Level 1 Case notes

"Complete my notes so you can keep track of the case" – Mark L

1 What happened to the body was a _____ reaction.

We found one of the new substances produced on the chair. It was _____.

2 One theory says that the body burned like a _____.

Another theory is 'spontaneous human _____'.

This could happen when too much _____ gas builds up in the body.

3 It was strange that nearby objects did not burn. Burning fuels produces a lot of _____. The fuel in a body is _____.

4 The empty gas cylinder might explain how the body kept burning.

Burning is a reaction with the _____ in the air.

5 We found alcohol on the unburned hand. This was very strange because alcohol is a _____ substance.

6 We found substances produced from the burning body on the ceiling.

They were _____ and _____.

These are called the _____ of the reaction.

7 To prove that we are safe experimenters, we learned how to do a _____ assessment:

Step 1 The things which can cause harm in an experiment are called the _____. We made a list of them.

Step 2 The likelihood of a hazard happening is called the _____. We decided whether this was _____ or small.

Step 3 We listed ways to _____ the risk. This means making it as small as possible.

Experiment 1:

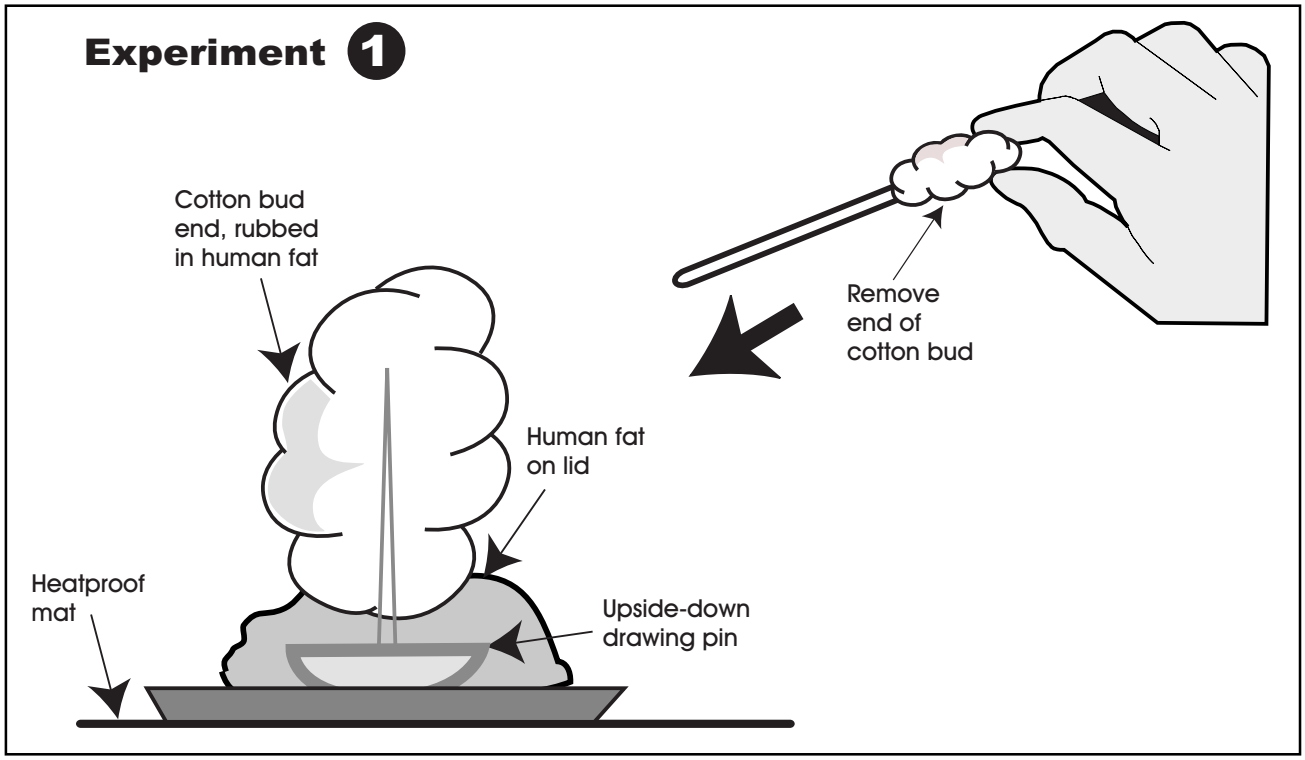
The wick effect

Can the ‘wick effect’ explain how the victim burned?
Can human fat burn like a candle – with the help of a wick?

You will need

- 1 lid e.g. film canister
- 1g softened human fat
- 2 cotton buds
- Splints
- Pin
- Heatproof mat
- Timer

Diagram



Risk Assessment

Before you do the experiment, you need to think about safety.

- Look at the equipment and the instructions.
- Think about all the dangers.
- Complete the risk assessment table.
- The Lab Director must check it before you do the experiment.

Human Torch

1 List the hazards These are things in the experiment that could cause you harm.	2 Put the risks in order Biggest, medium, smallest.	3 Decide how to control the risk List things to make the risk smaller, and the experiment safer (don't just say 'be careful').

What to do

YOU MUST WEAR EYE PROTECTION

1 Put 1g of fat in the lid.

2 Pull off the end of a cotton bud to make a wick.

3 Rub fat over the bud.

4 Push a pin through the middle. Push the bud carefully into the fat in the lid. Make it stand upright.

5 Try to set the bud alight with a long match or splint.

My results

	Does it start burning?	How well does it stay alight?
Human fat without wick		
Human fat with wick		

My conclusion

What did you find?	Tick one box	What your result means
Human fat burns with a wick	☐	The 'wick effect' theory could explain the burning
Human fat does not burn with a wick	☐	The 'wick effect' theory cannot explain the burning

Report your conclusion to the Special Projects Director

Experiment 2:

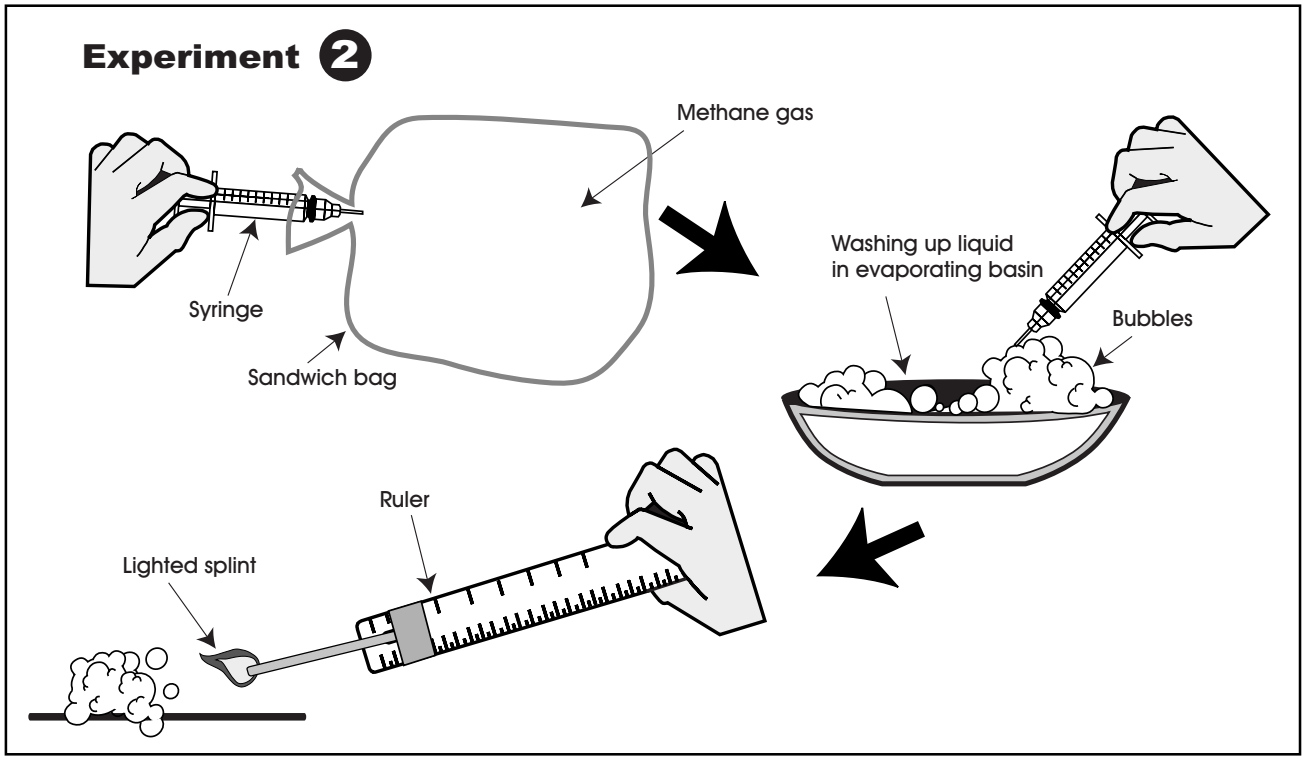
Burning methane

Can ‘spontaneous human combustion’ explain how the victim burned? Does methane gas burn? Could it build up in the gut and explode?

You will need

- Large sandwich bag with seal
- 50ml syringe without needle
- 250ml evaporating basin
- Washing up liquid solution
- 2 splints
- 30cm ruler
- Sheet of paper
- Sellotape

Diagram



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What to do

YOU MUST WEAR EYE PROTECTION

1 Collect a large sandwich bag of methane and seal it (your teacher may do this for you).
2 Sellotape a splint to the end of a 30cm ruler.
3 Fill the syringe full of methane.
4 Put 100ml of washing up liquid solution into a beaker.
5 Empty the gas in the syringe quickly into the liquid, to make bubbles.
6 Collect a big bubble on a damp piece of paper.
7 Light the splint. Holding it at arm's length, set light to the bubble.
8 Make another bubble. This time hold a splint above the bubble. See if the bubble can set it alight.

My results

When we set light to the bubble,

it _____

When we tried to get the bubble to light a second splint,

it _____

My conclusion

What did you find?	Tick one box	What your result means
The second splint lit when the bubble burned	☐	'Spontaneous human combustion' could explain the burning
The second splint did not light when the bubble burned	☐	'Spontaneous human combustion' cannot explain the burning

Report your conclusion to the Special Projects Director

Experiment 3:

Burning hydrogen

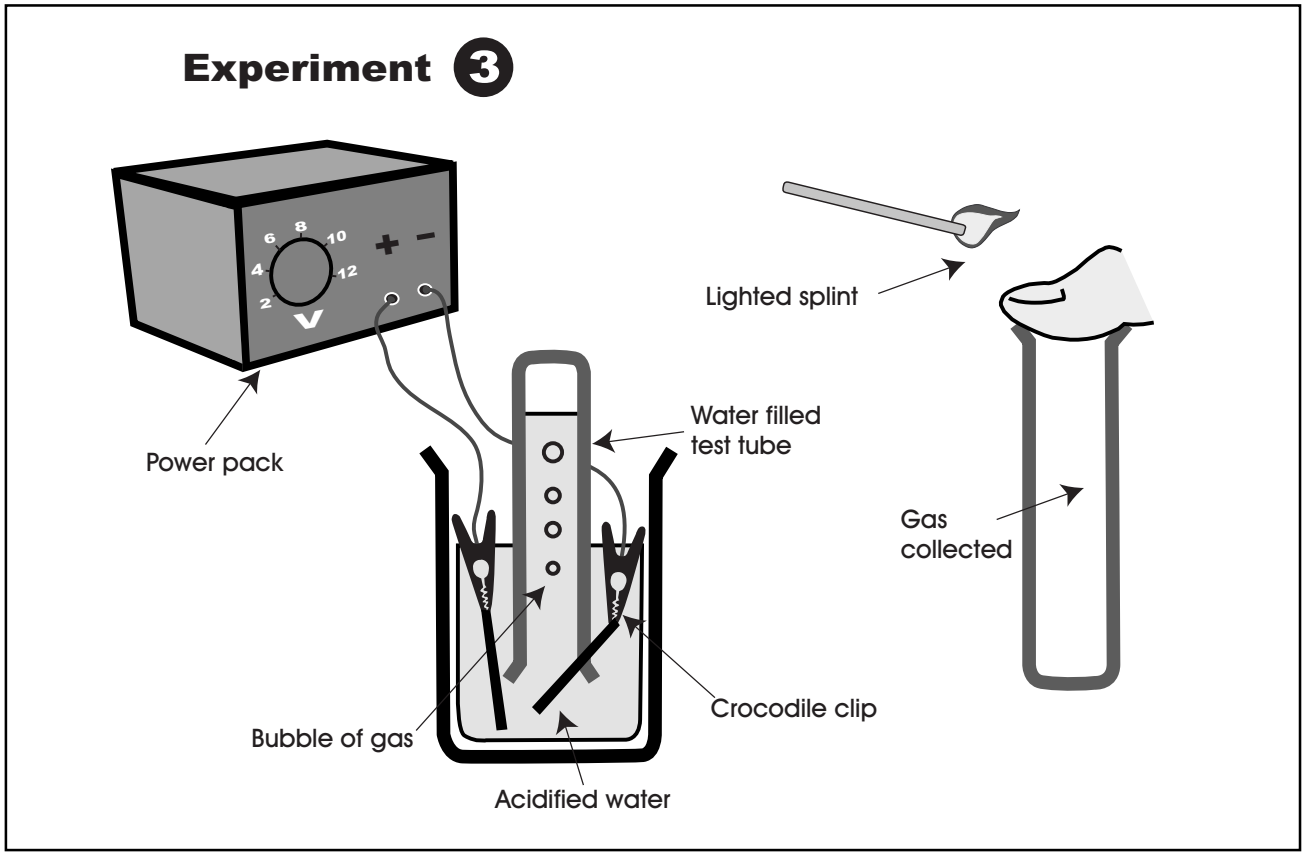
Can ‘spontaneous human combustion’ explain how the victim burned?

Does hydrogen gas burn? Could water in the body break down to produce hydrogen?

You will need

- 250ml beaker
- 2 carbon rods (electrodes)
- Water with a little acid added
- 12V power pack
- 2 leads with croc clips
- Splint
- Test tube

Diagram



Risk Assessment

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What to do

YOU MUST WEAR EYE PROTECTION

1 Half fill the beaker with acidified water.

2 Put the carbon rods in the water, close together. Important: Do not let them touch.

3 Connect the leads to the power pack. Set it to 12V.

4 Observe the rod connected to the 'negative' terminal.

5 Fill a tube with water. Put your thumb over it and invert it. Lower it into the water over the 'negative' rod.

6 When the gas bubbles have pushed out the water, put your thumb over the top again. Turn it the right way up.

7 Light a splint. Quickly remove your thumb and put the splint in the tube. If the gas is hydrogen, it will 'pop'.

My results

When we connected the power we observed:

When we tried to collect and test the gas we found:

My conclusion

What did you find?	Tick one box	What your result means
It takes electricity to break water down to make hydrogen	☐	'Spontaneous human combustion' cannot explain the burning
Water will break down on its own make hydrogen	☐	'Spontaneous human combustion' could explain to the burning

Report your conclusion to the Special Projects Director

Experiment 4:

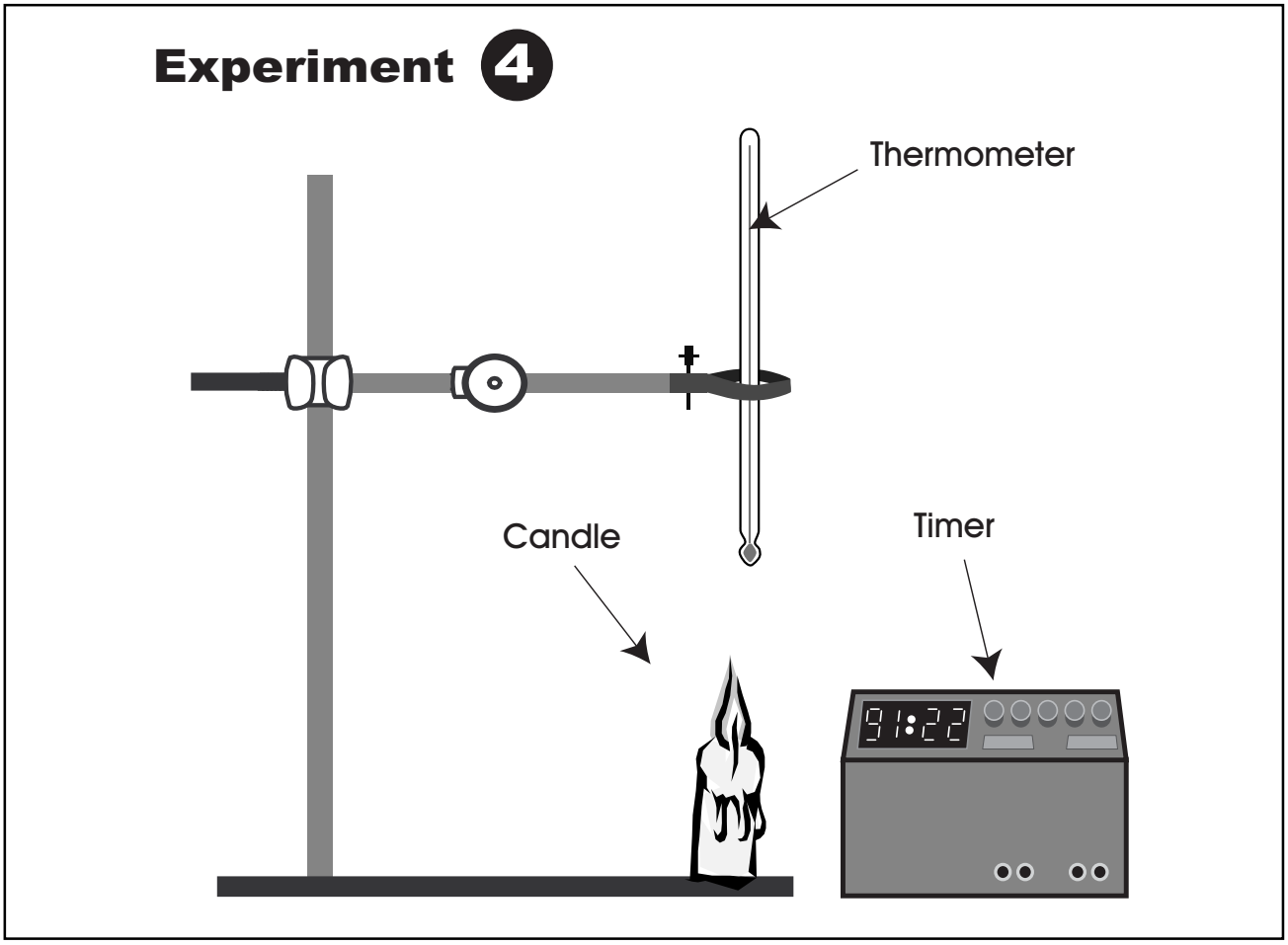
Spreading flame

Can the ‘wick effect’ explain the unburned nearby objects?
How well does the heat from a candle flame spread sideways?

You will need

- Candle
- Thermometer (0-100°C)
- Timer
- Clamp and stand
- Bunsen burner
- Heatproof mat

Diagram



Risk Assessment

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What to do

YOU MUST WEAR EYE PROTECTION

1 Start the candle burning.

2 Clamp the thermometer. Position it so the thermometer bulb is 10 cm above the flame.

3 Keep it there for 10 seconds only. Note the highest temperature reached.

4 Remove the thermometer and let it cool. Make sure the temperature does not reach 100°C.

5 Now position the thermometer 1cm to the side of the flame.

6 Keep it there for 10 seconds only. Note the highest temperature reached.

7 Remove the thermometer.

My results

Thermometer position	**Highest temperature reached (°C)**
Above flame:	_____
To side of flame:	_____

My conclusion

What did you find?	**Tick one box**	**What your result means**
Heat travels upwards faster than sideways	☐	The 'wick effect' could explain the unburned room
Heat travels sideways faster than upwards	☐	The 'wick effect' cannot explain the unburned room

Report your conclusion to the Special Projects Director

Experiment 5:

Burning in oxygen

Is the 'wick effect' correct – did the body burn for 12 hours?
Does pure oxygen make a body burn better and longer?

You will need

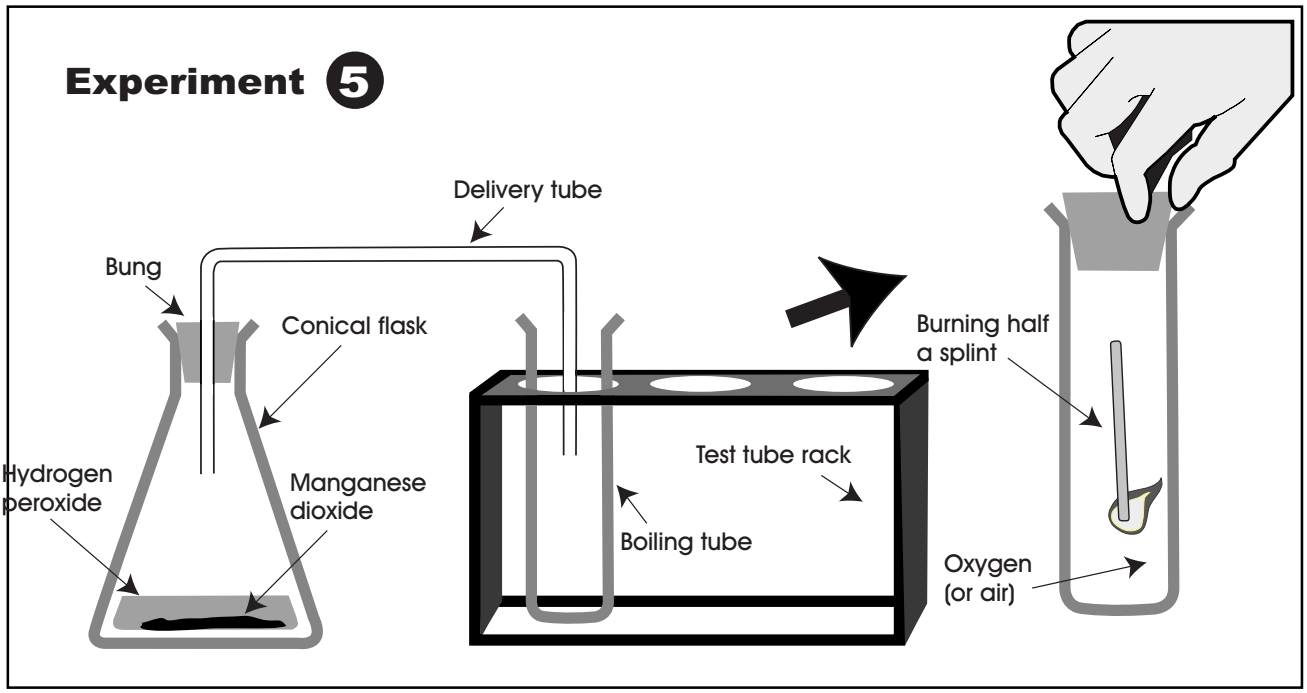
To make oxygen:

- Conical flask, bung and delivery tube
- 10ml hydrogen peroxide in a conical flask
- Manganese dioxide powder
- Boiling tube, tube rack

To do the tests:

- 1 tube filled with oxygen
- 1 tube filled with air
- Splints

Diagram



Risk Assessment

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Human Torch

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What to do

YOU MUST WEAR EYE PROTECTION

To make oxygen:

1 Put the hydrogen peroxide in the conical flask.

2 Add 1 level spatula of manganese dioxide to the flask.

3 Attach the bung and delivery tube.

4 Wait for oxygen to fill the boiling tube, then seal it.

To do the tests:

1 Break a splint in two. Light it and drop it in the boiling tube of air.

2 Time how long it burns for. Observe its brightness.

3 Repeat this with another splint in the tube of oxygen.

My results

Gas	How long did the splint burn (secs)?	How bright was the flame?
Air		

My conclusion

What did you find?	Tick one box	What your result means
Things burn longer in oxygen than in air	☐	The 'wick effect' could explain how the body burned for so long
Things do not burn longer in oxygen in air	☐	The 'wick effect' cannot explain how the body burned for so long

Report your conclusion to the Special Projects Director

Experiment 6:

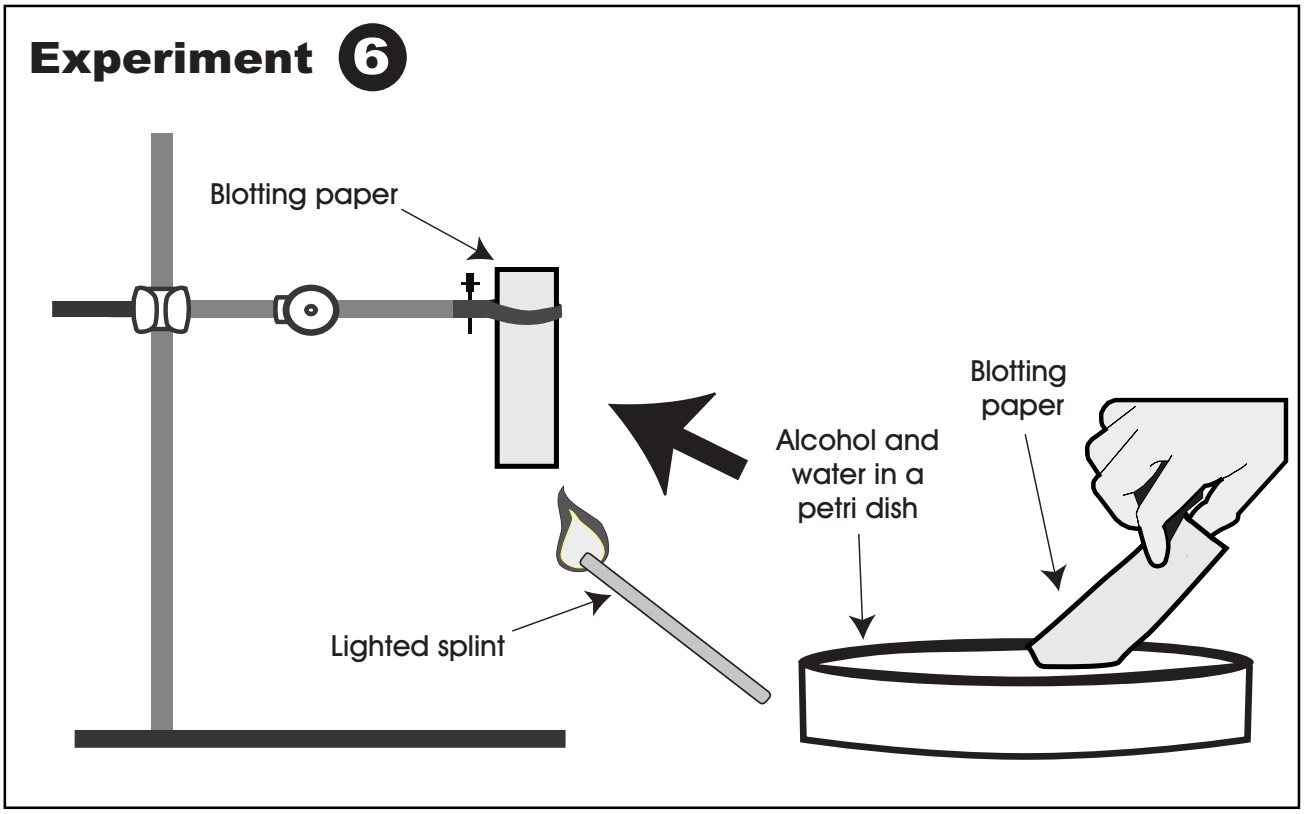
Burning alcohol

Could a hand covered in alcohol burn without being damaged?

You will need

- 1 petri dish with lid
- 2 pieces of 2cm x 5cm blotting paper
- Solution of 'victim's rum'
- Clamp and stand
- Splints

Diagram



Risk Assessment

Before you do the experiment, you need to think about safety.

- Look at the equipment and the instructions.
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Human Torch

1 List the hazards These are things in the experiment that could cause you harm.	2 Put the risks in order Biggest, medium, smallest.	3 Decide how to control the risk List things to make the risk smaller, and the experiment safer (don't just say 'be careful').

What to do

YOU MUST WEAR EYE PROTECTION

1 Put a little of the victim's rum into the petri dish.
2 Soak a piece of blotting paper in the alcohol for 1-2 minutes.
3 Hang it up on a clamp stand, on a heatproof mat.
4 Set light to the paper.
5 Observe the paper after the alcohol has stopped burning.

My results

After the alcohol had stopped burning I found:

My conclusion

What did you find?	Tick one box	What your result means
The paper did not burn away	☐	The 'wick effect' could explain why the hand was not burned
The paper did burn away	☐	The 'wick effect' cannot explain why the hand was not burned

Report your conclusion to the Special Projects Director

Level 2 Case report

"Help me complete the case report for the Director" – Mark L

1 The cause of the victim's death was _____.
I believe the person responsible was _____.

2 I have a lot of _____ for my conclusion.

3 There were two different theories _____ to explain how the body burned.
We did _____ to test which worked best.
We found the predictions of the 'wick effect' were _____ .

4 We looked for the source of a spark to provide the _____ energy to start the fire.
In a home, this could come from a _____, a _____or a _____ .

5 We found strong _____ that the victim died before the fire started.
She did not breathe in a gas produced in the fire. The gas is carbon _____.
It is made during incomplete combustion when carbon reacts with _____.

6 I also rescued SPI Mark Loughlin from a fire, by avoiding hazards like _____ and _____. I controlled the fire by using things like _____ and _____.

7 Statement of scientific procedure:

My evidence is based on _____ collected at the crime scene, which I _____ in the laboratory. Scientific experts also helped by giving me _____ for the evidence.

Signed SPI _____ **Date** _____