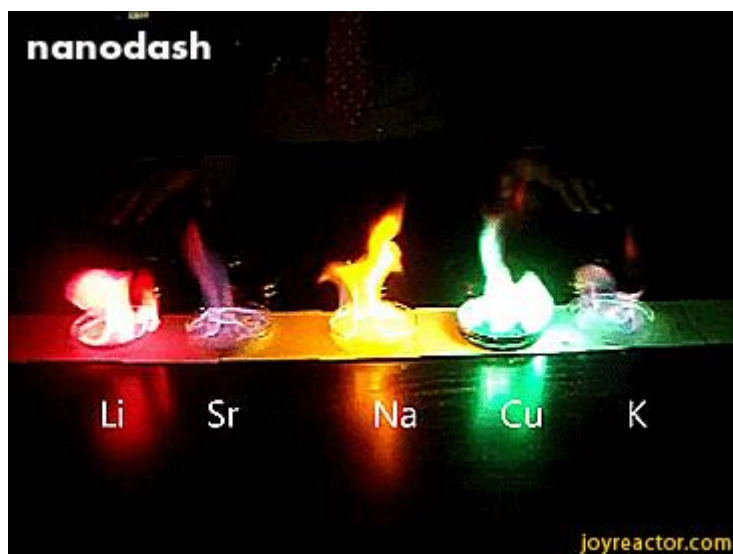


*Remember, Remember*

## Activity Pack Three



*Remember, Remember!*

*Remember, remember the fifth of November.*

*Gunpowder, treason and plot.*

*We see no reason*

*Why gunpowder treason*

*Should ever be forgot.....*

# *Remember, Remember*

Lily, Rosa and Frank are Healthcare Scientists working in the laboratories at Great Ormond Street Hospital. They work to help patients understand what is making them unwell, or to help with making them better.

It's November and there is fog hanging in the air, the leaves have begun to fall and the street lights have started to come on by the time they leave work.

Scientists often work late into the night and Lily is waiting for Rosa and Frank to finish for the day.

Whilst waiting for them she decides to run one more test using her favourite piece of lab equipment, a MALDI-ToF she's called Bonnie. Bonnie is a pretty cool piece of equipment as it has a laser and can get a result for Lily in less than 5 minutes for something she used to have to wait 2 days for.

Just as she presses the big red button, Rosa and Frank walk through the door to the laboratory. Suddenly a message appears on the screen, where no message should be saying 'HELPE...'

Then the message changes and gives an address at the top of Lamb's Conduit Street and what looks like a map.

Lily is so surprised she jumps back and tries to turn Bonnie off, but the machine doesn't respond and the message just stays on the screen.

Not knowing what to do Lily, Rosa and Frank decide to leave the lab and find somewhere to sit and chat to work out what might have happened, after all this is a piece of scientific equipment not a computer game.

As they leave the lab they are suddenly surrounded by the fog they had seen outside the window until they can barely see what's in front of them.

As they walk towards where they believe the tube to be they suddenly realise they are on Lamb's Conduit Street and the fog begins to clear

A child is waiting, she has a Scottish accent and demands they call her Princess Elizabeth! They must all bow to her!

She tells them there is a plot to get rid of her father by blowing up the Houses of Parliament. The scientists are amazed - do you mean the Gunpowder Plot of 1605?

She says she will tell them later how she managed that.

Even then, they don't believe she is a princess....

But she is

# *Remember, Remember*

Princess Elizabeth finds it very funny that the scientists don't know where they are, as everyone knows that Mr Lamb made a dam to direct water from the Fleet River so that people could make a street here and have fresh water, for drinking and washing. That's where Lamb's Conduit Street gets its name.

Princess Elizabeth says that you need to get from here to the Houses of Parliament in order to begin to investigate the Gunpowder Plotters. She draws the scientists a map that they can follow.

Before they leave, Princess Elizabeth gives them a piece of paper with a message on it for the guards at the Houses of Parliament, she says it contains a codeword so they will let you in.

What can you do to help the scientists in 1605?

The scientists must find a way to help Princess Elizabeth find the Gunpowder Plotters. Then maybe they'll be able to find out how to get back to 2020!

The scientists have asked you to complete a number of activities in order to help them find the plotters. You are the detectives, guiding the scientists so that they can get home.

Complete the following activities and we'll find a way to get the results back in time to the scientists in 1605.

# *Remember, Remember*

## Activity One

Whilst the scientists are travelling using Princess Elizabeth's map they are shocked to see by how dirty London was in the past. People are wandering covered in dirt and they are eating with hands that they haven't washed.

Lily, Rosa and Frank ask the boatman why they don't wash their hands? He says that they don't know anything about hand washing. Frank tries to give him a hand hygiene leaflet that explains how to wash his hands and why it's important, but the boat man says he doesn't know how to read.

Rosa asks how he learns things if he doesn't know how to read? The boatman says that they make up rhymes and use those to learn instead.

Can you make up a rhyme about keeping clean or washing your hands that Rosa can teach the boatman so he can teach others about why it's important to keep clean?

# Remember, Remember

## Activity Two

Lily, Rosa and Frank hand over the message to the guard at the Houses of Parliament. They are shown to an underground chamber where there are barrels of gunpowder, but also some barrels of river water, piles of wood and some blood where one of the plotters has hurt himself before they ran away.

The scientists decide to investigate the scene using some science skills from working in the hospital. The guard gives them a map with 4 possible places where the plotters might have fled to.

Can you help the scientists use their science to find where on the map below the plotters might be hiding?

(Hint: combine the information from activities two, three, four and five to help you)

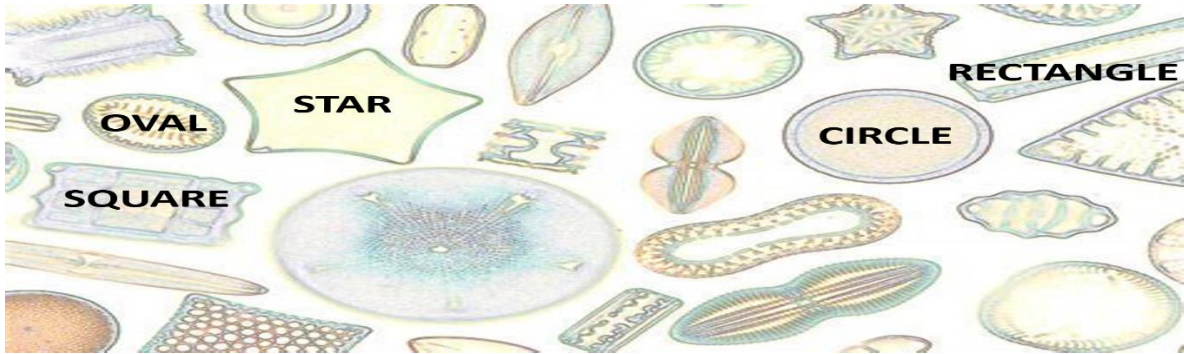
The map displays four locations with the following features:

- Location One:** Beech Forest (represented by a Beech tree icon).
- Location Two:** Elm forest (represented by an Elm tree icon).
- Location Three:** Oak forest (represented by an Oak tree icon).
- Location Four:** Beech Forest (represented by a Beech tree icon).

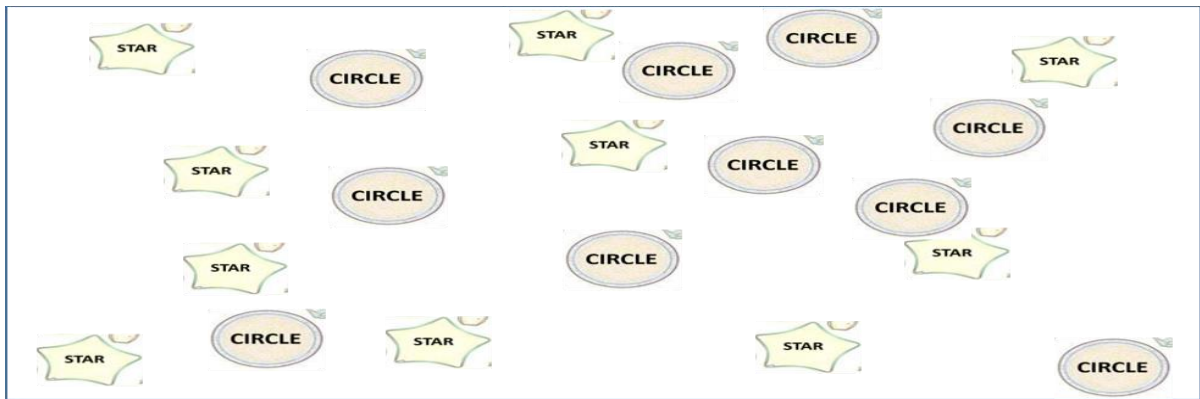
Other features on the map include a river, a city (Houses of Parliament), and four mines: Gold mine, Copper mine, Chalk mine, and Silver mine.

# Remember, Remember

First they look at where the river water came from, and then investigate the blood that is on the wood. The scientists look at some the micro-organisms (diatoms) in the river water. Lily says that what organisms are in there can be used to work out which river the water came from. Hopefully then we'll be able to narrow down where the plotters might be hiding!



Use the shape of the diatoms in the water to identify where the water has come from



Diatoms present in river water sample

River	Star	Oval	Rectangle	Square	Circle
Tyburn	Yes	Yes	No	No	No
Thames	No	Yes	Yes	No	No
Fleet	Yes	No	Yes	No	No
Lea	No	Yes	No	Yes	No
Oakley	Yes	No	No	No	Yes
Sample					

Diatoms present in different London rivers for comparison

Which river do you think that the river water came from?

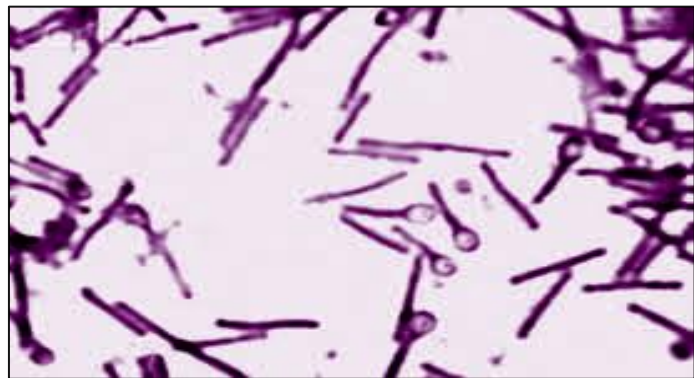
# Remember, Remember

## Activity Three

Then scientists investigate the blood that is on the wood.

In order to investigate the blood on the wood Rosa decides that she needs to look to see if there are any bacteria in the blood sample. She thinks that the plotter who has been injured may have been infected when he was hurt and may therefore need their help.

She finds the bacteria below, can you help her identify it, to see whether it's the kind of bacteria that might cause harm, rather than the kind of bacteria that just lives in the environment?



The bacteria Rosa found look like this:

Bacteria name	Spiral shaped	Gram positive (purple colour)	Gram negative (pink colour)	Rod shaped	Cocci shaped (circular)	Key appearance straight with round end
<i>Listeria</i>	NO	YES	NO	YES	NO	NO
<i>E.coli</i>	NO	NO	YES	YES	NO	NO
<i>Streptococci</i>	NO	YES	NO	NO	YES	NO
<i>MRSA</i>	NO	YES	NO	NO	YES	NO
<i>Clostridium tetani</i>	NO	YES	NO	YES	NO	YES
<i>Clostridium picollo</i>	NO	NO	YES	YES	NO	YES

Which organism do think it is? Can you guess what infection it might cause?

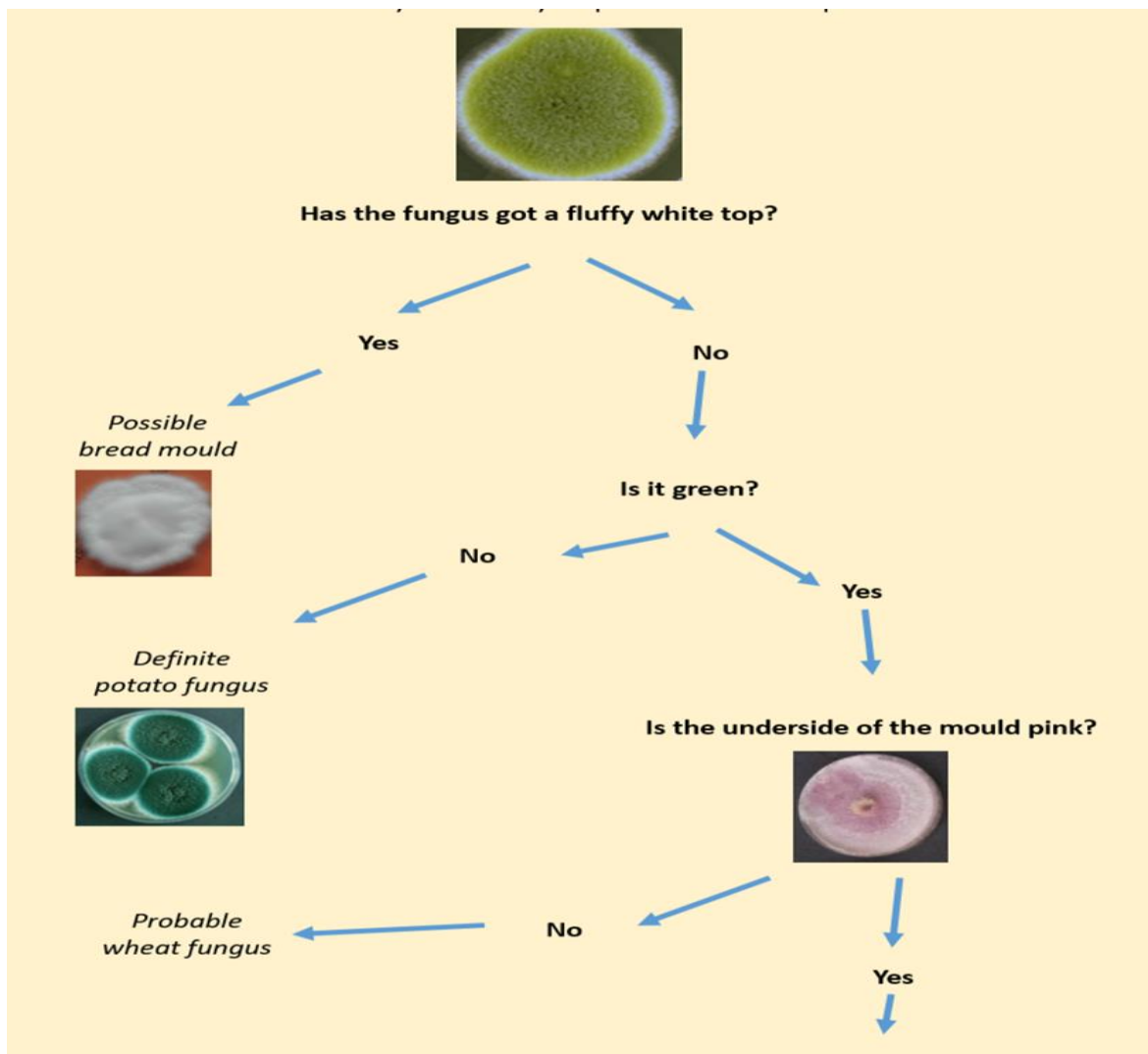
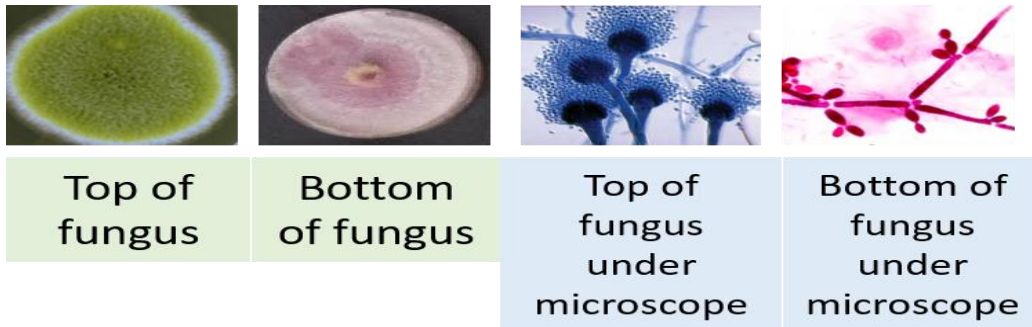
Rosa thinks that the injured plotter needs to be found, as he won't have been vaccinated and so may need medicine

# Remember, Remember

## Activity Four

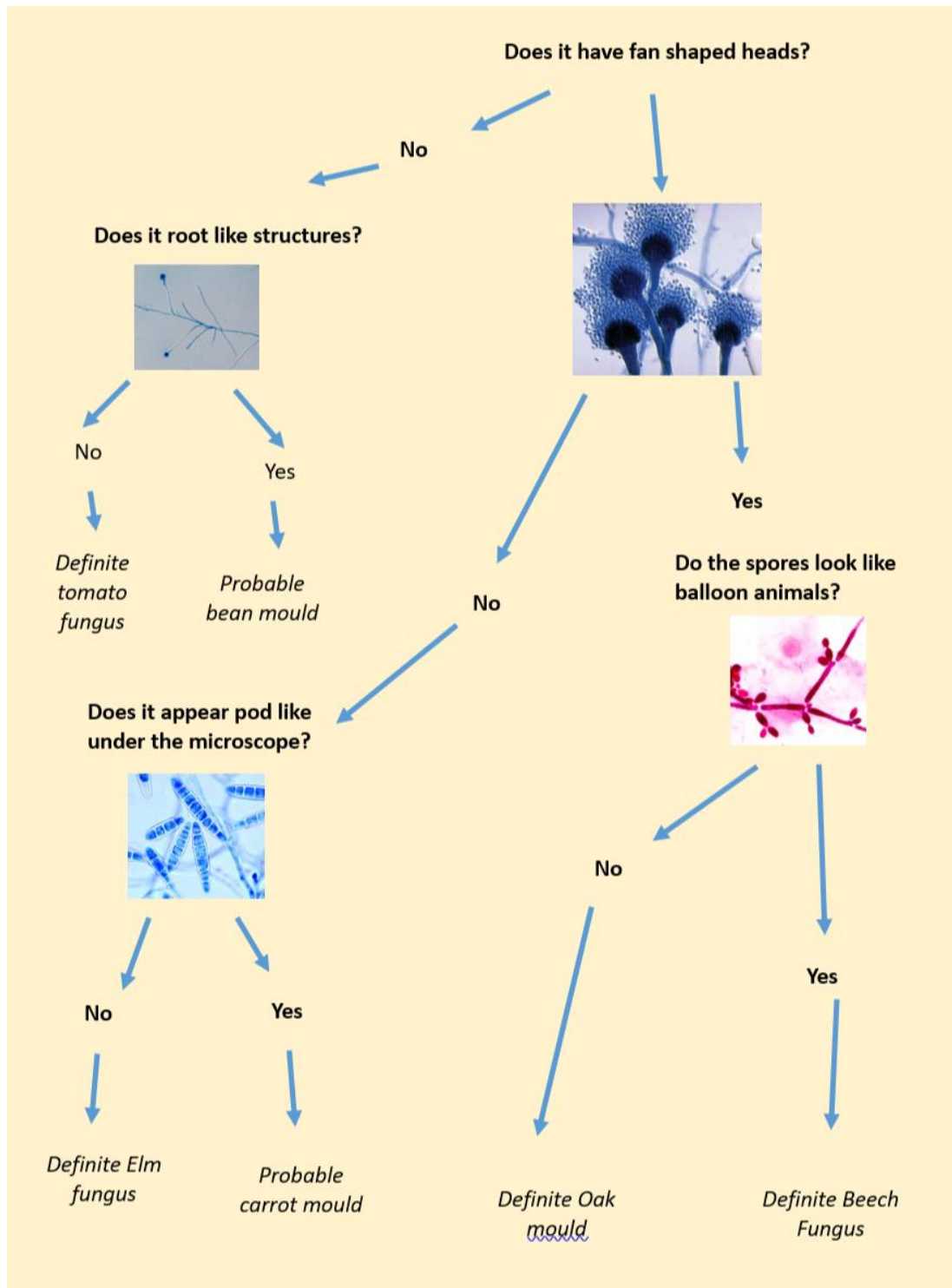
Whilst Rosa was looking at the bacteria Lily found an interesting organism on the wood. She explains to the guard that certain fungi only live on certain types of plant. The map the guard gave her has a number of forests on it, and Lily thinks the fungi on the wood will suggest which woodland the plotters are hiding in.

The fungus that Lily found looks like this:





# Remember, Remember



Which organism do think it is? What locations might it be present in?

# Remember, Remember

## Activity Five

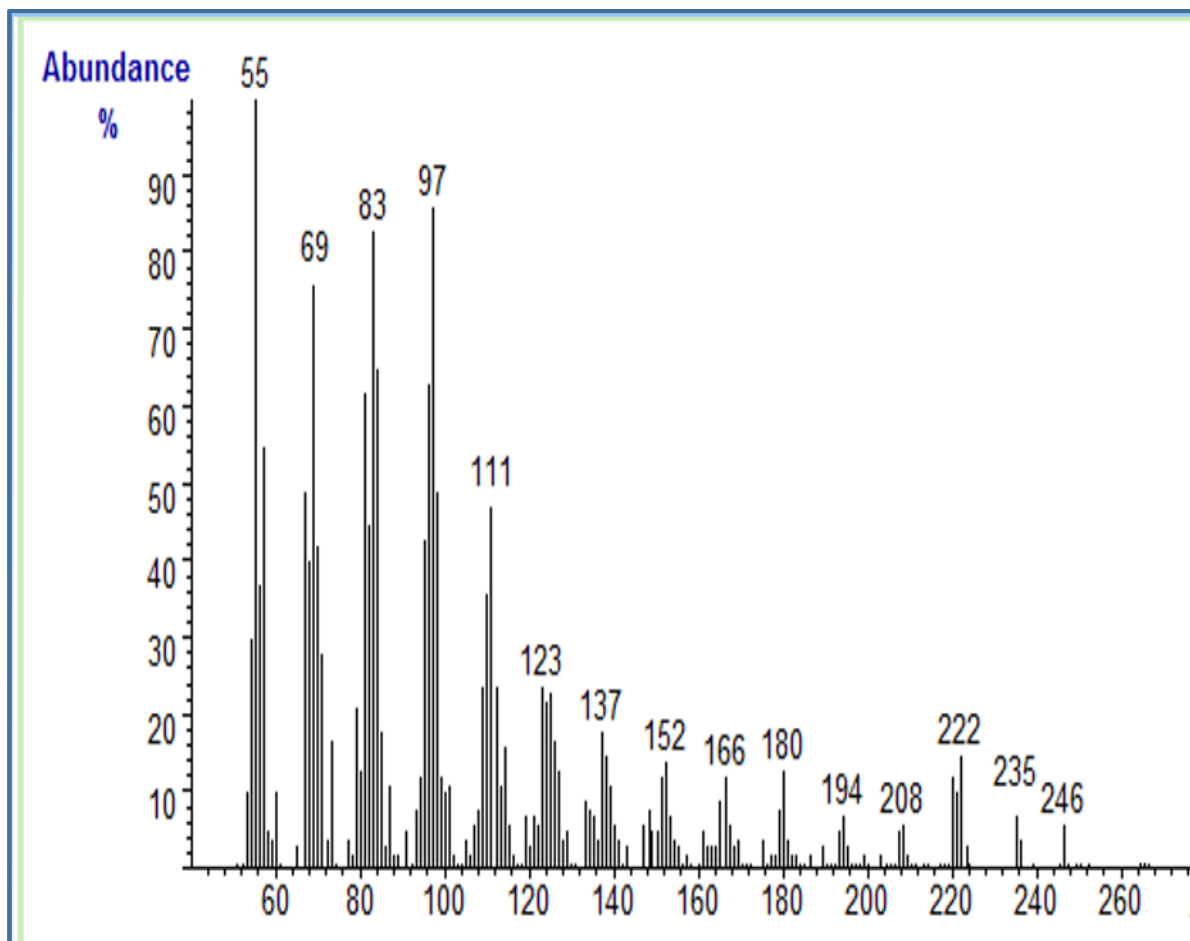
Frank tells the guard that it is not just living things, like microorganisms, that can help track the plotters.

Chemicals can be found in the environment and they may also be useful to working out which of the 4 locations was used to store the wood and the barrels of gunpowder.

Frank tries to explain the technique to the guard, but the guard looks very confused and so Frank gets out some images to explain.

The technique is called Mass Spectroscopy. Because different chemicals (or residues) have different molecular masses they have different molecular weights and have peaks when drawn on a graph at different points.

The results of the mass spectroscopy at the scene look like this:



# *Remember, Remember*

<b>Material</b>	<b>Peaks at</b>				
<b>Chalk</b>	208	54	83	27	123
<b>Iron</b>	166	55	111	122	82
<b>Gold</b>	208	235	83	270	68
<b>Zinc</b>	111	180	152	136	180
<b>Silver</b>	55	69	55	208	166
<b>Carbon</b>	55	111	179	235	222
<b>Phosphate</b>	96	152	180	122	69
<b>Copper</b>	69	195	123	235	83

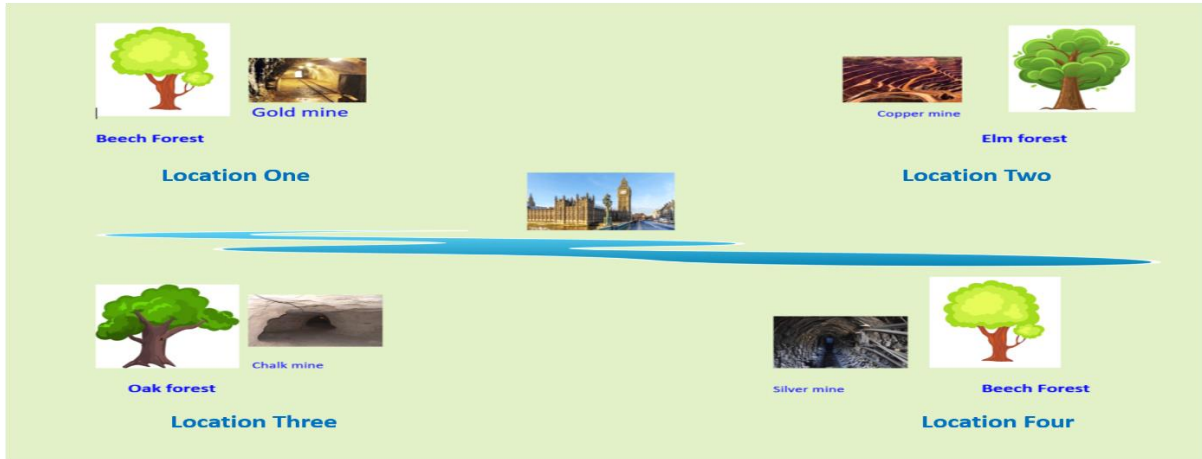
Use the table to look at which peaks are present in the chart. The material that has all of its peaks present is the one that is at the scene. This should give the scientists more information about which of the 4 locations were used to store the gunpowder.

What material is present and what location does it indicate?

# Remember, Remember

## Activity 6

Now the scientists have all the information they need to find which location the Gunpowder plotters are hiding in!



The scientists now need to write up a report of their results. This is important so that they can share their knowledge with everyone in 2020. Most importantly, they need to write it up so that Princess Elizabeth and the guards know where to try and find the plotters.

Help the scientists by writing a short report that details the information you have gathered for Princess Elizabeth

# *Remember, Remember*

Because the report has to go back to Princess Elizabeth the scientists need to turn it into code, the same way that she did with their note for guard.

Use the table below to create a code

Write what letter each of your code letter equates to below so:																										
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	

Write your new encoded message in the box below so the scientists can take it with them:

# *Remember, Remember*

## **What happens next?**

Lily, Rosa and Frank have investigated the scene under the Houses of Parliament using science skills from working in the hospital. They have looked at what the blood is made up of and where the river water came from. They know that the river water came from the River Oaxley and that one of the plotters has been infected with a bacteria (*Clostridium tetani*) from being injured when carrying the pile of wood.

They found that the fungi growing on the wood was from a Beech tree and that the chemical residues on the gunpowder barrels included silver material.

By putting all this information together they have been able to look at maps of London and find the plotters were hiding in location 4. They wrote an encoded message for Princess Elizabeth and overnight the scientists find the plotters and persuade them to give themselves up.

The Plotters are due to be hung, drawn and quartered....but Guy Fawkes is more frightened of the scientists because they have with them the equipment they used to find him, plus their needles and swabs.

Lily, Rosa and Frank get a bit upset when Guy Fawkes is scared of them and say "but we are just trying to make people well and stop diseases".

Guy Fawkes replies "but that is why we were plotting! All these people in our towns are sick and we have had plague and we don't know what to do! No one is helping us".

Princess Elizabeth steps in and says that she can't have her people getting sick. She demands that the scientists help. The scientists decide to teach the plotters the rhyme they taught the boatman in order to remember how to stay well and avoid infection.

The Guard says, we can't just release them!

Lily, Rosa and Frank say you must release them – these rhymes, this knowledge are the antidote to the plague and all these illnesses.

OK, the guard and Elizabeth agree, but they have to all have fake names and never tell anyone the truth. We'll make up a story that they were all executed so no one will plot against us again, and they can make up for their crimes by doing good in the world.

It's a deal! Says everyone

And it's almost morning and the scientists have to get back to work. They get back in their boat and row and by the time they are back at Lamb's Conduit Street they are in 2020 again, and late for work.

# *Remember, Remember*

## **What do Healthcare Scientists do?**

Healthcare Scientists are often considered the forgotten workforce in the NHS, we are small in numbers, but in terms of impact, we are mighty. Eighty percent of diagnosis, and therefore people put on the pathway to better health, have that diagnosis made by Healthcare Scientists. We don't just work in labs, many of you will meet us and assume we are doctors or nurses.

*Remember, Remember*

***Remember, Remember!***

*Remember, remember the fifth of November.*

*Gunpowder, treason and plot.*

*We see no reason*

*Why gunpowder treason*

*Should ever be forgot.....*