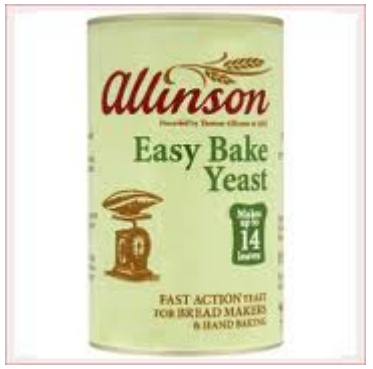
Type of Food	Made with a microbe? (Yes/No)	If yes what type of microbe? (Bacteria, fungi or virus?)
Bread	Yes	Fungi
Milk	Yes	Bacteria
Cheese	Yes	Bacteria/Fungi
Chocolate	No	
Cakes	Yes	Fungi
Doughnuts	Yes	Fungi
Beer	Yes	Fungi
Wine	Yes	Fungi
Avocado	No	
Burger	No	
Coke	No	
Popcorn	No	
Yoghurt	Yes	Bacteria

Fermentation

Watch this clip for a summary of fermentation:

http://www.bbc.co.uk/learningzone/clips/the-use-of-microbes-in-the-food-and-drink-industry/4198.html

- Yeast is used frequently to make food stuffs.
- Yeast is a type of fungus.
- Yeast helps to convert sugars into alcohol and carbon dioxide.
- Sugar $\xrightarrow{\text{yeast}}$ Ethanol + Carbon dioxide
- The yeast speeds up the reaction (it is a catalyst).



Fermentation Quick Quiz!

1. What type of microorganism is yeast?
2. Name 3 foods or drinks it is commonly used to produce.
3. Write out the fermentation word equation from memory.
4. What effect does the yeast have on the chemical reaction?

Lesson 4 Decomposers

1. Consider the following questions:

- What is meant by decomposition?
- Which microorganisms will act as decomposers?
- Why is decomposition important?

View the next slide for answers.

2. Study the decay cycle on slide 64.

3. Match the labels to the correct part of the decay cycle on slide 65.

4. Watch the documentary “The strange science of decay”, which can be found online here:

https://www.youtube.com/watch?v=wsLxHySrkcI

Think, Pair, Share

1. What is meant by decomposition?

Decomposition means to break down or decay.

2. Which microorganisms will act as decomposers?

Bacteria and fungi acts as decomposers.

3. Why is decomposition important?

In order to recycle nutrients back into soil so they can be absorbed by other plants and animals.

Plants take in (absorb) nutrients through the soil.

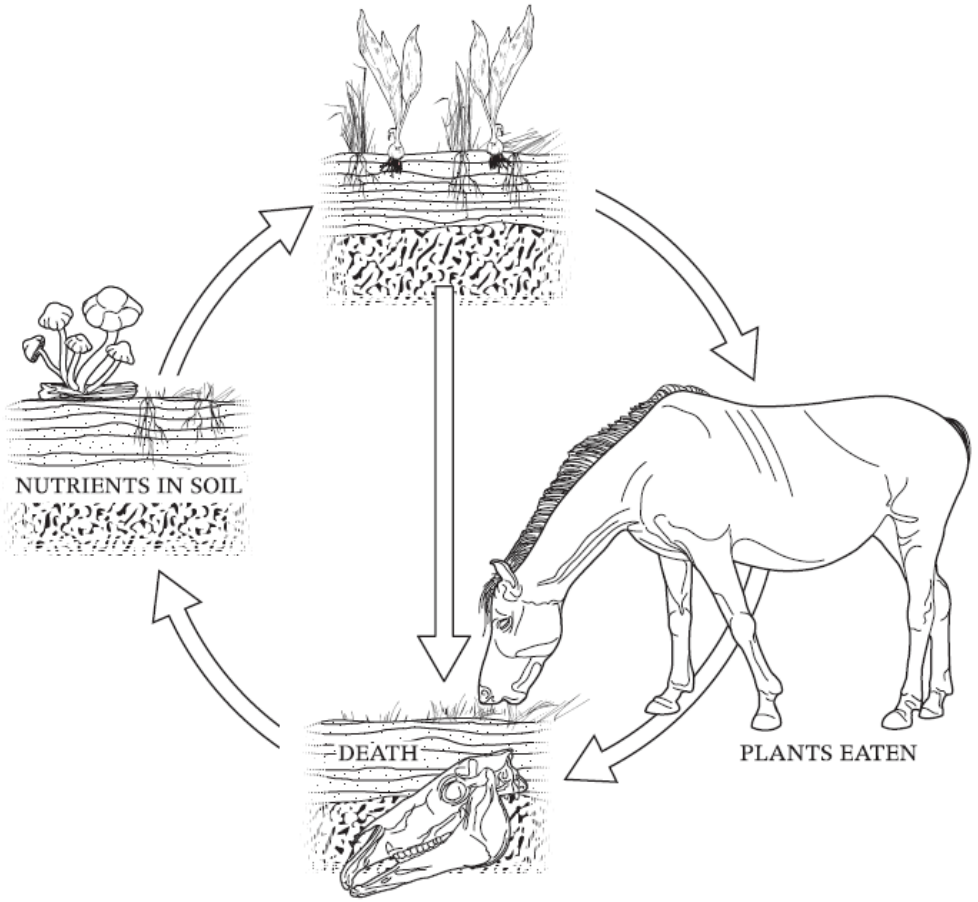
Animals eat plants to gain nutrients.

Plants produce waste over their lifetime and eventually die.

Bacteria and fungi in soil break down waste and dead plants and oils to release nutrients back into the soil.

Death

Animals produce waste over their lifetime and eventually die.



Bacteria and Fungi in the soil break down waste and dead plants and animals and release nutrients back into the soil.

Plants and animals produce waste (e.g. leaf litter, faeces) over their lifetime and eventually they die.

Animals eat plants to gain nutrients.

Plants take in (absorb) nutrients from the soil through their roots.

Lesson 6 Investigating Mould

If your parents/guardians allow it you can grow your own mould at home via the following experiment:

https://www.youtube.com/watch?v=LUBXUgoGM98

You will need:

- Sellotape
- Tupperware boxes OR sealed sandwich bags
- Different food stuffs (apple, bread, marshmallow, cheese and a biscuit for example).

DO NOT OPEN THE TUPPERWARE/SANDWICH BAGS AFTER GROWING THE MOULD PUT STRAIGHT IN THE BIN.

You can share your experiment results with us through Twitter.

Other than the type of food, what else could impact the growth of mould on a foodstuff?

Lesson 7 The Immune System

1. Watch the clip below:

https://www.youtube.com/watch?v=GIJK3dwCWCw

2. Match up the function to the barrier and see the answers on the next slide.

3. Read through the information on the remaining slides.

4. Create a comic strip on the action of lymphocytes and phagocytes in the immune system. You could imagine you are a microscopic super hero! Get creative and use your imagination. Share your ideas with us on Twitter.

Natural Barriers

- These are barriers which the body has to try to prevent harmful microbes entering the body and causing infection.

- Some examples are: the **skin**, sticky **mucus** in the lungs, **acid** in the stomach.

Think

If we have these natural barriers such as the skin present to block out microbes, how do they ever enter the body??

You have 1 minute on the clock to discuss with your partner ways in which harmful microbes get into your body.

Ready, steady.....GO

FIRST LINE OF DEFENCE	FUNCTION
SKIN	
STOMACH ACID	
CILIA TINY HAIRS IN WINDPIPE	
MUCUS IN NOSE AND WINDPIPE	

- TRAPS PARTICLES AND MICRORGANISMS,
- SWEEPS MUCUS TOWARDS THROAT,
- DESTROYS INGESTED BACTERIA,
- FORMS A WALL TO PREVENT ENTRY OF MICROBES

FILL IN THE TABLE

FIRST LINE OF DEFENCE	FUNCTION
SKIN	FORMS A WALL TO PREVENT ENTRY OF MICROBES
STOMACH ACID	DESTROYS INGESTED BACTERIA
CILIA TINY HAIRS IN WINDPIPE	SWEEPS MUCUS TOWARDS THROAT
MUCUS IN NOSE AND WINDPIPE	TRAPS PARTICLES AND MICRORGANISMS

Think, Pair, Share - Answers

When your skin becomes damaged in some way like by a cut, wound or bite, this acts as a passage for microbes to enter!

They can also enter the body through any natural openings such as the mouth, nose, ears and eyes.

The Immune System – Background facts!

- What is the immune system?

- It is the body system in charge of fighting off illnesses and infections.

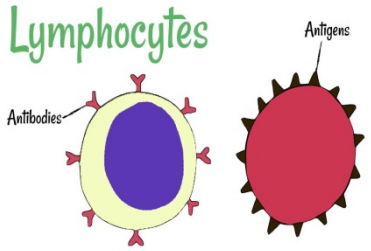
- Where is it located in the body?

- It is made up of a network of cells, tissues and organs which are found all over the body.

- What are some of the main structures of the immune system?

- White blood cells - lymphocytes & phagocytes
- Antibodies

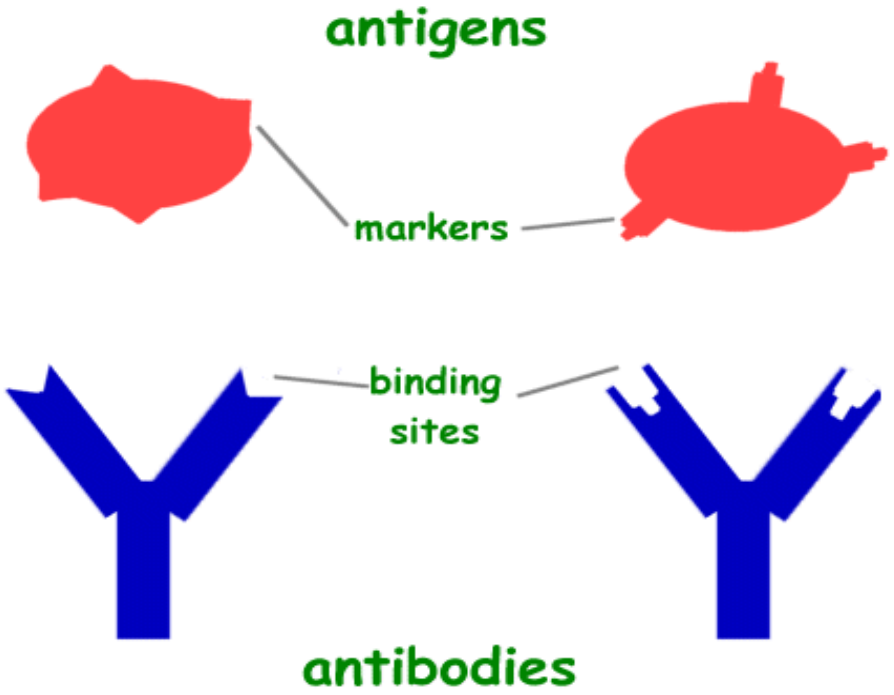
White blood cells



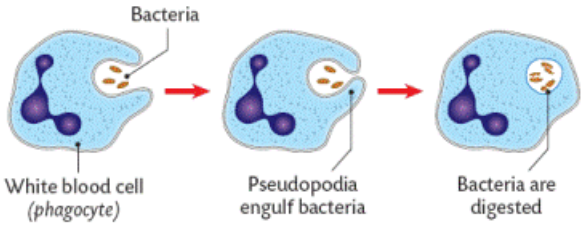
Lymphocytes

Attack the microbes by creating **antibodies** – Y shaped protein molecules.
These antibodies bind to structures on the microbe called **antigens** and destroy them.

Stick this diagram into your jotters and label it as shown.



White blood cells



Phagocytes

These **engulf and destroy** microbes!!

They also consume dead cells in our body and play an important role in healing wounds.

Immunity

The immune system is very smart and can adapt to new infections. Our bodies gain immunities in two ways: natural and acquired.

Natural - When we are born, our bodies already have some immunity. Babies get **antibodies from their mother** as they are growing in the womb. They may also gain some **antibodies from their mother's milk**.

Acquired - Our bodies also learn immunities over time. **Memory cells** remember antigens that have attacked the body in the past, so the next time that disease invades, our body is ready for it and can quickly produce antibodies to prevent infection. We can also gain immunity from **vaccines**.

Comic strip task

Create a short comic strip article on the role of Lymphocytes, Phagocytes and Memory cells within the Immune system. You should use **diagrams and descriptions** to make up your comic strip.

You could for example, imagine these cells as being super heroes, ready to attack the harmful microbes!