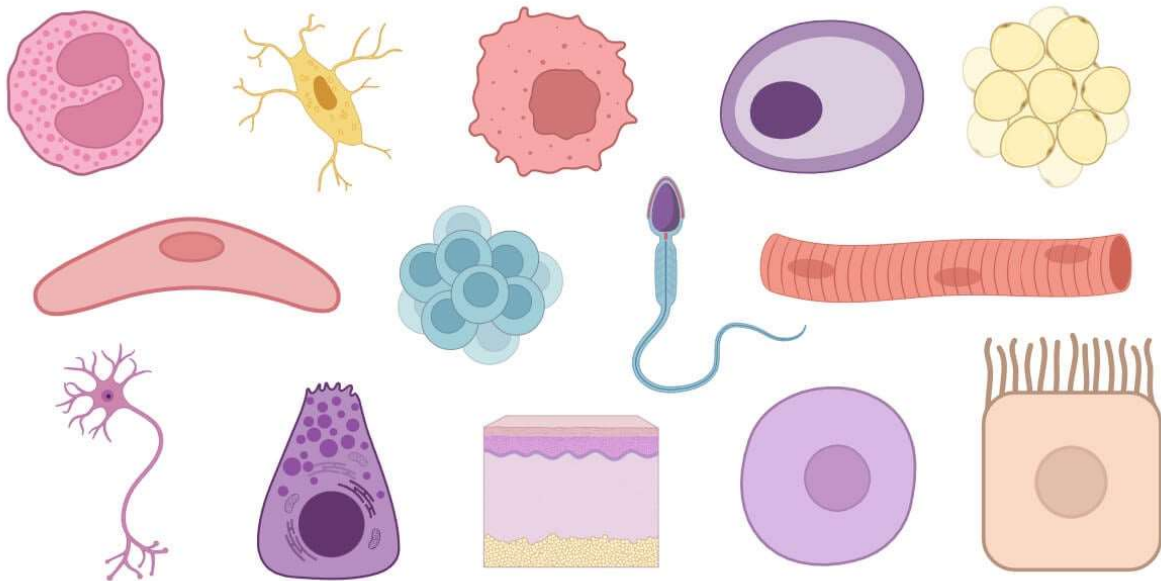




Kirkcaldy High School



S1 Science Cells

Name: _____

Class: _____

Teacher: _____

Experiences and Outcomes

SCN 3-13a:

Using a microscope, I have developed my understanding of the structure and variety of cells and of their functions.

SCN 3-13b:

I have contributed to investigations into the different types of microorganisms and can explain how their growth can be controlled.

SCN 3-13c:

I have explored how the body defends itself against disease and can describe how vaccines can provide protection.

Expectations and Outcomes Learner Evaluation

Topic: Cells

Experience and Outcomes	Date Completed (dd/mm/yy)	Evaluation How happy are you with it? (☺ ? ☹)
I can state the main types of cells in the body		
I can describe the function of different types of cells		
I can draw an animal cell		
I can label an animal cell		
I can state the function of each structure in an animal cell		
I can use a microscope		
I can view my own cheek cells using a microscope		
I can state the names and identify the different types of microbes		
I can compare the different types of microbes		
I can describe one or more aseptic technique		
I can protect an experiment from contamination		

I can show by experiment that microbes are everywhere		
I can grow microbes on an agar plate		
I can explain the importance of hand hygiene		
I can describe the difference between the direct and indirect spread of microbes		
I can state two food products made using yeast		
I can describe a simple fermentation experiment		
I can state two food products made using bacteria		
I can state that the first-lines of defence are the body's natural barriers.		
I can explain how the first-lines of defence can prevent the entry of pathogens.		
I can state that vaccines are used to prevent diseases.		
I can explain how the first vaccine was developed.		
I can explain how vaccinations result in immunity.		
I can research what antibiotics are		
I can describe what antibiotics are used to treat		
I can discuss the problems that antibiotics cause		

Cells

Starter:

1. Write down 3 things you think we might be learning about in this topic.

2. What comes to mind when you think of the word 'cell'?

Learning Intentions

- I am learning about the cells and their structures.

Success Criteria

- I can state the main types of cells in the body
- I can describe the function of different types of cells

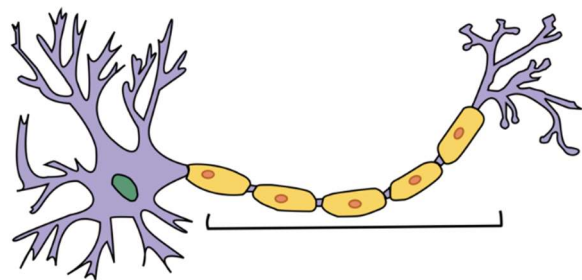


Cells

Cells are the _____ of life.

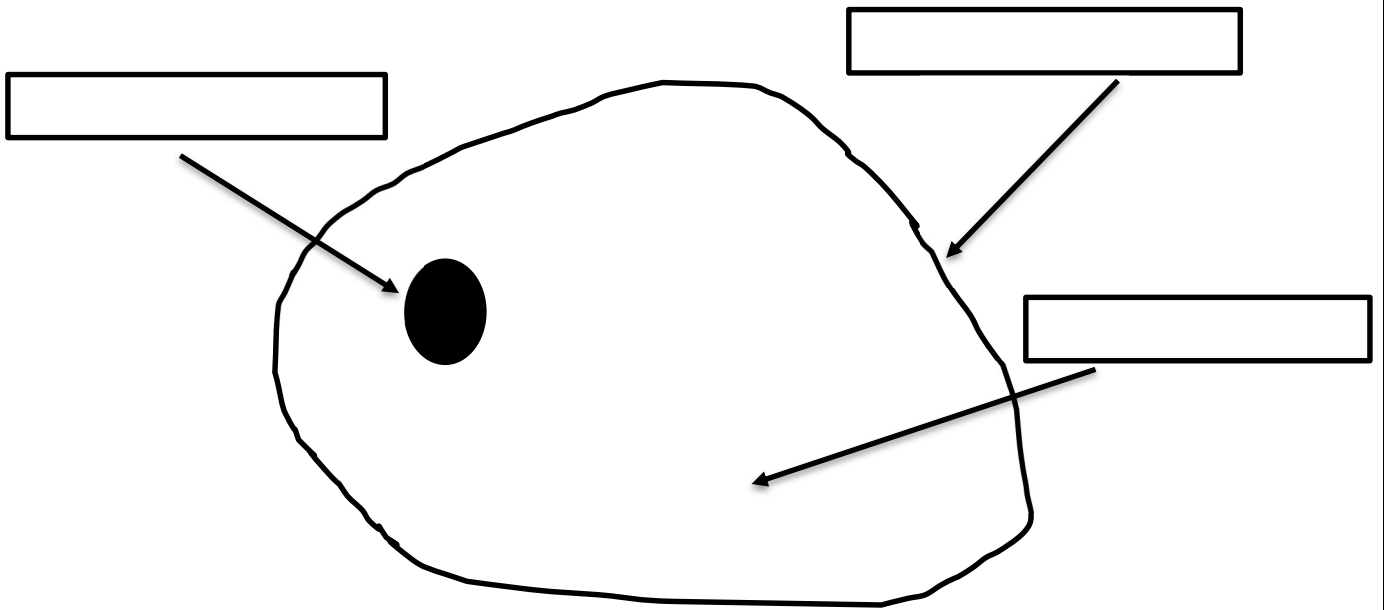
There are many different types of cell, for example:

1. Red Blood Cells carry _____
2. _____ carry electrical impulses around the body.



Animal Cell

An animal cell has three main parts, the _____, _____ and _____.



Cell Structures

Your cells can be compared to little factories.

They contain lots of smaller structures, and each of them has a specific job.

Structure	Function	Factory Role
Nucleus		
Membrane		
Cytoplasm		

Cells Problem Solving

Your teacher will show you the Scale of the Universe.

- Complete the table by writing down the size (in micrometres) of the following cells/structures:

Cell Structure	Size (μm)
Ovum (egg) Cell	
Skin Cell	
White Blood Cell	
Red Blood Cell	
Cell Nucleus	

Extension

1. How many human skin cells would we fit in a human ovum?

2. How many white blood cells could we fit in a human ovum?

3. How many times bigger than a red blood cell is a skin cell?

Red Blood Cells DO NOT have a nucleus. Why might this be?

Cells Under the Microscope

Starter:

1. State the function of the nucleus in an animal cell.

2. State which structure controls entry and exit of substances.

3. Name the piece of equipment used to see cells.

Learning Intentions

- I am learning how to use a microscope to view cells.

Success Criteria

I can use a microscope

I can view my own cheek cells using a microscope



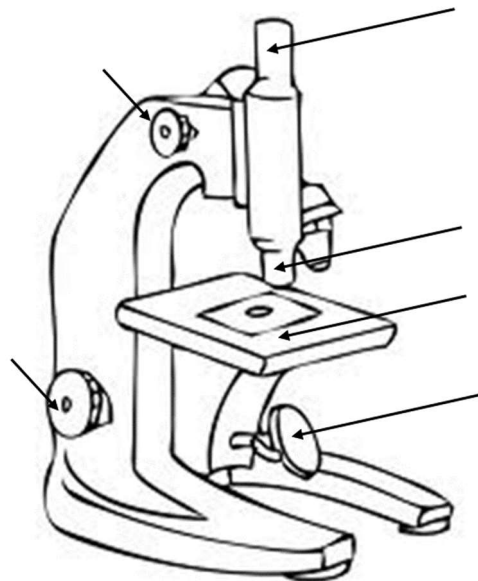
Microscopes

Cells are very _____.

A microscope is used to make cells appear

_____.

Label the parts of the microscope.

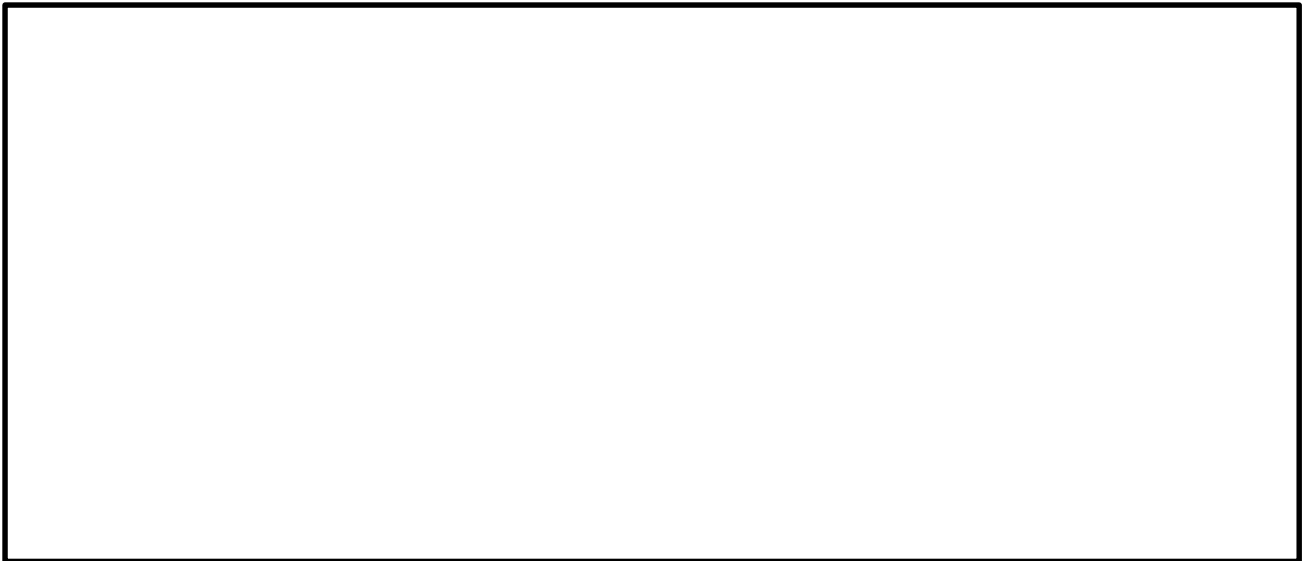


Aim:

Method: *(what did you do?)*

1. Rub the cotton bud on the inside of your mouth for about _____
2. Now roll the cotton bud onto the middle section of your _____
_____ for about 5 seconds.
3. Add 1 drop of _____ dye.
4. Place a cover slip on top of your cells.
5. Blot with a paper towel.
6. Now you can view the _____ under the microscope.

Results: *Draw a diagram of the cheek cells under the microscope, labelling the nucleus, cytoplasm and cell membrane. Also, remember to write down the magnification you used!*



Conclusion: *(answer your aim)*

Estimating Cell Size

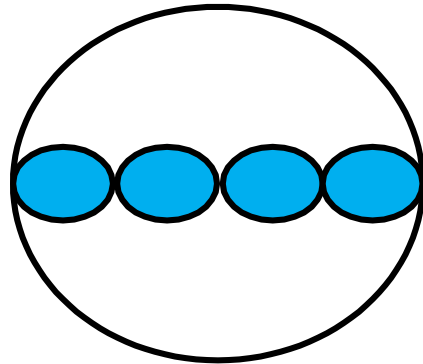
To calculate the length of one cell in our field of view down a microscope we can work out the diameter and divide it by the number of cells.

$$\text{Length of one cell} = \text{diameter} / \text{number of cells}$$

Can you use this formula to work out the length of one cell in this example?

Example:

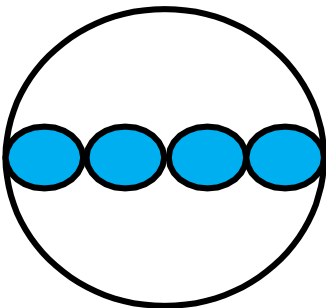
Space for working.



Field of view = 8mm

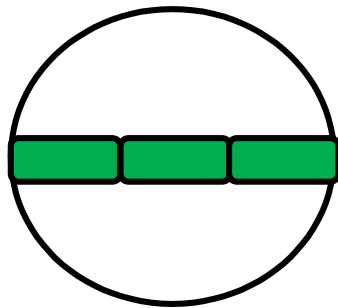
Answer _____

Can you use this formula to work out the **length of one cell** in these examples?



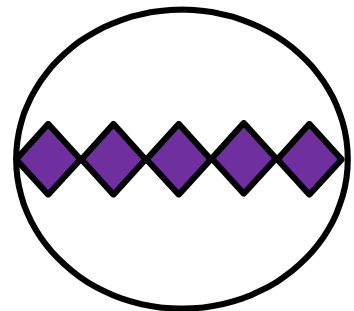
Field of view = 2mm

Answer _____



Field of view = 9mm

Answer _____



Field of view = 10mm

Answer _____

Types of Microbes

Starter:

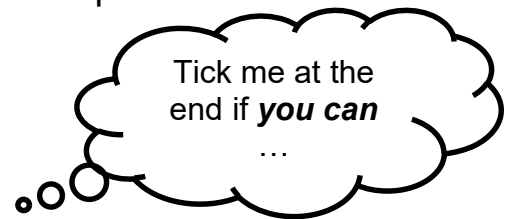
What causes rotting and mould?

Learning Intentions

- To identify and compare different types of microbes.
- To use numeracy skills to solve simple size and scale problems

Success Criteria

- I can state the names and identify the different types of microbes
- I can compare the different types of microbes



Types of Microbes

A micro-organism is a _____.

We can see micro-organisms using a _____.

The different groups are:

Microbes Numeracy

We use micrometres to measure microbes $1\text{mm} =$ _____

To change mm to μm we _____ by 1000

To change μm to mm we _____ by 1000

Answer the following questions:

1. How many micrometers (μm) are there in one millimetre (mm)?

2. The HPV virus measures $5\ \mu\text{m}$ wide. What is its width in mm?

3. The bacterium which causes TB is 0.026mm long, write down its length in μm .

4. E.coli is a type of bacteria that is usually harmless and can be found in your intestines. It measures 2 micrometers (μm) in length. The largest known bacteria is called "Thiomargarita namibiensis" can be found in the ocean off the coast of Namibia and measures a massive 750micrometers (μm).

- a. What are the sizes in mm of the bacteria mentioned in the passage?

E. Coli = _____ (1)

Thiomargarita namibiensis = _____ (1)

- b. How many times bigger are Thiomargarita namibiensis than E. Coli bacteria?

_____ (1)

5. Bacteria make more bacteria by dividing. If the conditions are right, bacteria are able to divide every 20minutes. If there is one single E. coli bacterium on a piece of raw chicken at 11am in the morning, how many E. coli can we expect by 1pm on the same day?

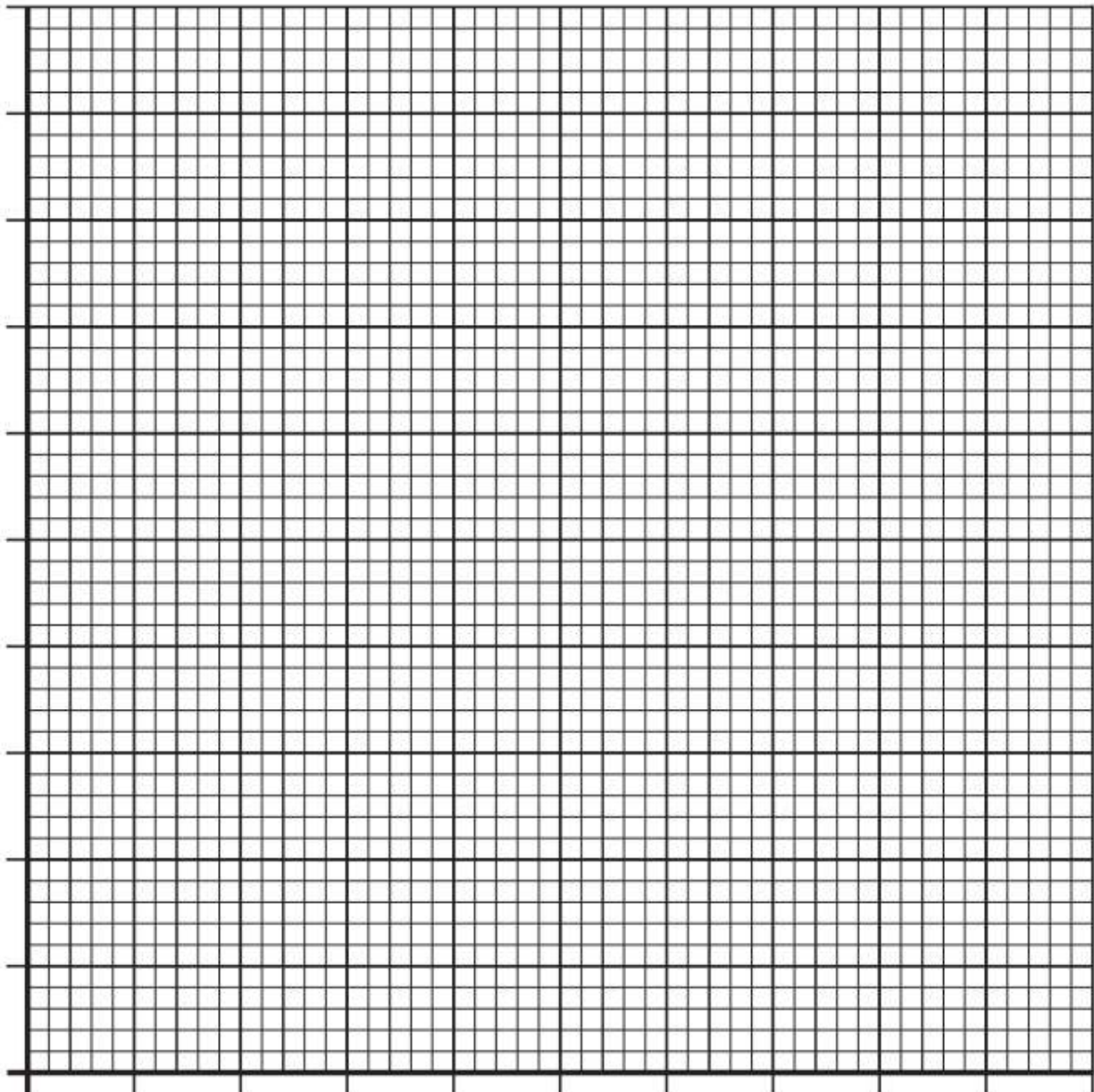
_____ bacteria (1)

6. A microbiologist swabbed areas of the kitchen to test for presence of bacteria. The table below shows the number of colonies found at different places in the kitchen. Use the table to produce a bar graph of their results.

Sample site	Number of bacterial colonies
Dishcloth	88
Microwave	42
Floor	64
Sink	20

Remember: Title, x-axis label, y-axis label, even scale, neatly plotted bars

(3)



Aseptic Technique

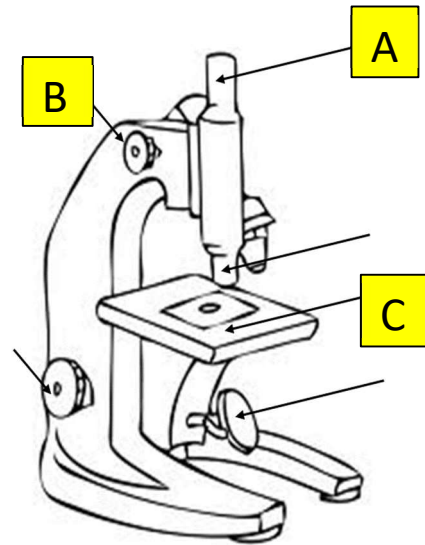
Starter:

Label parts A-C on the microscope.

A _____

B _____

C _____



Learning Intentions

- To describe aseptic technique
- To use an appropriate technique to grow microbes.

Success Criteria

- I can describe one or more aseptic technique •○○
- I can protect an experiment from contamination
- I can show by experiment that microbes are everywhere



Aseptic Technique

Aseptic means the _____ of microorganisms that can cause _____. Sterile techniques must be used when working with microorganisms. This prevents _____

Examples of Aseptic Technique

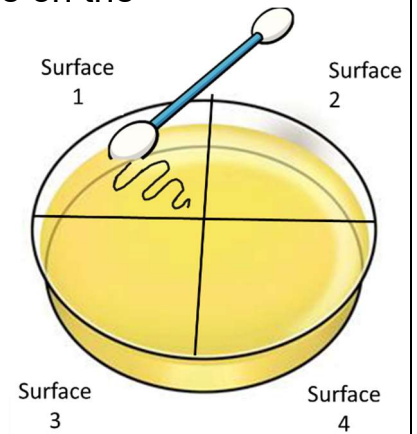
- Wear a _____
- Wash your _____
- _____ surfaces
- Ensure petri dish is _____
- Flame the _____ loop

Growing Microorganisms Experiment

Aim:

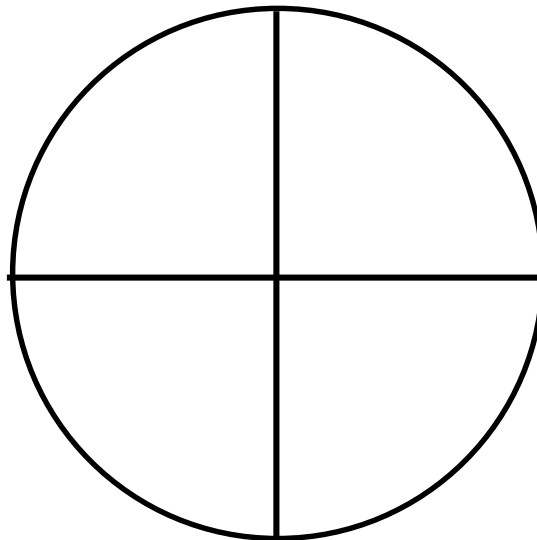
Method:

1. Split your plate into _____ – remember to write on the bottom of the plate!
2. Take a _____ and rub it on one section.
3. _____ this with a fresh bud on different surfaces.
4. Put used buds in the discard jar then carefully _____ your plate with two pieces of sellotape.
5. _____ until next lesson.



Results:

Draw your agar plate once the microbes have grown:



Conclusion:

Evaluation:

Growing Microorganisms in the Air – Demonstration

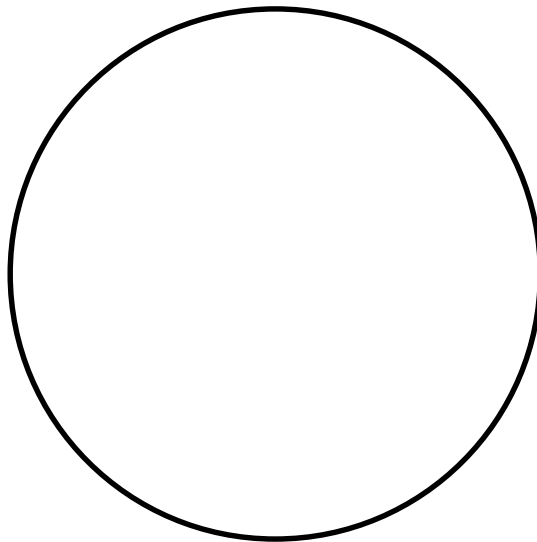
Aim:

Method:

1. Your teacher will label the underside of a petri-dish with today's date.
2. Choose a suitable place to leave the dish open to the air
3. At the end of the lesson, tape the lid onto the dish and incubate.

Results:

Draw your agar plate once the microbes have grown:



Conclusion:

Evaluation:

Aseptic Techniques Quiz

1. A B C
2. A B C
3. A B C
4. A B C
5. A B C
6. A B C
7. A B C
8. A B C
9. A B C
10. A B C

Score: ___/10

Spreading Microorganisms

Starter:

Complete the Results, Conclusion and Evaluation from the **Growing Microorganisms** experiment and **Growing Microorganisms in the Air** demonstration from last lesson.

Learning Intentions

- Use an appropriate technique to grow microbes.
- Explain the importance of hand washing in preventing the spread of microbes.
- Understand the difference between direct and indirect spread of microbes

Success Criteria

- I can grow microbes on an agar plate
- I can explain the importance of hand hygiene
- I can describe the difference between the direct and indirect spread of microbes



Spreading Microbes Experiment

Aim:

Method:

Circle which group you are in

Group A

- The person with the glitter on their hands should shake hands with the first pair of pupils at the start of their line. This pair should go onto shake hands with the next pair in their line. Repeat until they get to the end of the line.

Group B

- The person with the glitter on their hands should handle a ruler and a pencil. The ruler should be passed down one line from pupil to pupil and the pencil down the other until they reach the end of the line.

Group C

- The person with the glitter on their hands should go and wash them using soap and water. Then repeat activity as for group A. Each group should examine their hands and describe what they see.

Conclusion:

Microbes can be passed from person to person by hand contact. This is called _____ spread of microbes.

Touching contaminated surfaces such as door handles can pass microbes on _____ spread of microbes.

The simplest and most effective way to prevent the spread of microbes is frequent _____.

Word bank: indirect, hand washing, direct

Extension Activity

1. Read the following passage and then answer the questions below

You may think that the world is full of dangerous, disease-causing microbes. In fact many microbes are useful to us whilst others are not harmful or useful. Organisms, which cause diseases, are called **pathogens**. They can be divided into 4 main groups

- **viruses** cause the common cold, flu, measles, chicken pox and AIDS
- **bacteria** cause Salmonella poisoning, tetanus and cholera
- **protists** cause malaria and amoebic dysentery
- **fungi** cause athletes foot and ring worm

Pathogens can spread in many ways. **By droplets in the air** when you sneeze e.g. flu and the cold spread in this way.

By touch e.g. sharing towels with infected people can spread athletes foot.

By faeces (solid waste) e.g. germs in faeces can sometimes get into food and drinking water. Cholera and dysentery spread in this way.

By animals e.g. rats, mice, cockroaches and flies can spread diseases to humans like malaria.

By blood e.g. blood-to-blood contact in humans can spread AIDS.

a. What is a pathogen? (1)

b. What are the four main groups of pathogens? (1)

c. Using the passage name two diseases caused by viruses and two diseases caused by fungi.

Viruses _____ (1)

Fungi _____ (1)

Making Alcohol

Starter:

1. State the three types of microbes.

2. Name two aseptic techniques.

Learning Intentions

- To state two food products made using yeast
- To carry out a simple fermentation experiment



Success Criteria

I can state two food products made using yeast

I can describe a simple fermentation experiment

Yeast

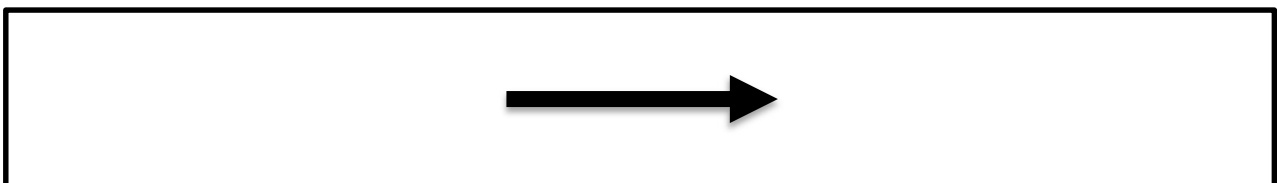
Making Alcohol

Yeast is a type of _____.

Yeast makes alcohol and _____ from _____.

Alcohol makes beer _____ and carbon dioxide makes beer **fizzy**.

Copy the **fermentation** equation into the box below.



Fermentation Experiment

Aim: _____

Method:

Draw a diagram of your apparatus:

Results:

Draw a diagram of what you observed.

Conclusion:

Describe what happened to the balloon and give a reason for this.

Evaluation:

Yeast is needed to make alcohol. How could we have set up the experiment to prove this?

Seven Wonders of the Microbe World Video

Activity: Watch the video and note down three facts:

1. _____

2. _____

3. _____

Making Bread

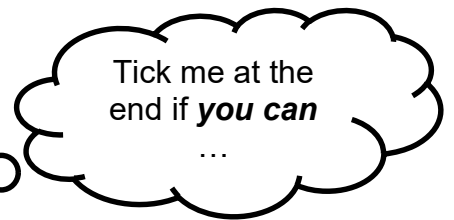
Starter:

1. Write the fermentation equation.

2. Name two products of fermentation.

Learning Intentions

- To state two food products made using yeast
- To carry out a simple fermentation experiment



Success Criteria

I can state two food products made using yeast

I can describe a simple fermentation experiment

Yeast

Bread

Yeast is a type of _____.

Yeast feeds on sugar to produce _____ and _____.

In bread-making the _____ gas is trapped in the bread dough. This makes the dough _____.

The alcohol _____ during baking.

Copy the **fermentation** equation into the box below.



Making Dough

Aim: _____

Method:

Draw a diagram of your apparatus:

Results:

Draw a diagram of what you observed.

Conclusion:

Describe what happened to the dough and give a reason for this.

Evaluation:

Yeast is needed to make dough rise. How could we have set up the experiment to prove this?

Making Yoghurt

Starter:

1. Name the gas which makes dough rise.

2. What happens to the alcohol in bread when it is baked?

Learning Intentions

- To state two food products made using bacteria
- To carry out a simple experiment using bacteria



Success Criteria

- I can state two food products made using bacteria
- I can describe a simple fermentation experiment

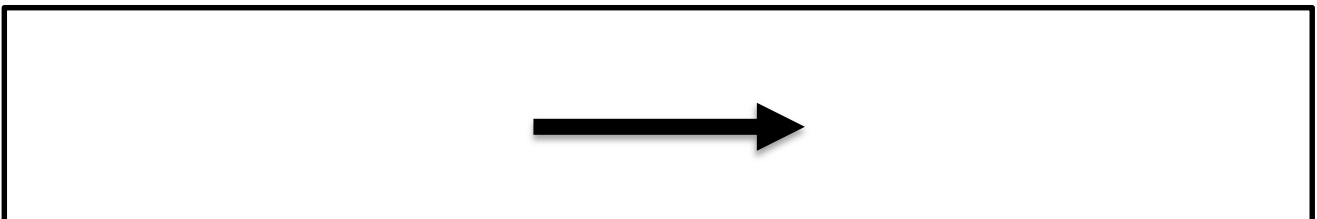
Bacteria

Making Yoghurt

Yoghurt is made by adding a bacterial _____ to _____.

Probiotic products contain billions of _____ bacteria which benefit the digestive system.

Lactobacillus is a type of _____ used in yoghurt making. It changes the milk sugar lactose into lactic acid.



Making Yoghurt

Aim: _____

Method:

1. Measure 50mL of _____ into a beaker. Use pH paper to record the starting pH.
2. Stir the milk while heating gently on a tripod over a _____.
3. When it begins to bubble, turn off the gas and leave to cool.
4. Place a _____ into the milk.
5. When the milk has cooled to 35oC, transfer milk to plastic cup, add 3 spatulas of _____ into the cup and stir.
6. Place your mixture into an _____ until next lesson.

Results:

	Colour of pH paper	pH Number	pH: Acid/Alkali/Neutral?
Start			
Final			

Conclusion:

Describe what happened to the pH of the milk.

Evaluation:

Bacteria is needed to make milk thicken into yoghurt. What would we do to make our results more reliable?

Immune System

Starter:

1. Where in the body can microorganisms enter?

2. Can you think of anything that stops microbes from getting in?

Learning Intentions

- To describe the role of the immune system
- To investigate the different ways that the body defends itself from microbes

Success Criteria

I can state that the first-lines of defence are the body's natural barriers.

I can explain how the first-lines of defence can prevent the entry of pathogens.



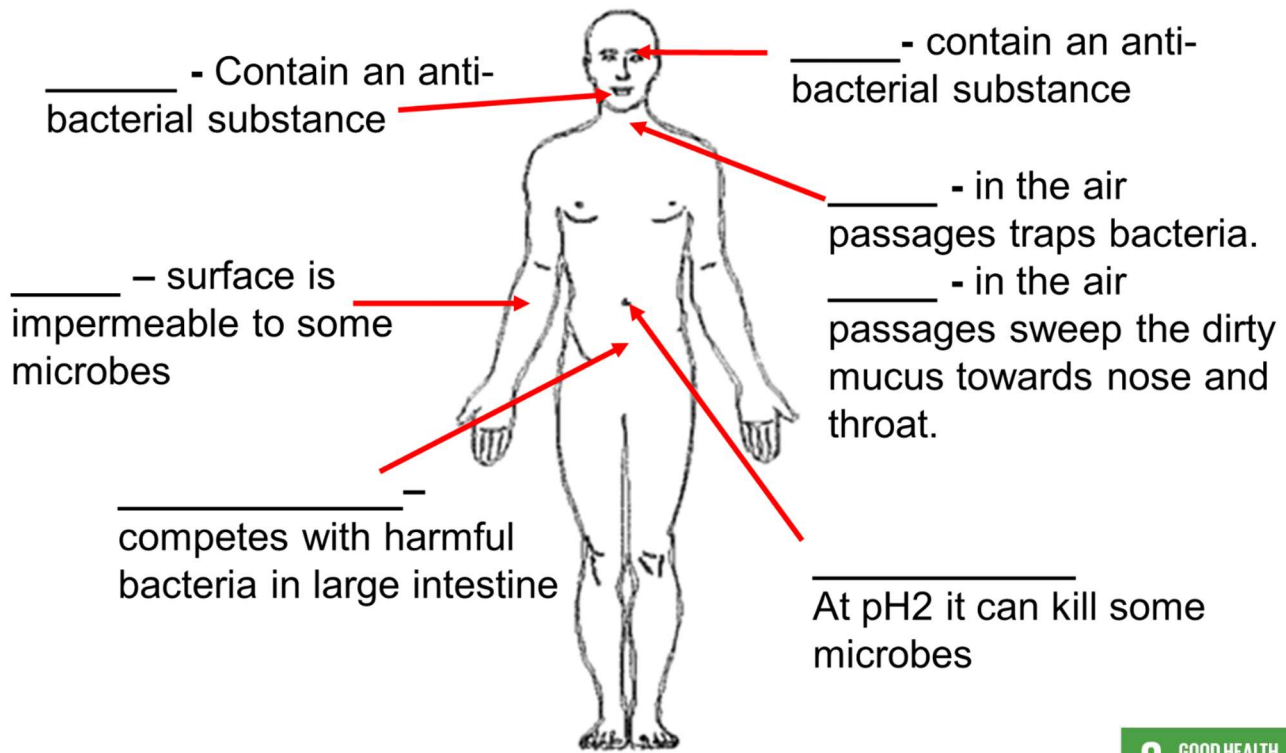
Defending ourselves against microbes

The body's defences:

- _____ microbes getting into the body
- _____ microbes once they have got in

The first-line of defence

The first line of defence preventing _____ from entering are the body's _____ . These can be **physical** or **chemical** barriers.



Sustainable Development Goals



Numeracy Task

- Coverage of the required three doses of the vaccine that prevents diphtheria, tetanus and pertussis increased from 72 per cent in 2000 to 85 per cent in 2015 and has remained unchanged between 2015 and 2017.
- An estimated 19.9 million children did not receive the vaccines during the first year of life, putting them at serious risk of these potentially fatal diseases. The estimated number of children in the whole world is 1.9 billion
- Two doses of the measles vaccine are required to prevent the disease and the illnesses, disabilities and deaths caused by complications associated with it. Coverage with the second dose of measles vaccine increased from 59 per cent in 2015 to 67 per cent in 2017, but that is still insufficient to prevent this highly contagious disease.

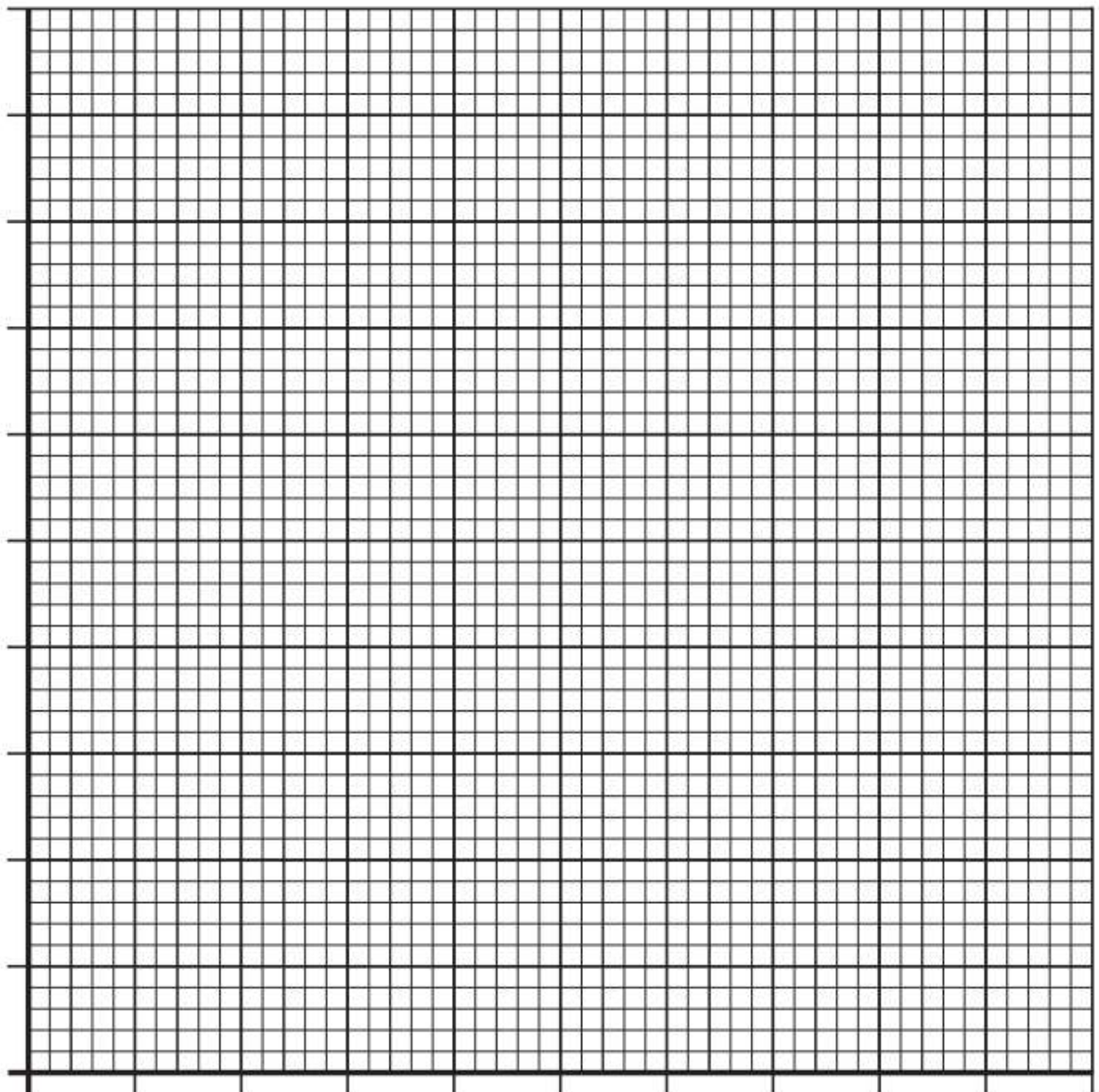
<https://sustainabledevelopment.un.org/sdg3>

1. Make a table using the information above
2. Label one column "Year" and the other "Percentage coverage of vaccine (%)"
3. Fill in information for each of the years 2000,2015,2017

4. Using the information above, work out how many children in the whole world have been vaccinated during the first year of life

5. Challenge yourself: work out the percentage of children in the world that have been vaccinated.

6. Make a bar graph using the information above
 - Label the x-axis "Year"
 - Label the y-axis "Percentage coverage of vaccine (%)"
 - Make a bar for each of the years 2000,2015,2017



Immunity and Vaccinations

Starter:

Can you remember any vaccinations you've had?

Learning Intentions

- To describe the development of vaccinations and their importance in preventing diseases

Success Criteria

- I can state that vaccines are used to prevent diseases.
- I can explain how the first vaccine was developed.
- I can explain how vaccinations result in immunity.



Immunity

Immunity is when your body is able to resist a _____ or infection.

Immunity results from either being exposed to the disease before or by

_____.

Vaccines

We are injected with a _____ or dead form of a disease causing

_____.

Our body think the microbe is real and makes _____ against it.

If the person becomes infected for real the _____ system acts more

_____ because it already has antibodies.

Activity: Watch the Smallpox video and note down three facts

1. _____
2. _____
3. _____

Microbes Added Value Project

Starter

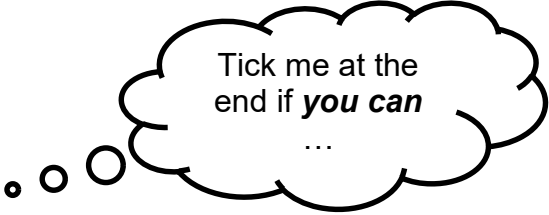
What do you know about **antibiotics**? Do you know what they are used to treat?

Learning Intentions

- To take part in a project that investigates what antibiotics are and how they affect society.

Success Criteria

- I can research what antibiotics are
- I can describe what antibiotics are used to treat
- I can discuss the problems that antibiotics cause



Tick me at the end if *you can*
...

Antibiotics

The main question you are being asked to research is:

- What are antibiotics and what affect do they have on society?

If you want to push yourself, you can also research:

- What happens when antibiotics don't work? What affect will this have on society?

Your Project

Your project will have two parts:

1. Research stage – this is where you think about the aim of your project.
2. Presentation/Reporting stage – this is where you bring together all your research to make a presentation (this could be a poster or powerpoint for example)

Research stage

Aim: *(What will your project show?)*

Background information

Your research might include questions like:

1. What are antibiotics?
2. What do antibiotics do?
3. When/how were antibiotics discovered?
4. What effects do antibiotics have on microbes?
5. What effects do antibiotics have on society?

(space to make notes)

Presentation/Reporting stage

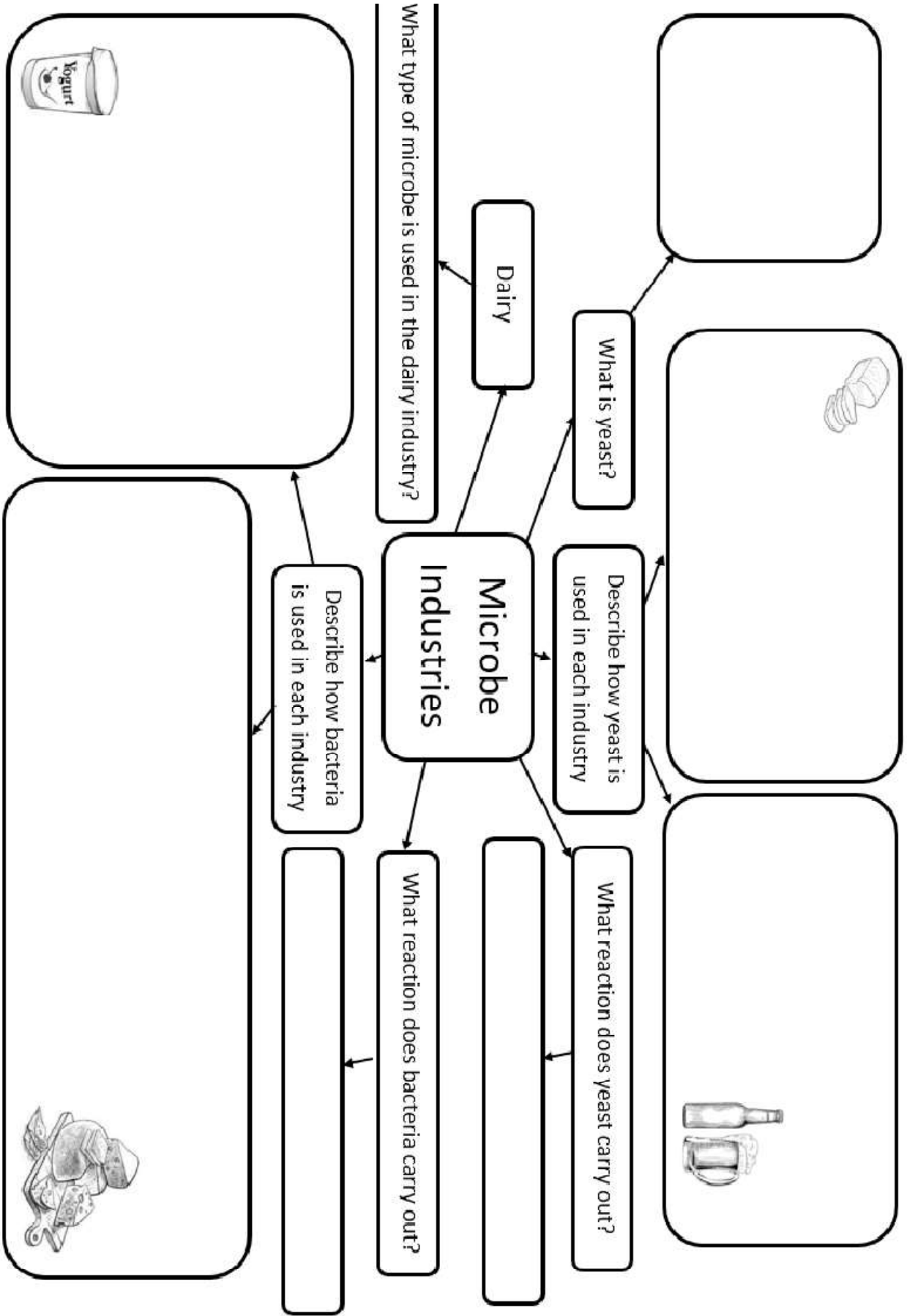
- Use your research to make a poster
- Use your checklist to make sure you have included everything

Conclusion:

- What has your research found out?
- You must now make a conclusion:
- What is the science behind antibiotics?
- Have you explained how antibiotics impact society?

(space to make notes)

Extension Tasks
Microbes in the Food Industry Mindmap



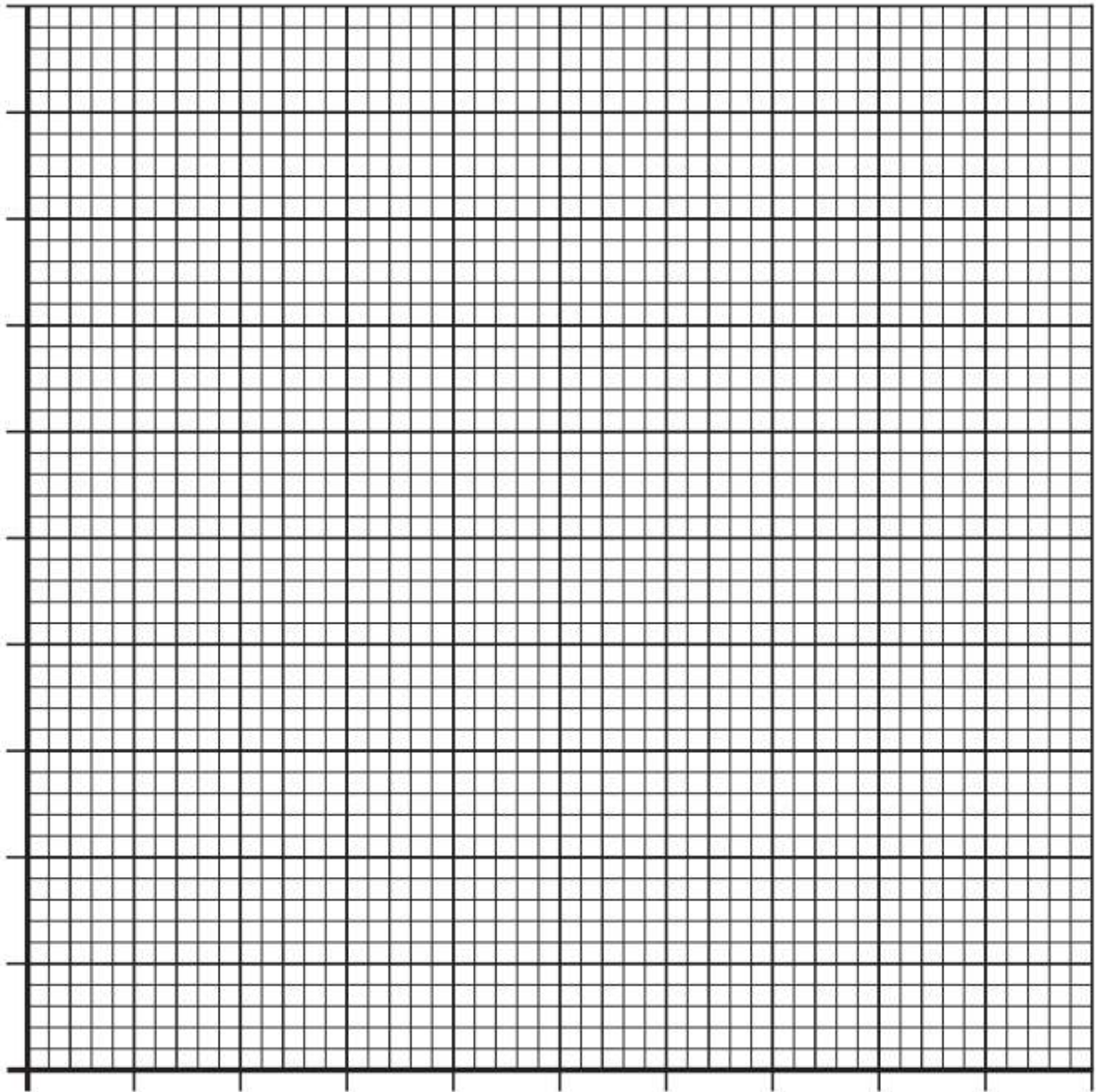
Microbes and Health

Watch the Scientific Eye video about Microbes and health.

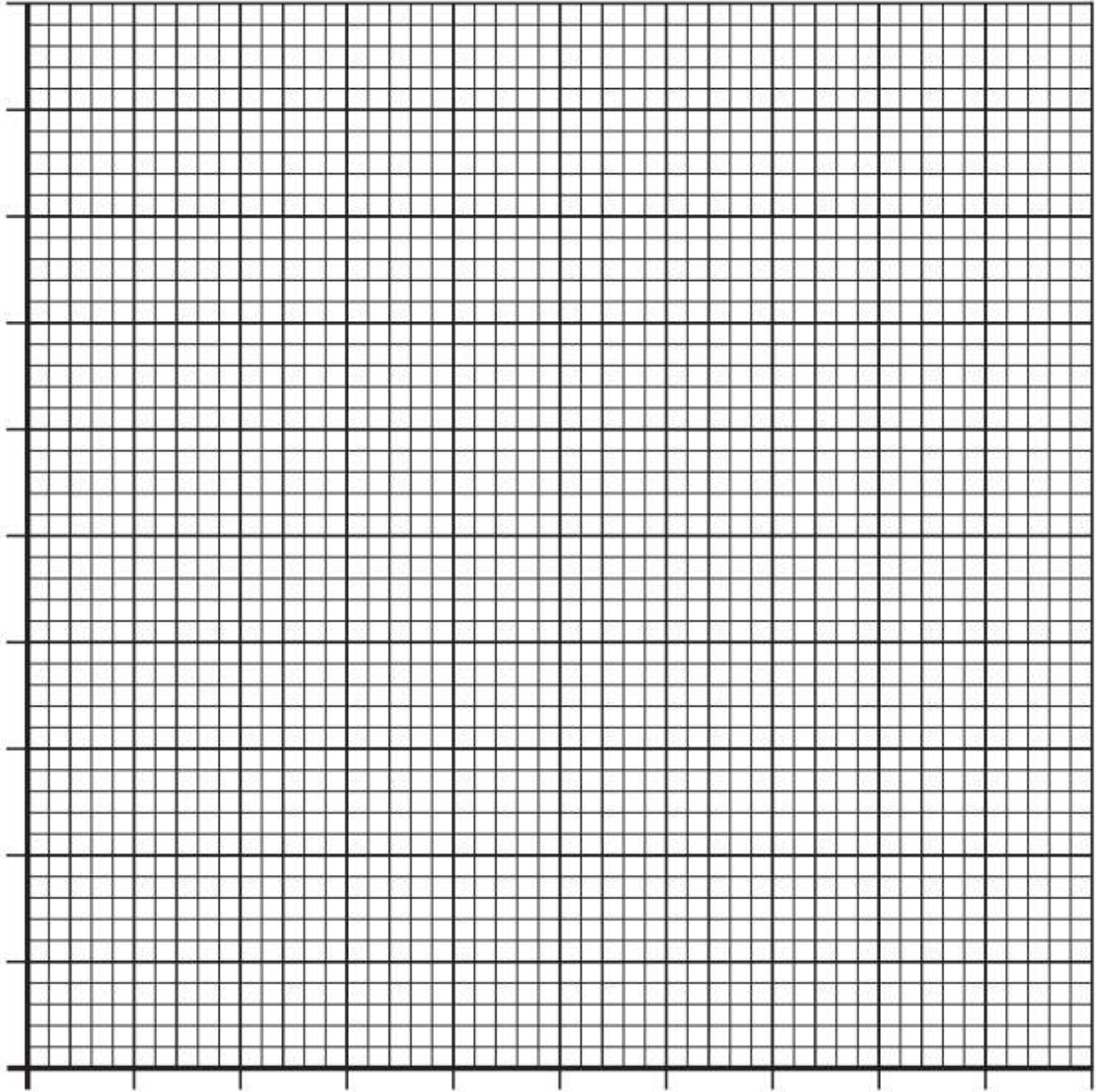
Take brief notes about:

- the diseases mentioned
- what causes them
- the treatments
- how to prevent the disease

Graph paper for numeracy tasks:



Graph paper for numeracy tasks:



Extension Tasks

Word Search

Human Body Systems

L A S I I O R B R P V T L D U M A I N I
T S G N U L O E N N S H N R X S S H U E
D T B H E A N S L E M G M E A S E I I C
C H E A R R R S O I M N T E R E P S D I
T N L L E M S G E T A L L L A X T T R C
O E S I I E I H C A I D R A C H U A B V
A R I N N H T E N E Y I U O I A M S U T
U V G G U O R A L U C S U M E L E T T T
J O I N T S U R R I N T E S T I N E S N
H U D I G E S T I V E U M R O N O A T I
B S S H I V R B M A A S S Y R G N H D I
O N T U E L S O I S B T H C O R T N T U
D E O T P M E N V L T U E R N S H S N G
Y E M S E I R E T R A M U T C E R S N E
R I A O L O S S E V R E N A N E E T A B
T E C T T E N S N I E V I M B L O O D A
I T H E S S T Y E K M R S H S U A U L R
N L L U K S T I Y S N C N I E G U C U A
E H L S M O O T H T U O M I I E L H G A
C T X M H O X Y G E N I A R B T N L E E

Oxygen

Septum

Nervous

Digestive

Muscular

Skull

Brain

Joints

Bones

Mouth

Rectum

Exhaling

Taste

Body

Smooth

Inhaling

Smell

Heart

Arteries

Nerves

Stomach

Touch

Cardiac

Hear

Blood

Intestines

Lungs

Veins

Draw a comic strip on one of the topics. Ask your teacher for ideas.

Extra Questions

1. What are the three parts of an animal cell?

2. State the function of the cell membrane.

3. State the function of the nucleus.

4. State the function of the cytoplasm.

5. Describe how you would prepare cheek cells under the microscope.

6. Name the three types of microbe.

7. Give an example of an aseptic technique.

8. State the equation for the fermentation of yeast.

9. State the equation for the fermentation of bacteria.

Colouring Sheet

