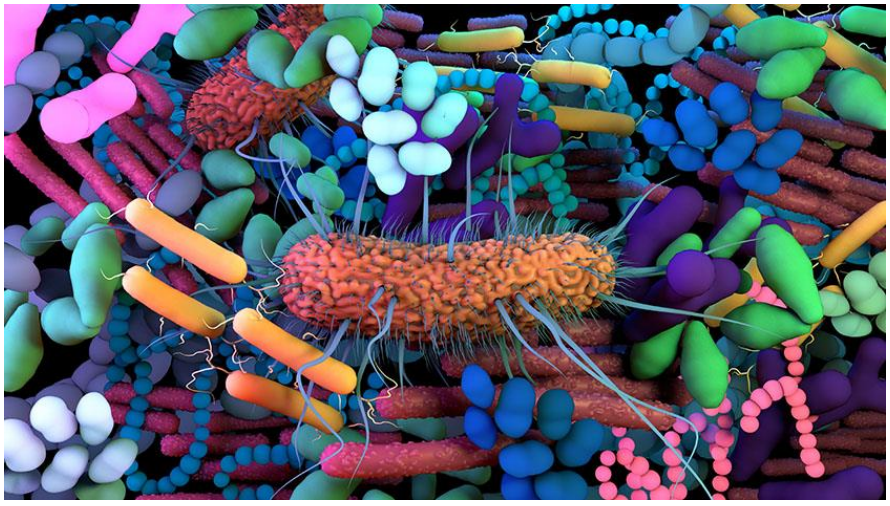
Kirkcaldy High School



BGE Science

Science of the House

Microorganisms

Name:_____

Class:_____

Teacher:_____

Expectations and Outcomes Learner Evaluation

Topic: Microorganisms

Experience and Outcomes	Date Completed (dd/mm/yy)	Evaluation How happy are you with it? (☺ ? ☹)
I can state the names and compare the different types of microbes		
I can describe the structure of microbes		
I can stain yeast cells and identify them under a microscope		
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 grow microbes on an agar plate		
I can explain the importance of hand hygiene		
I can state two food products made using yeast		
I can state two food products made using bacteria		
I can describe a simple fermentation experiment		
I can understand how to make cheese		

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 list different types of white blood cells and explain how they help defend the body against disease.		
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.		

Date: _____

Types of Microbes

Starter

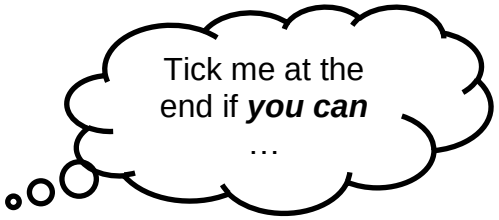
What causes rotting and mould?

_____

_____

Learning Intentions

- To identify the different types of microbes.
- To research and describe the structure of microbes.
- To compare the different types of microbes.



Success Criteria

☐ I can state the names and identify the different types of microbes

☐ I can describe the structure 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:

_____

_____

_____

Using the fact sheets on your table you need to complete your fact file about the different types of microbes.

Microbe	Examples	Structure	Extra Info
Fungi			
Bacteria			
Virus			

You must include a labelled diagram of one microbe for each of the categories:

Bacteria	**Fungi**	**Virus**

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)

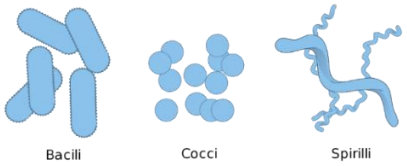
Date: _____

Microscopes

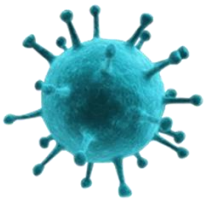
Starter

What do you think the size order of our three types of microbes might be?

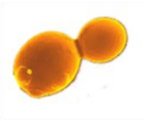
(number them 1 – 3: 1 = smallest 3 = biggest)



Bacteria



Viruses



Fungi

Learning Intentions

- To compare the sizes of bacteria, viruses and fungi.
- To stain yeast cells
- To look at stained yeast cells under a microscope.
- To use numeracy skills to solve simple size and scale problems

Success Criteria

Tick me at the end if ***you can*** …

☐ I can compare the sizes of bacteria, viruses and fungi

☐ I can stain yeast cells and identify them under a microscope

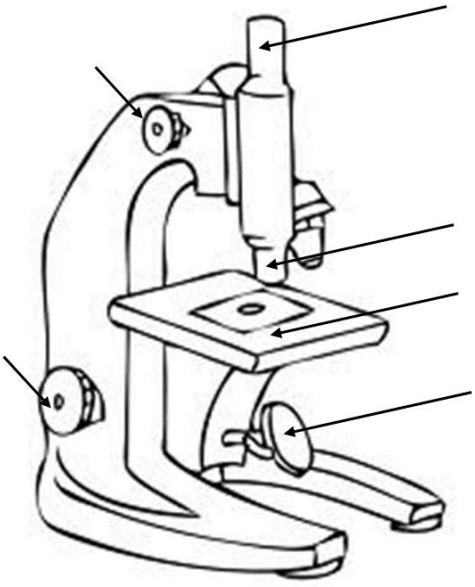
---

Microscopes

Cells are very _____.

A microscope is used to make

cells appear _____.



Staining Yeast Cells

Aim:

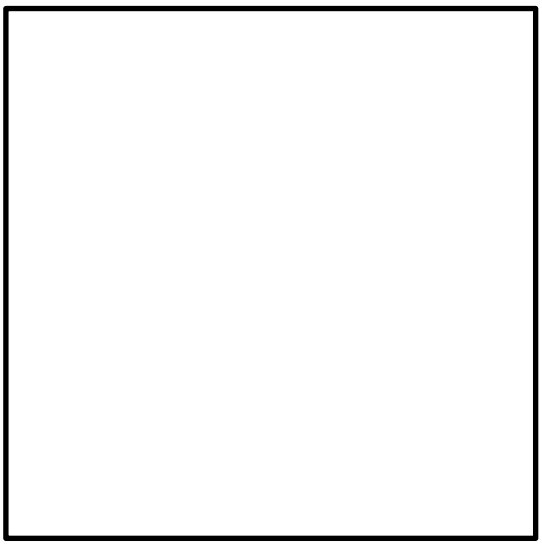
_____

_____

Method:

1. Add 1 drop of _____ sample to a clean _____ slide
2. Add 1 drop of _____ _____ stain to the slide
3. Place the _____ _____ over the sample
4. Use the _____ magnification on your microscope to bring the sample in to focus

Results: *Draw a diagram of the yeast cells under the microscope, write down the magnification you used.*



Magnification: _____

Conclusion:

_____

_____

_____

Microbes Numeracy

We use micrometres to measure microbes 1mm = _____

To change mm to µm we _____by 1000

To change µm to mm we _____by 1000

Date: _____

Microbes Numeracy

Starter

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

   _____

2. The HPV virus measures 5 μm wide. What is it's width in mm?

   _____

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

   _____

Microbes Numeracy

1. 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)

2. 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?

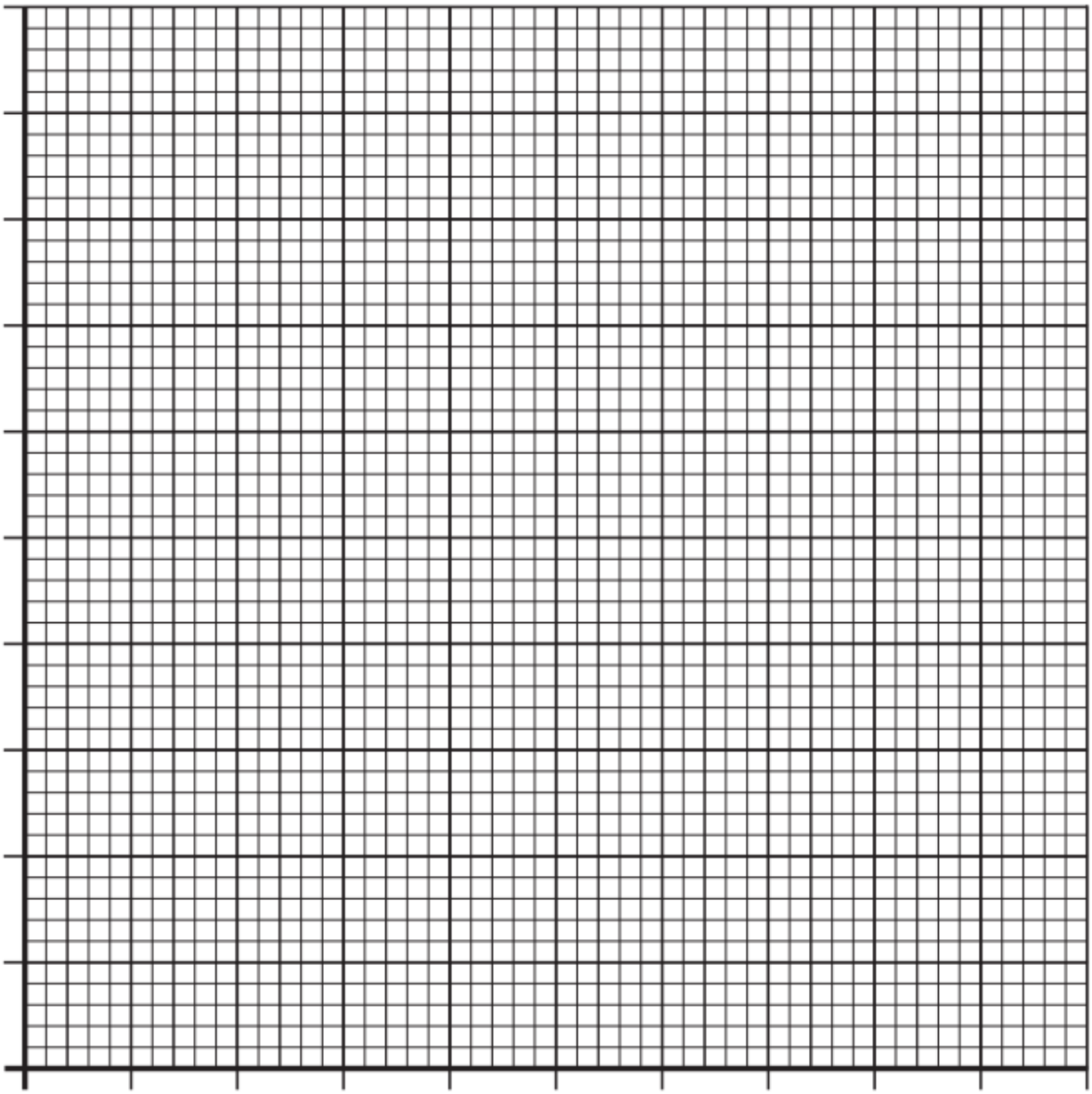
   _____ bacteria (1)

3. 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

(3)

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

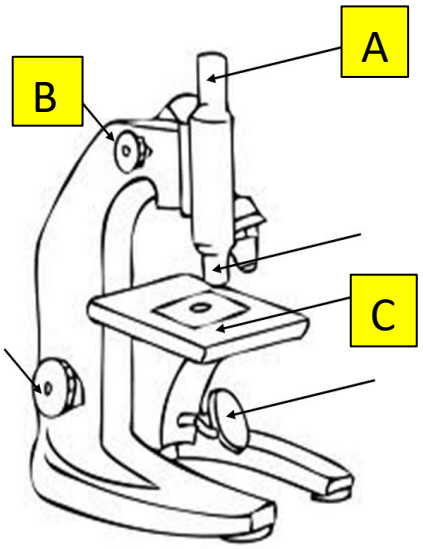


Date: _____

Aseptic Technique

Starter

Label parts A-C on the microscope.



A _____

B _____

C _____

Learning Intentions

- To define contamination
- To investigate hand hygiene
- To describe aseptic technique
- To identify ways to prevent contamination of experiments
- To identify ways to prevent contamination of experimenter
- Set up an experiment to show why aseptic technique is important

Success Criteria

Tick me at the end if ***you can*** …

- ☐ I can define contamination
- ☐ 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 _____. Healthcare professionals use aseptic technique to _____ patients, themselves and the public from _____.

Healthcare professionals include _____, _____, _____ and _____.

Examples of Aseptic Technique

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

Hand Hygiene Experiment

Aim:

_____

_____

Method:

1. Apply a small drop of hand gel to your hands and rub them together
2. Let the gel dry
3. Wash your hands as you would normally
4. Look at your hands under the UV torch

Results: *How clean are your hands? Are your hands any cleaner after watching the video and re-washing?*

_____

_____

Conclusion: *What happened to the pathogens when you washed your hands?*

_____

_____

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

Date: _____

Growing Microorganisms

Starter

1. Describe what is meant by contamination.

   _____

2. State two ways to prevent the spread/growth of microorganisms.

   _____

3. Why is it important to wash your hands?

   _____

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

Tick me at the end if ***you can*** …

☐ 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

---

Growing Microorganisms Experiment

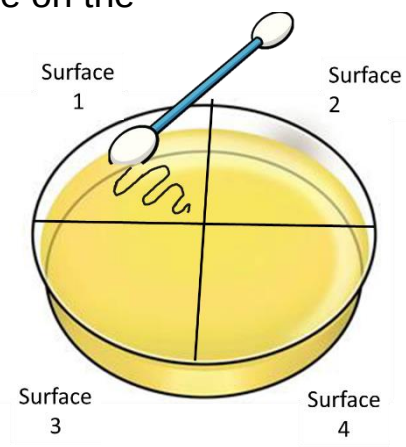
<u>Aim</u>:

_____

_____

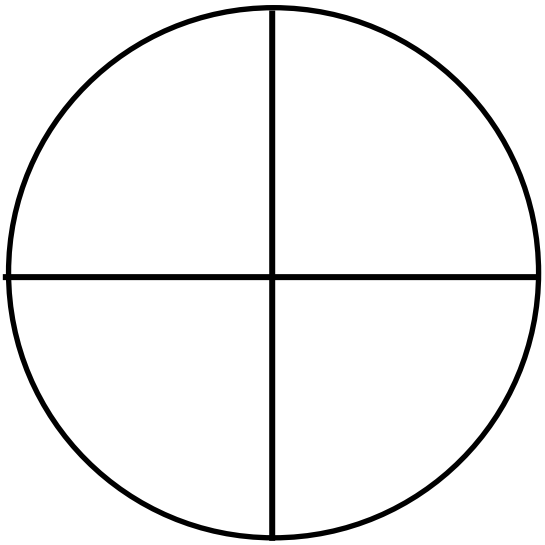
<u>Method</u>:

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

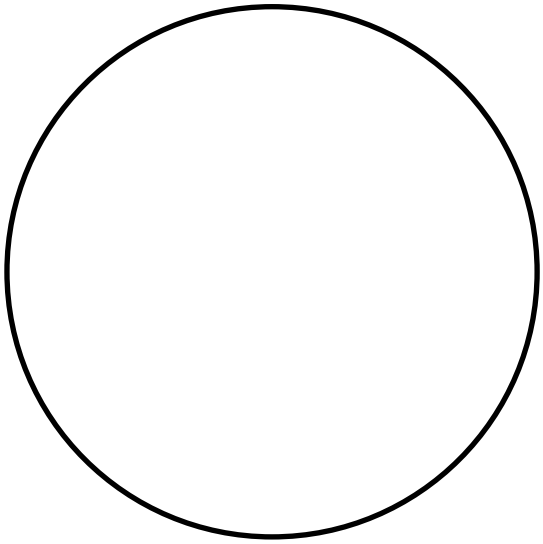
Aim: _____

Method:

1. Your teacher will label the underside of a petri-dish with todays 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:

_____

_____

Extension Activity - Complete table below

Aseptic Technique	**Reason measure is needed**
No eating or drinking in the lab	
Wiping bench with disinfectant/alcohol	
Not growing microorganisms at body temperature	
Using sterile loops when transferring cultures	
Flaming culture bottle necks to prevent contamination	
Washing hands thoroughly	

Date: _____

Spreading Microorganisms

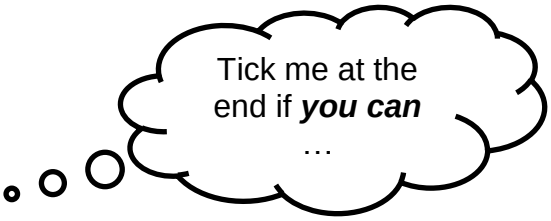
Starter

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

Seven Wonders of the Microbe World Video

Activity: Watch the video and note down three facts:

1. _____
   _____
2. _____
   _____
3. _____
   _____

Date: _____

Making Alcohol

Starter

1. State the three types of microbes.

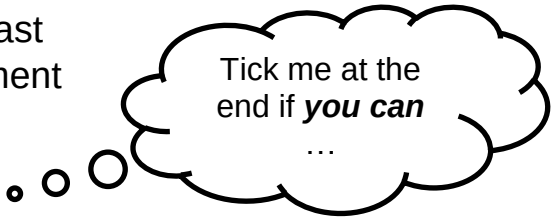
_____

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

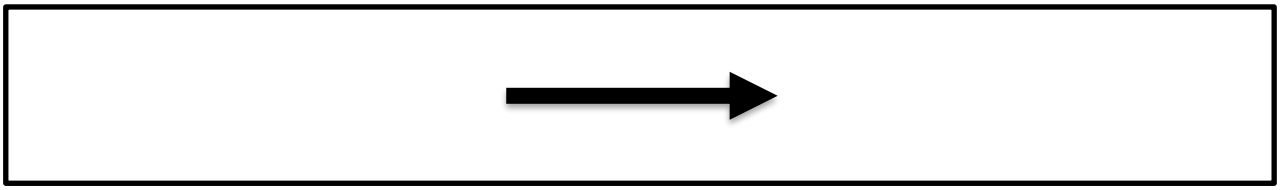
Making Alcohol

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?

_____

_____

_____

_____

Date: _____

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

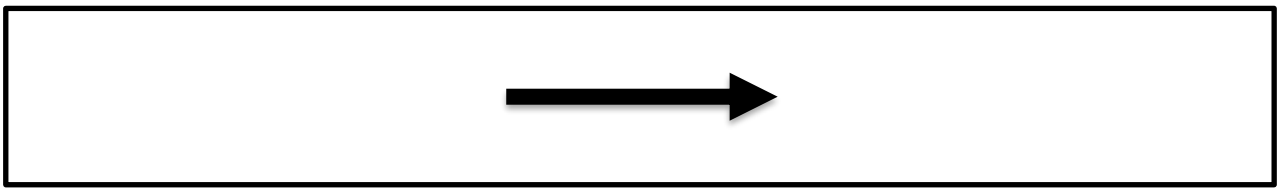
Yeast is a type of _____.

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?

_____

_____

_____

_____

Date: _____

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?

_____

_____

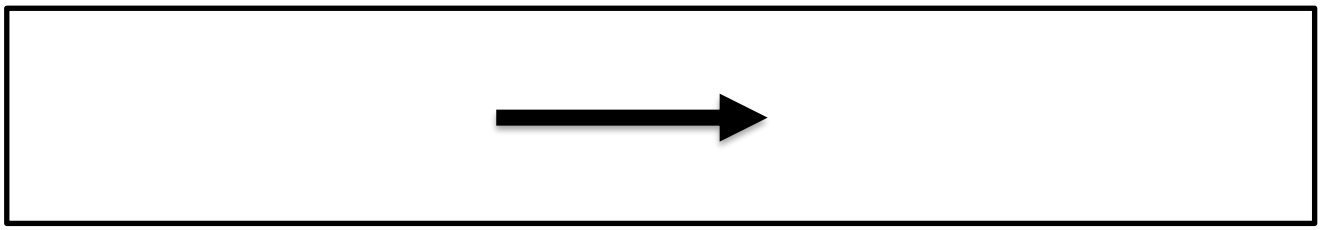
_____

Date: _____

Making Cheese

Starter

Write the word equation for the fermentation for sugar in milk, labelling the raw materials and end products in the box below.



Learning Intentions

- To state two food products made using bacteria
- To understand how to make cheese

Success Criteria

☐ I can state two food products made using bacteria

☐ I can understand how to make cheese

Making Cheese

There are *two stages* in making cheese:

1. Cheese-making bacteria, which feed on milk sugar, multiply and produce _____. This gives the cheese its flavour and helps the milk to _____.
2. Adding an _____ called _____ to milk, which makes the milk curdle (clot).

Making Cheese

<u>Aim</u>: _____

<u>Method</u>:

1. Test your _____ from last lesson with pH paper
2. Record the pH in your table from last lesson and write a conclusion

3. Add one drop of _____ to the beaker and stir.
4. This should be covered with clingfilm and left in a _____ environment for 24 hours.
5. Your teacher will put the beakers in a fridge if longer than 24 hours.

Results:

Look at your cheese from last lesson.

The yoghurt has turned into _____ and _____.

The solid _____ are dried to become _____.

Conclusion:

Answer your aim.

_____

_____

Evaluation:

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

_____

_____

_____

Making Cheese Video

1. The video shows the production of which type of cheese?

2. How long does the milk get pasteurised for?

3. Once the whey is drained off, what is it used for?

4. What is added to increase the flavour and preserve the cheese?

5. The length the cheese is stored for affects what?

Date: _____

Immune System

Starter

1. Where in the body can microorganisms enter?

   _____

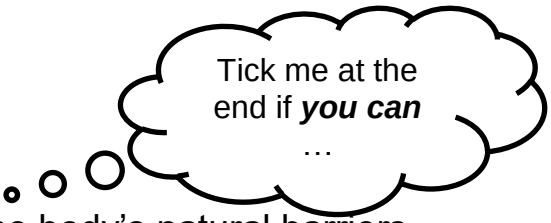
2. Can you think of anything that stops microbes from getting in?

   _____

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.
- ☐ I can list different types of white blood cells and explain how they help defend the body against disease.

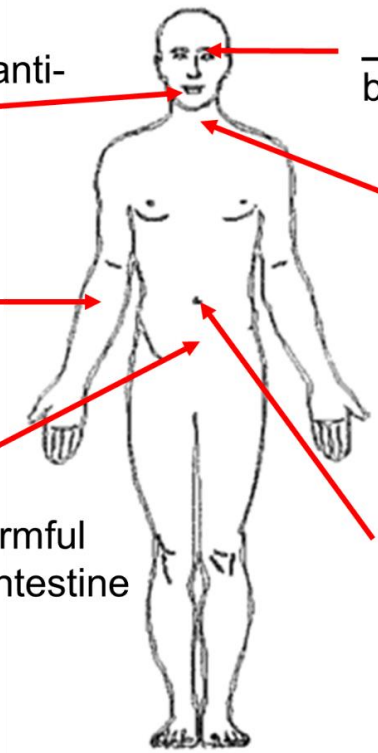
Defending ourselves against microbes

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.



_____ - Contain an anti-bacterial substance

_____- contain an anti-bacterial substance

_____ - in the air passages traps bacteria.

_____ – surface is impermeable to some microbes

_____ - in the air passages sweep the dirty mucus towards nose and throat.

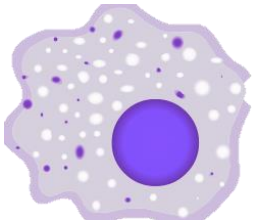
_____–
competes with harmful bacteria in large intestine

_____
At pH2 it can kill some microbes

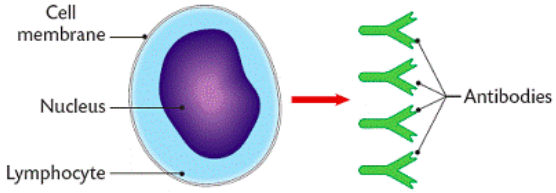
White Blood Cells

There are <u>two</u> main groups of white blood cells which are involved in the immune system:

1. _____
   – engulf bacteria



2. _____
   – produce antibodies



Sustainable Development Goals Extension Task – part 1

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.

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

Date: _____

Immunity and Vaccinations

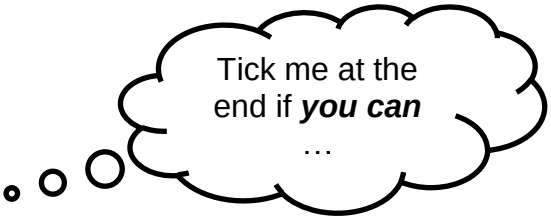
Starter

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. _____

Sustainable Development Goals Extension Task

Part 2.
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.

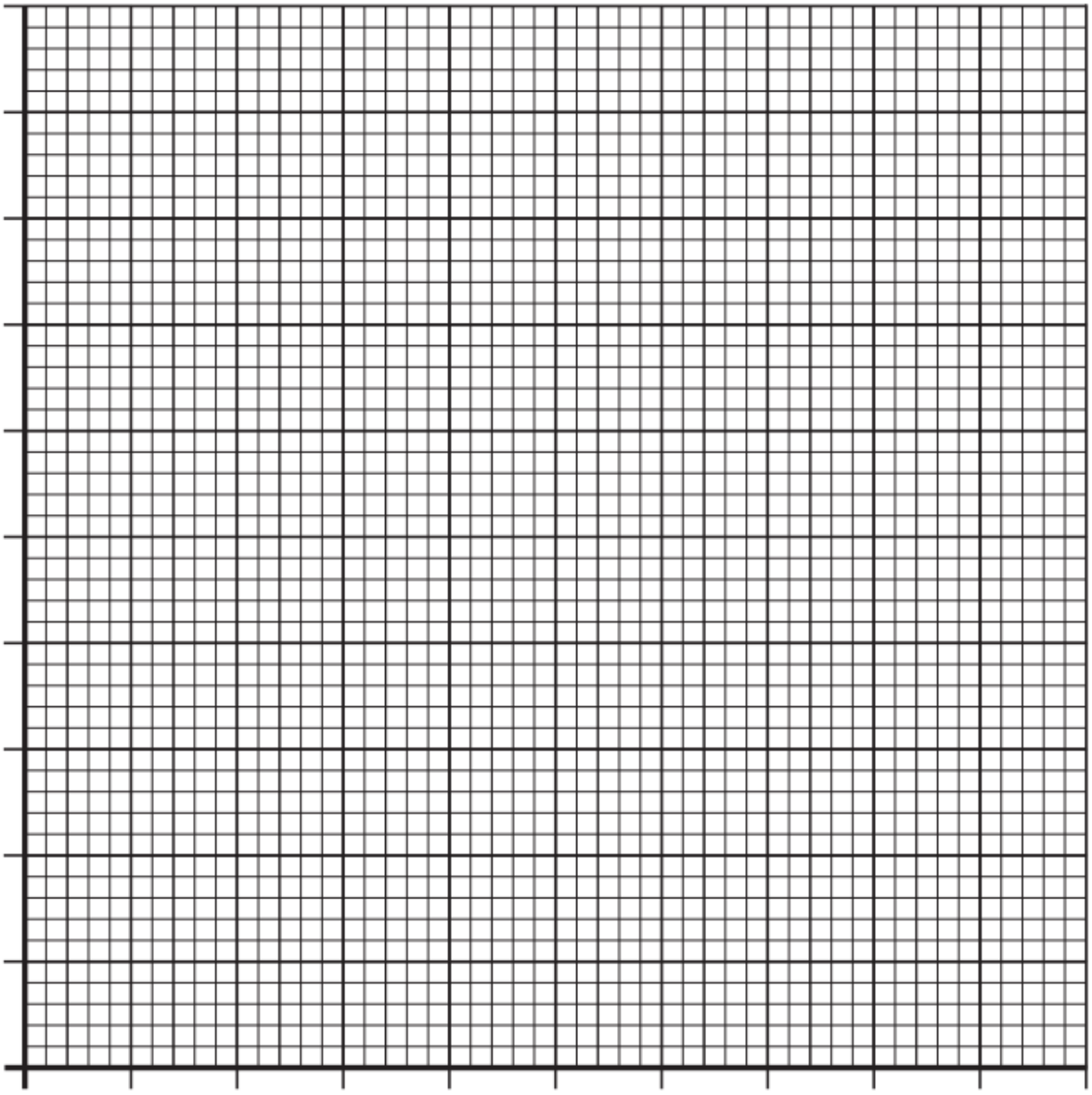
1. Using the information above, work out how many children in the whole world have been vaccinated during the first year of life

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

Part 3.
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.

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

Graph paper for numeracy task:



Microbes and Health

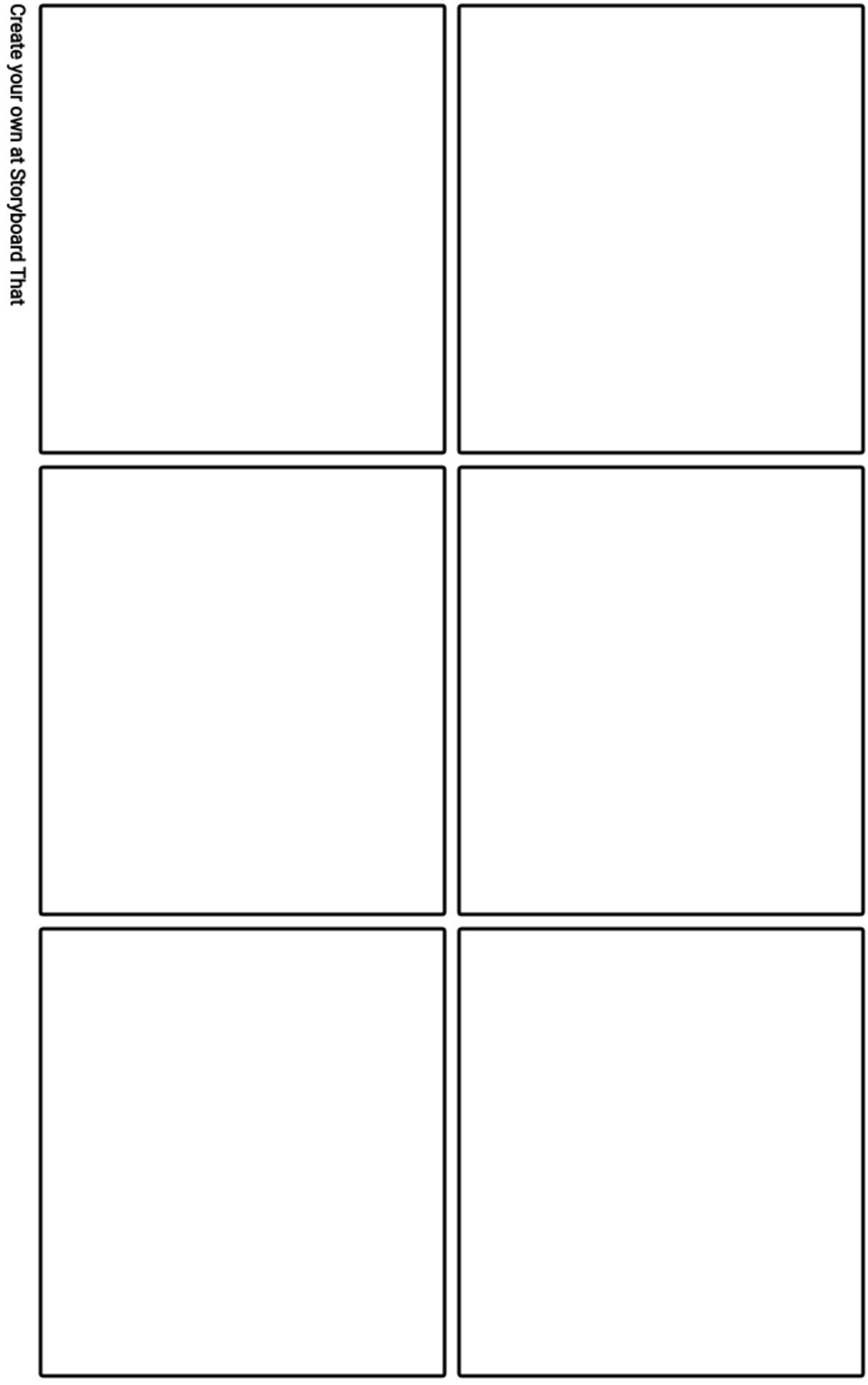
Watch the Scientific Eye video about Microbes and health.

Take brief notes about:

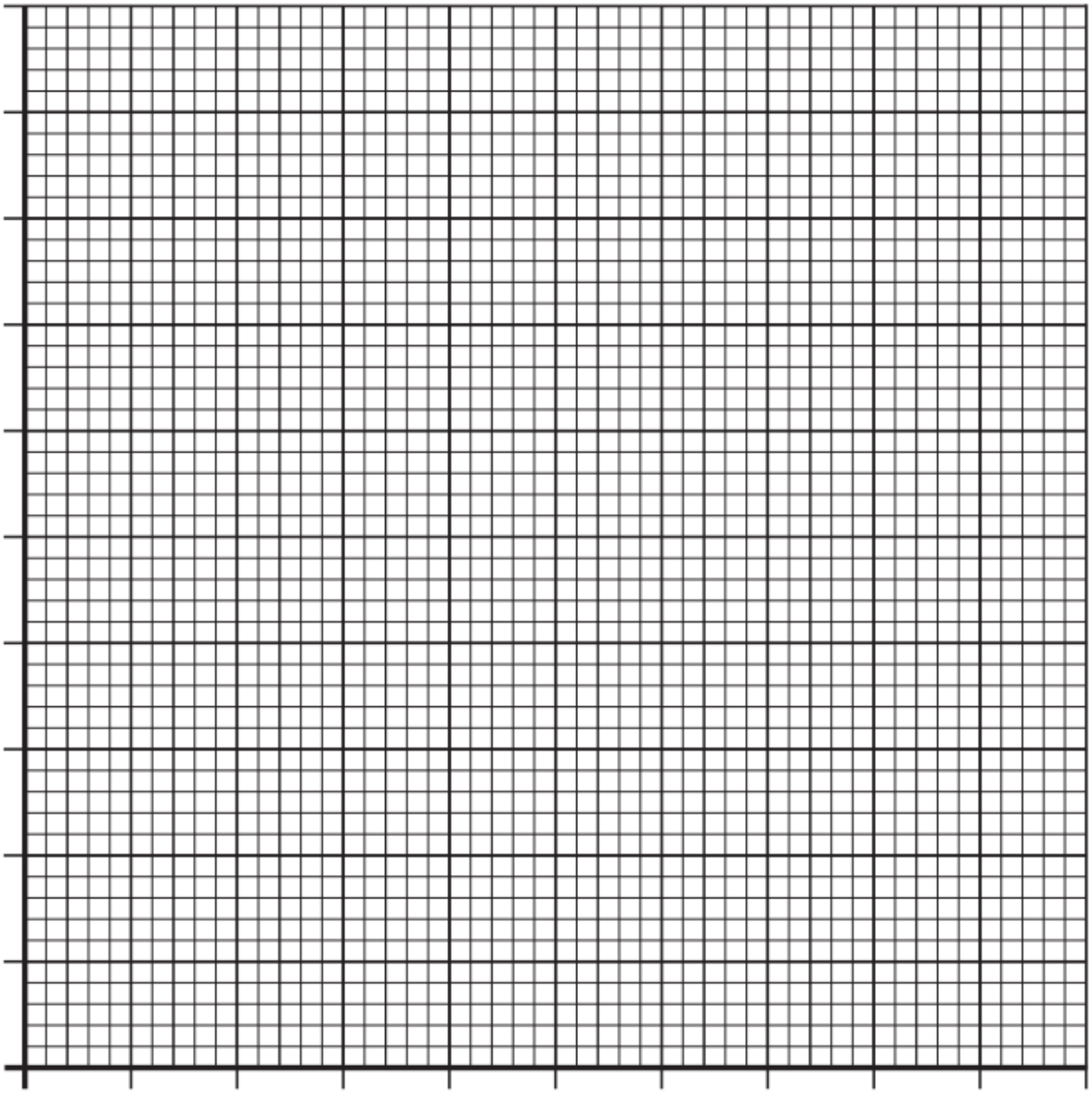
- the diseases mentioned
- what causes them
- the treatments
- how to prevent the disease

_____
_____
_____
_____
_____
_____
_____

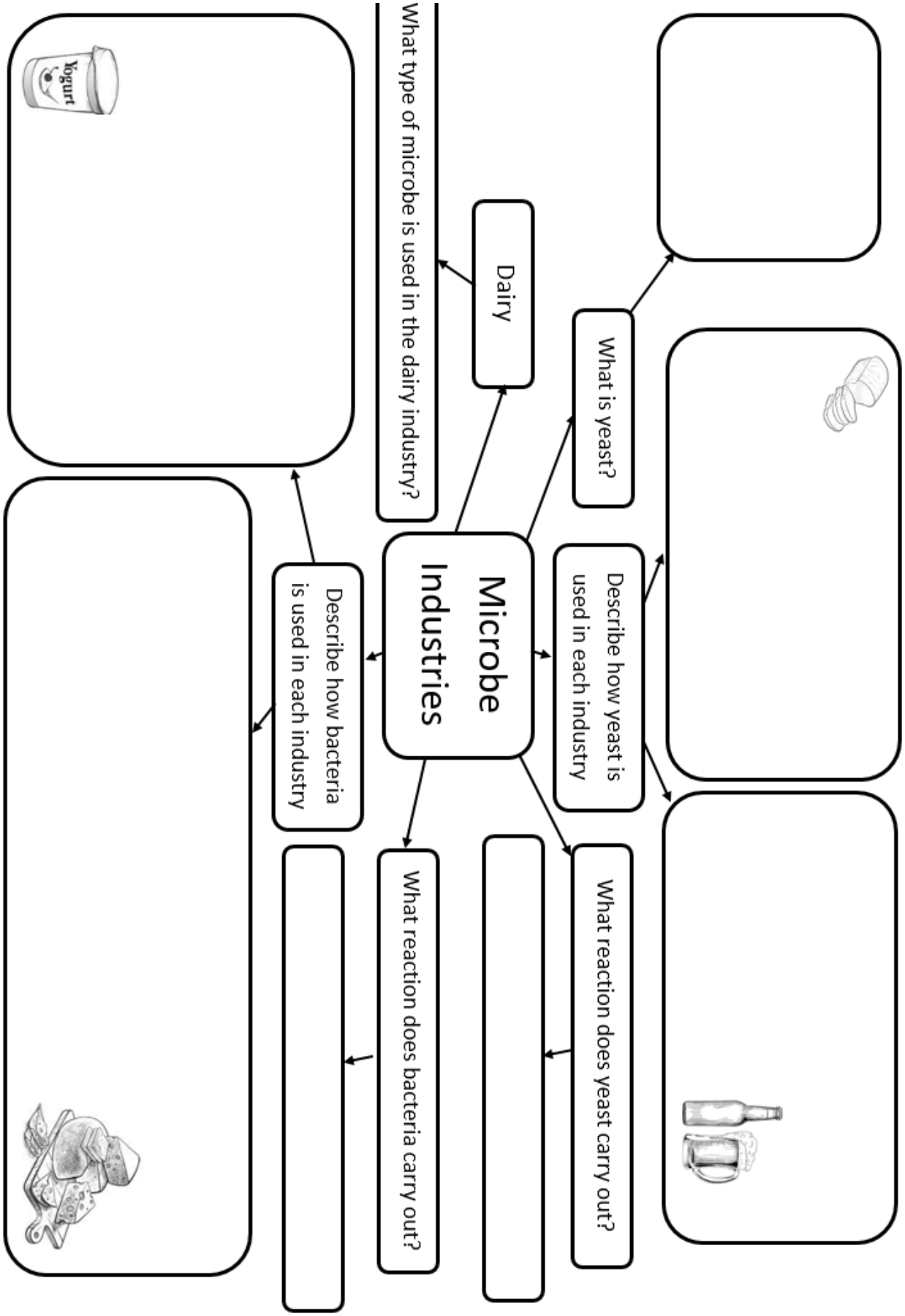
Create a storyboard of Edward Jenner and his discovery of the first Smallpox vaccine.



Graph paper for numeracy tasks:



Extension Tasks
Microbes in the Food Industry Mindmap



Word Search

Microbes

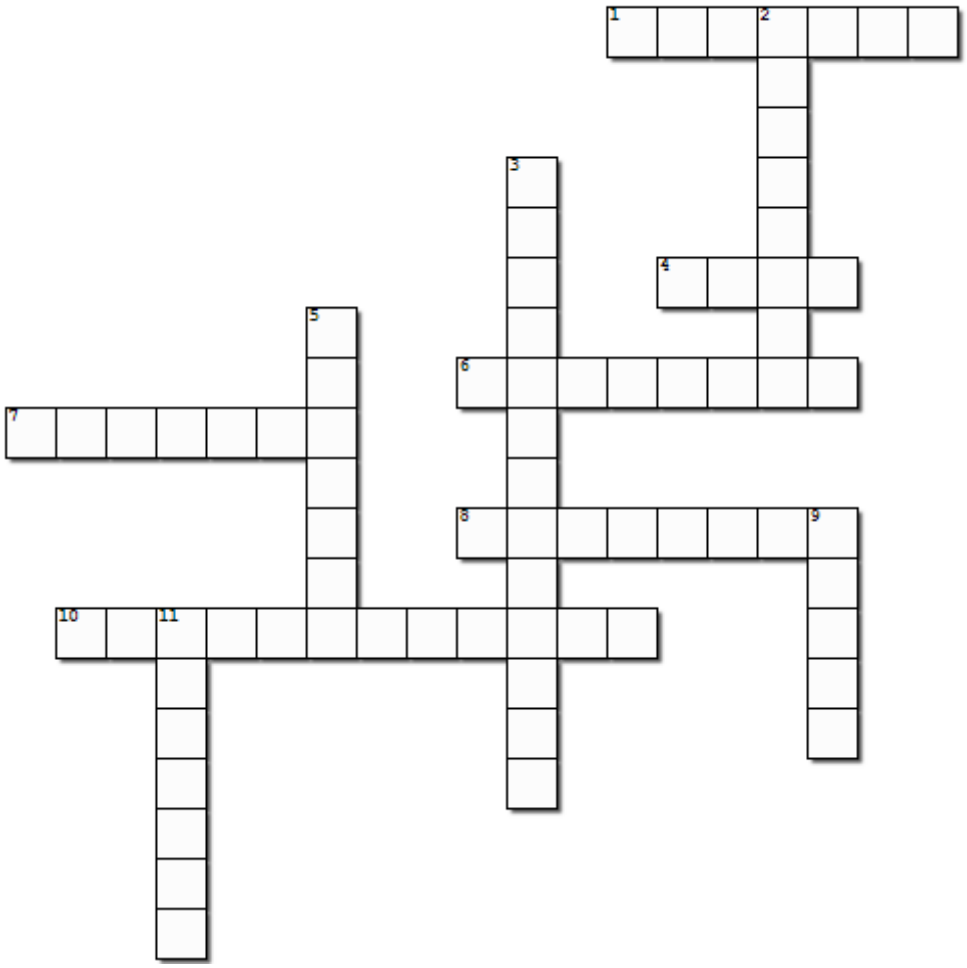
N	O	I	T	A	T	N	E	M	R	E	F	M	I
P	S	S	E	I	E	F	L	A	C	T	O	S	E
N	A	E	C	I	I	N	E	N	O	I	I	I	T
G	H	T	A	A	P	L	F	T	N	G	N	N	I
M	G	Y	H	S	L	T	O	I	T	C	C	A	M
A	E	O	G	O	A	E	B	B	A	O	U	G	N
S	N	B	T	I	G	E	F	O	M	I	B	R	E
E	C	I	I	N	E	E	I	D	I	E	A	O	G
P	R	M	A	C	T	N	N	Y	N	O	T	O	I
T	E	M	E	M	I	E	E	G	A	E	E	R	T
I	C	U	C	T	B	A	R	A	T	O	E	C	N
C	E	N	R	E	M	C	B	G	I	A	N	I	A
A	U	E	S	G	C	E	O	A	O	L	M	M	A
T	N	M	M	N	A	I	E	R	N	I	N	N	E

LACTOSE
ANTIGEN
ANTIBODY
SCALE
AGAR
FERMENTATION
HYGIENE
PATHOGEN
ASEPTIC
CONTAMINATION
INCUBATE
IMMUNE
MICROORGANISM

Crossword

Microbes

Complete the crossword below.



Across

1. Hand _____ must be practiced when growing microbes.
4. A gel like substance used to grow bacteria.
6. A microbe that can cause infection and disease
7. A technique used to prevent unwanted microbes growing.
8. Has a role in the specific immune system.
10. The bodies defence against pathogens

Down

2. When microbes are left in warm conditions to grow.
3. If something has been made impure, polluted or poisoned.
5. A sugar found in milk products.
9. A type of fungus used to make bread and beer.
11. Must be seen under a microscope.