



# Sensational Science

Teachers' Notes & Student Worksheets



# Contents

Overview of Sensational Science Information Pack.....	3
Topic 1: Science of Sight.....	4
Activity 1: Blind Spot.....	5
Activity 2: Challenge Your Eyes .....	9
Activity 3: Pencil Points .....	15
Topic 2: Science of Smell.....	16
Activity 1: The Speed of Scent .....	18
Activity 2: The Smell Scale.....	20
Topic 3: Science of Hearing .....	21
Activity 1: Good Vibrations .....	23
Activity 2: Travelling Sound .....	25
Topic 4: Science of Taste.....	30
Activity 1: On the Tip of Your Tongue.....	31
Activity 2: Saliva and Taste .....	32
Activity 3: Tongue Twisters.....	37
Topic 5: Science of Touch.....	40
Activity 1: Smooth or Rough?.....	43
Activity 2: Hot and Cold .....	44
Activity 3: Touch Sensations .....	46



## Overview of Sensational Science Resource Pack

This resource pack contains the following:

- A set of teachers' notes. These give some background information and information about how to set up the experiments.
- A set of experiment sheets for the pupils.

The resource pack is about the science of the senses, covering the following topics:

1. Science of Sight
2. Science of Smell
3. Science of Hearing
4. Science of Taste
5. Science of Touch

It is proposed that this information pack contains enough material for **at least** 6 weeks work. For some of the topics, there are a number of activities that, depending on the duration of the club, may all be able to be carried out in the same week, but could be split over different sessions.

This is a new resource and we would appreciate your feedback and some photos for our website/newsletters etc. Please email or send to:

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## Topic 1: Science of Sight - Introduction

### Overview:

Most people take their sight for granted as they do everyday tasks and find their way about. In reality, the science of seeing is complex, as is the eye. Your eyes both see objects from different angles, but instead of seeing two of the object, your eyes are trained to focus the light that comes into your eye and to convert the light to electrical impulses. These are then “processed” by your brain (including turning the image the right way up, filling in the blind spot, combining the images), allowing us to make sense of the images to give one continuous “picture”.

This topic uses three activities to illustrate the complexity of sight:

- **Blind Spot** shows how your eyes have blind spots (a point on your retina where there are no photoreceptors) which your eyes work together to “fill in”.
- **Challenge Your Eyes** uses optical illusions to show the complexity of sight.
- **Pencil Points** illustrates how judgement of depth changes using each eye in turn and then both together.

### Extension:

An extension to these activities is that students could research the eye to identify the different parts and their function.



# Sensational Science - Science of Sight

## Activity 1: Blind Spot

### Teachers' Notes

## Activity 1: Blind Spot – Teachers' Notes

**Aims:** To investigate how your eyes “fill in” their blind spot

**Safety:** None

**Apparatus:** For each pupil, a strip of paper with a square and circle on it (Figure 1) and a strip of paper with a square, two rectangles and a circle on it (Figure 2). These are replicated pages in the pupils sheets for photocopying purposes.



Figure 1: The picture for the blind spot activity, part one.



Figure 2: The picture for the blind spot activity, part two.

### Method:

#### Part 1:

1. Hold the piece of paper with the square and circle in front of you at arm's length
2. Close your left eye and focus on the square with your right eye.
3. Move the paper towards you, still focussing on the square.

Part 2: Repeat the experiment with the other pattern, again focussing on the square.

### Suggested questions to ask the pupils [and expected results]:

- What happens to the circle? [In the first experiment, the circle will disappear. In the second, the rectangles and circle will merge to form one rectangle. This happens because when the circle is in the blind spot, it is “filling in” the blind spot with what is round the image so there is not a “hole”.]

## Activity 1: Blind Spot – Student Worksheet

In this experiment, you will investigate how your eyes “fill in” their blind spot.

Apparatus: A strip of paper with a square and circle on it  
A strip of paper with a square, two rectangles and a circle on it

Method:

### Part 1:

1. Hold the piece of paper with the square and circle in front of you at arm’s length
2. Close your left eye and focus on the square with your right eye.
3. Move the paper towards you, still focussing on the square.

**What happens to the circle?**

Part 2: Repeat the experiment with the other pattern, again focussing on the square.

**What happens to the circle now?**









# Sensational Science – Science of Sight

## Activity 2: Challenge your Eyes

### Teachers' Notes

## Activity 2: Challenge Your Eyes – Teachers' Notes

The following activity is not a truly “science” but demonstrates the complexity of the sense of sight and how you can confuse the messages to your brain.

Aims: To show the complexity of eyesight through the use of optical illusions.

Safety: The pupils should not stare at the pictures for too long (20 seconds should be enough). If there are any pupils with motion sickness then it may be best if they do not do the lines example in particular.

Apparatus: A copy of the patterns shown in Figure 3, Figure 4 and Figure 5.

A ruler

Method:

Follow the instructions for each optical illusion.

1. Look at the pattern in Figure 3, stare at it for 20 seconds then describe what you see.

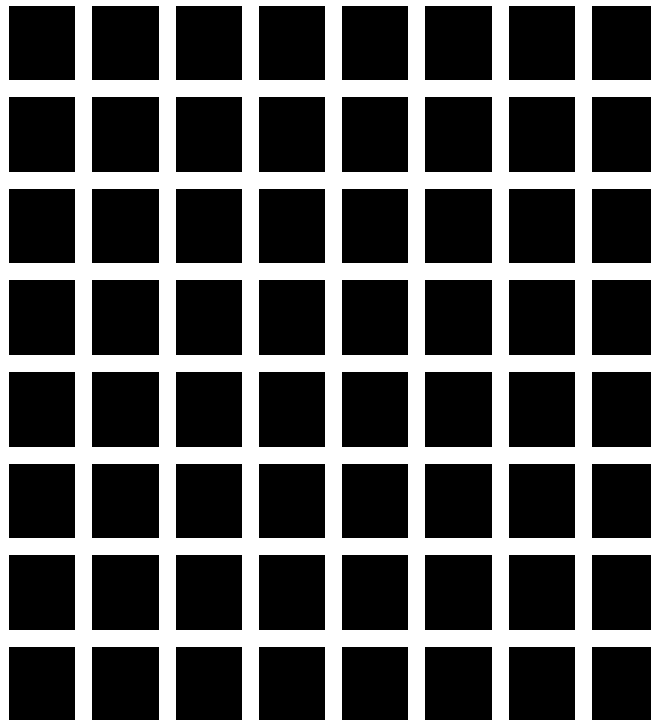
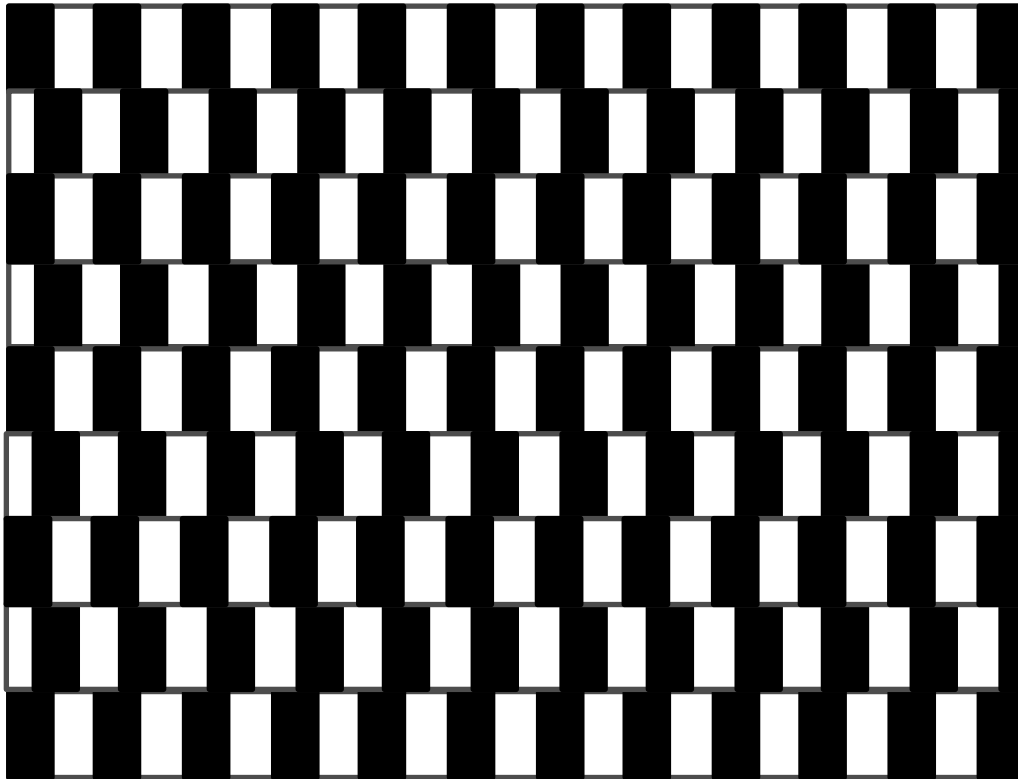


Figure 3: Grid.

2. Stare at

4

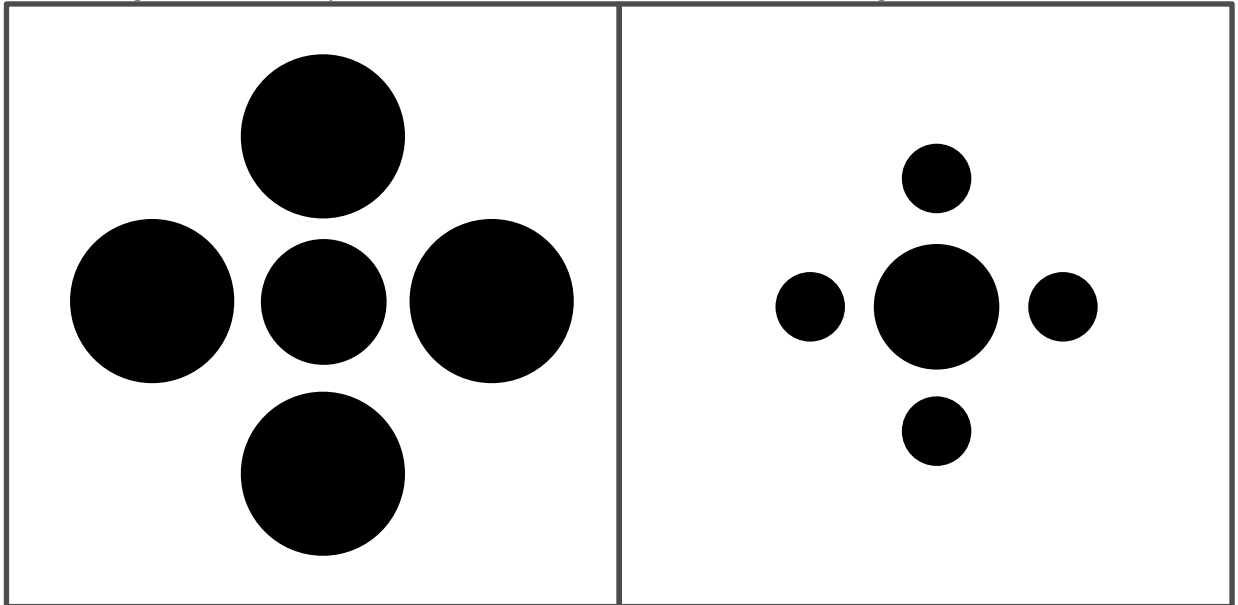


3. Figure for 20 seconds; describe the lines going across the page.

Figure 4: Lines.

4. Look at the patterns in Figure 5, describe and compare the two middle circles

Figure 5: Circles – pattern A on the left hand side and B on the right hand side.



Suggested questions to ask the pupils [and expected results]:

- Example 1 – what do you see? [They should see black squares, with white lines and then grey dots at the points the lines meet. They grey dots do not actually exist. To try to help show this, part of the pattern has been enlarged below in
- Figure 6. The dots are added by your brain as it tries to make sense of the pattern and the colours.]

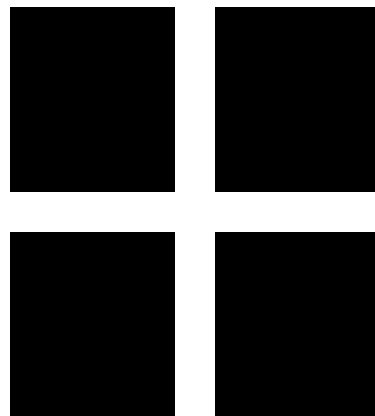


Figure 6: Enlarged portion of Figure 3

- Example 2 – what do the lines across the page look like? [Most people will see these as curving when they are in fact straight. The pupils can check this with a ruler. This happens because the rectangles are

not in exact alignment to make a grid (like that shown in Figure 7) and so your brain thinks the straight horizontal lines are in fact curved.]

- Example 3 – describe and compare the middle circles. [The middle circle in A looks smaller than the one in B, but they are both the same size. The pupils can check this with a ruler. Your brain takes the objects around each circle as context – in A, the other four circles are bigger so the middle circle will be small; while in B, the four small outside circles makes the middle circle big and so the middle circle of B looks bigger than the middle of B.]

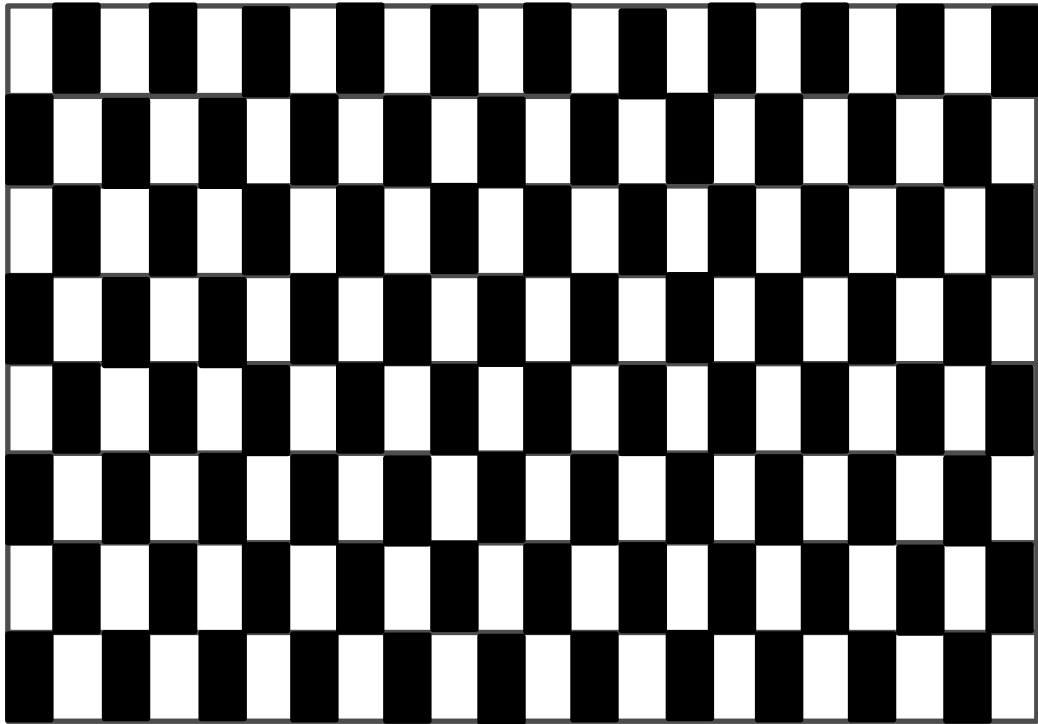


Figure 7: Comparison for

Figure 4 to show the difference in perspective on the straight horizontal lines when all the rectangles are aligned.

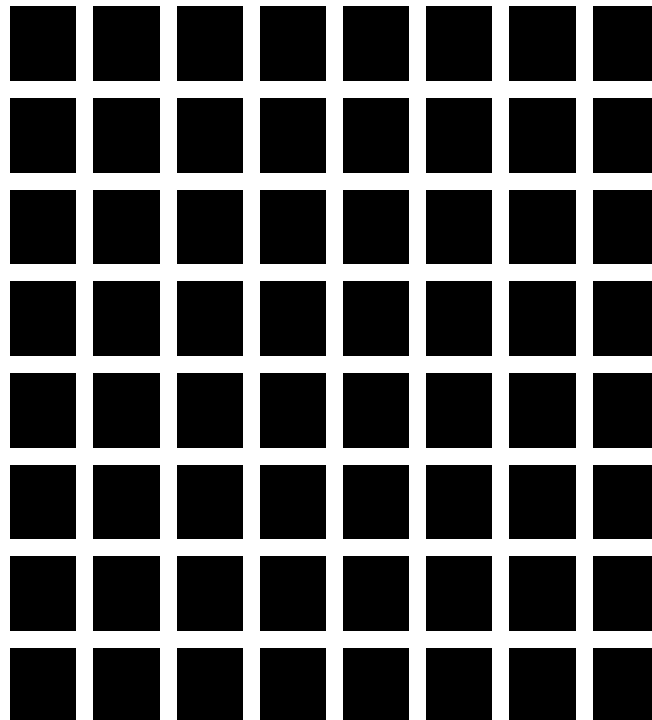
## Activity 2: Challenge Your Eyes – Student Worksheet

In this experiment, you will show the complexity of eyesight through the use of optical illusions.

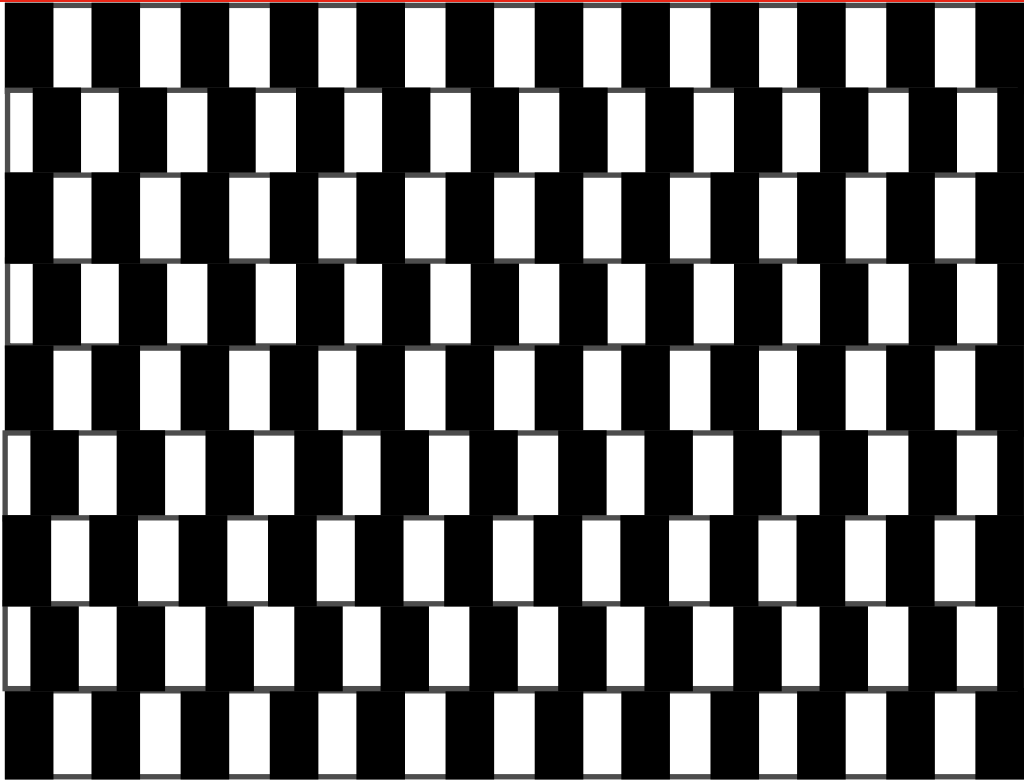
**Safety:** Make sure that you do not stare at the pictures for too long (20 seconds should be enough).  
If you have motion sickness then it may be best if they do not do the lines example in particular.

Follow the instructions for each optical illusion.

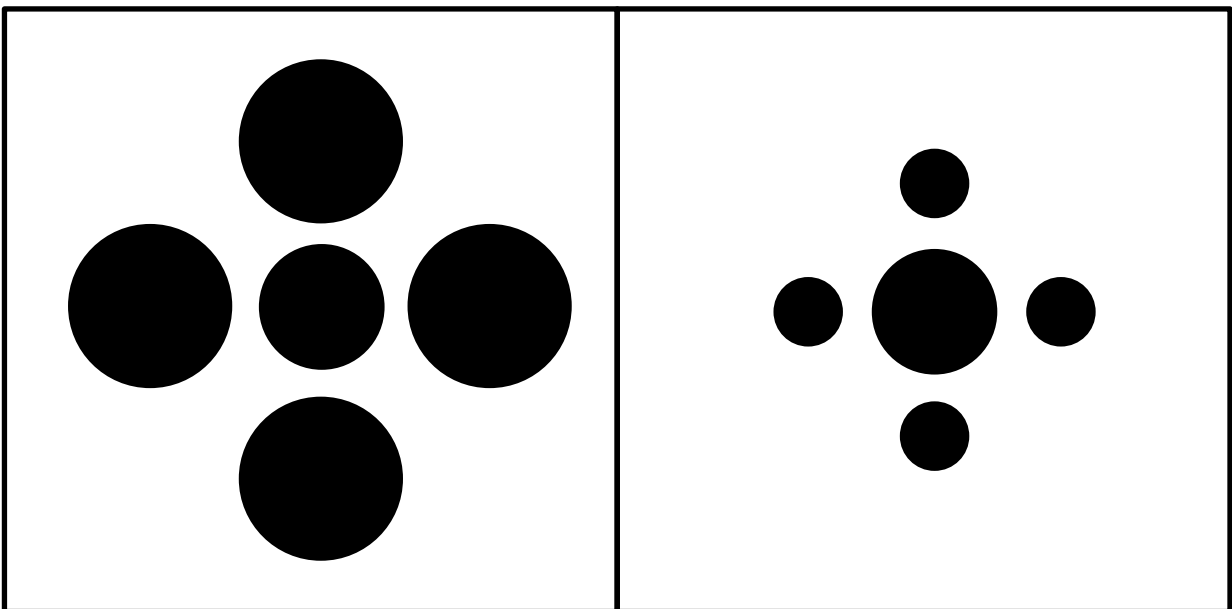
Look at the pattern; stare at it for 20 seconds. What do you see?



Stare at the figure below for 20 seconds; describe the lines going across the page. What do the lines across the page look like?



Look at the two patterns below. Describe and compare the two middle circles in the patterns.



## Activity 3: Pencil Points – Teachers' Notes

**Aims:** To investigate how both eyes are used to judge depth and distance.

**Safety:** Make sure that the pupils have enough room to do this activity.

Take care that the pencils are not too sharp

**Apparatus:** 2 pencils per pupil

**Method:**

1. Stand with your arms at shoulder height, holding one pencil horizontally in each hand.
2. Close your left eye and then in one smooth move try to bring both the points of the pencils together (see Figure 8) so they are both touching. What happens?
3. Repeat step 2 with your left eye open and right eye closed. What happens?
4. Repeat step 2 with both eyes open. What happens?

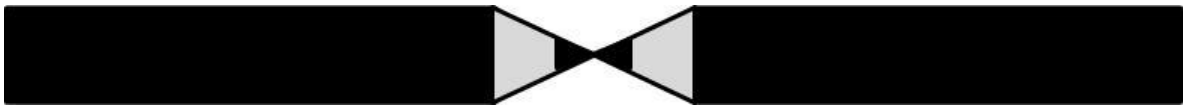


Figure 8: The pencil point challenge.

**Suggested questions to ask the pupils [and expected results]:**

- What do you think will happen?
- What happened? [The pencils should touch in most cases with both eyes open only. In the other options, the pencils usually pass each other.]
- Why do you think this happens? [Each eye sees the pencils from a different angle. Using both eyes together, allows you to judge depth and distance easier.]





# Sensational Science – Science of the Senses

## Activity 3: Pencil Points

### Student Worksheet

## Activity 3: Pencil Points – Student Worksheet

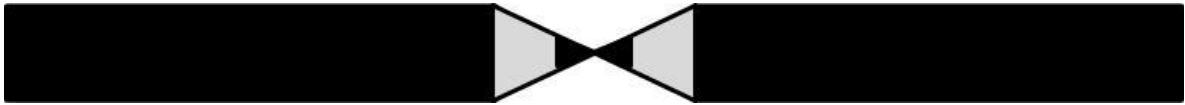
In this experiment, you will investigate how both eyes are used to judge depth and distance.

**Safety:** Make sure that you have enough room to do this activity.  
Take care that the pencils are not too sharp.

**Apparatus:** 2 pencils per pupil

**Method:**

1. Stand with your arms at shoulder height, holding one pencil horizontally in each hand.
2. Close your left eye and then in one smooth move try to bring both the points of the pencils together so they are both touching like the diagram below. What happens?



3. Repeat step 2 with your left eye open and right eye closed. What happens?
4. Repeat step 2 with both eyes open. What happens?

## Topic 2: Science of Smell - Introduction

### Overview:

The sense of smell is very important – from warning us of dangers (e.g. through the smell of smoke), invoking memories and even helping with the sense of taste. While humans' sense of smell is sensitive – it isn't as

Ask most people how they smell scents then they will usually say with their nose. While this is true to some extent, their brain will also have a huge part to play in being able to smell things and interpret the smells. The sense of smell starts as scent molecules go up the nose and pass the hair like ending of the smell receptor cells. This then sends an electrical impulse to the brain and your brain decodes this and translates it into the different smells.

This topic uses two activities to illustrate the power of the sense of smell:

- **The Speed of Scent** encourages the pupils to think about how smells travel through the air.
- **The Smell Scale** challenges the pupils' senses of smells to put different concentrations of fragrance in order from the weakest to the strongest.

### Extension:

The pupils could try a smell test where they try to identify different scents. Care should be taken when choosing these.

## Activity 1: The Speed of Scent - Teachers' Notes

**Aims:** To investigate the time it takes to be able to smell a scent at a distance.

**Safety:** Before carrying out this experiment, you should check for any allergies and asthma. The room used should be well ventilated. If a pupil does have asthma, it would be better not to carry out this experiment indoors.

The scents should not be sprayed at anyone or near people's eyes.

**Apparatus:** Selections of scents in spray bottles. These could be perfumes or food essences.

Timers

Tape measure

Fan

**Method:**

1. The pupils should stand at one end of the classroom.
2. Spray the scent up into the air at the other end of the classroom. Start the timers.
3. Stop the timer when the pupils can smell the scent.
4. If they don't smell the scent, then move closer and repeat.
5. Continue until they smell the scent, and then measure the distance (in metres) between the scent bottle and the pupil.
6. Divide the distance by the time (in seconds) to get the speed of the scent molecules in metres per second.
7. Repeat the whole experiment but this time spray the scent in front of the fan.

**Suggested questions to ask the pupils [and expected results]:**

- Does everyone smell the scent at the same time? [No, depends on how well developed the person's sense of smell is.]
- What effect do you think the fan will have? [It should disperse the scent molecules quicker as the molecules in the air will be moving quicker.]



## Sensational Science – Science of Smell

### Activity 1: The Speed of Scent

### Student Worksheet

#### Activity 1: The Speed of Scent – Student Worksheet

**In this experiment, you will investigate the time it takes to be able to smell a scent at a distance.**

**Safety:** If you have asthma or allergic to perfumes, please let your club leader know.  
The room used should be well ventilated.  
The scents should not be sprayed at anyone or near people's eyes.

**Apparatus:** Selections of scents in spray bottles. These could be perfumes or food essences.  
Timers  
Tape measure  
Fan

**Method:**

1. Stand at one end of the classroom.
2. The leader will spray the scent up into the air at the other end of the classroom. Start the timers.
3. Stop the timer when you can smell the scent.
4. If you don't smell the scent, then move closer and repeat.
5. Continue until you smell the scent, and then measure the distance (in metres) between you and the scent bottle.
6. Divide the distance by the time (in seconds) to get the speed of the scent molecules in metres per second.

**Does everyone smell the scent at the same time?**

7. Repeat the whole experiment but this time the scent will be sprayed in front of the fan.

**What effect do you think the fan will have?**



# Sensational Science – Science of Smell

## Activity 2 – The Smell Scale

### Teachers' Notes

## Activity 2: The Smell Scale - Teachers' Notes

**Aims:** To investigate the power of the sense of smell by putting different concentrations of scent in order from weakest to strongest.

**Safety:** Before carrying out this experiment, you should check for any allergies and asthma. The room used should be well ventilated.

The pupils should not put the containers directly to their noses, but 10-15 cm away.

Do not make the concentrations of the scent too strong

**Apparatus:** Food essence – e.g. vanilla, peppermint, lemon.

Water

Small containers, e.g. 50 mL in size

Dropper

Use the above to make up different concentrations of solutions in the containers (e.g. 5, 10, 15, 20 and 25 drops of food essence in 50 mL water, but will differ depending on the size of the dropper, essence used and volume of containers). Label the containers as 1-5, keeping a note of which concentration is which. Repeat with a different essence.

**Method:**

1. Smell each of the different concentrations and try to put them in order depending on the strength of the smell.
2. Repeat with the other series.

**Suggested questions to ask the pupils [and expected results]:**

- Did you manage to identify the correct order?
- Was one scent easier than the other?

**Extension for secondary pupils:**

After having diluted the concentrated essence significantly with water, pupils (in small groups) could use pipettes and volumetric flasks to practice serial dilutions, and then give these to another group to try to put them in order.



## Science – Science of Smell The Smell Scale Worksheet

### Activity 2: The Smell Scale – Student Worksheet

In this experiment, you will investigate the power of the sense of smell by putting different concentrations of scent in order from weakest to strongest.

**Safety:** If you have asthma or allergic to perfumes, please let your club leader know.

The room used should be well ventilated.

Do not put the containers directly to your noses, but 10-15 cm away.

**Apparatus:** Small containers of scent solutions at different concentrations

**Method:**

1. Smell each of the different concentrations and try to put them in order depending on the strength of the smell.
2. Repeat with the other series.

**Did you manage to identify the correct order?**

**Was one scent easier than the other?**

### Topic 3: Science of Hearing - Introduction

#### Overview:

The other senses involve chemical reactions, however hearing is mechanical. As sounds are transmitted, energy is emitted as a vibration. This gives a sound wave. The height (amplitude) of the sound wave affects the volume – the larger the amplitude, the louder the sound. The frequency (the number of waves per second) affects the pitch – the higher the frequency, the higher the sound. Examples of this are shown in

Figure 9.

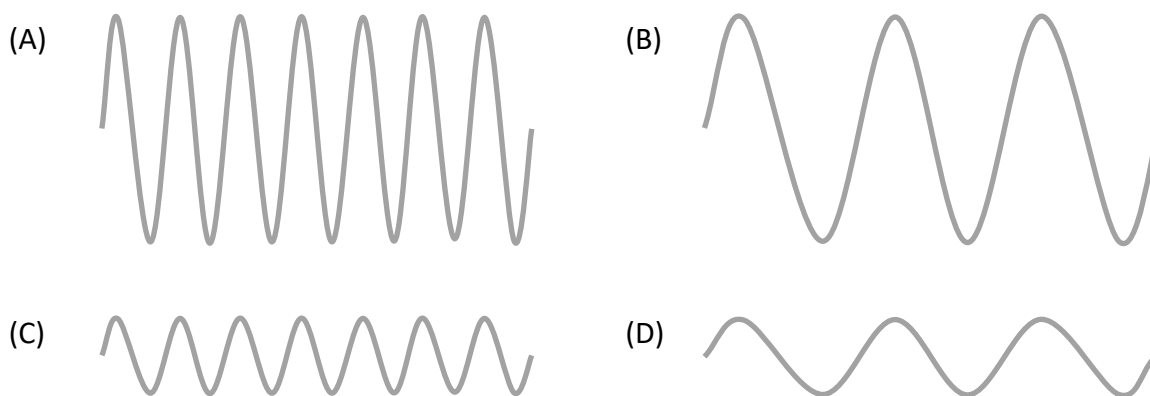


Figure 9: Examples of waves. Taking the example of the top left (A) as the control

(B) has got more waves, therefore a higher frequency and would be a higher sound. (C) has waves with a smaller amplitude than (A), therefore the sound would be quieter. There is still the same number of waves and so it would be the same pitch. (D) has smaller waves and smaller frequency too so would be lower and quieter than (A).

Ears “pick up” these sound waves and the ear drum vibrates. This is processed and then an electrical signal is sent to the brain which interprets the sound as something we hear.

This topic uses two activities to illustrate sound and hearing:

- **Good Vibrations** illustrates how sounds are made through vibrations to give sound waves and shows how the vibrations vary to give different volumes and pitches of sounds.
- **Travelling Sound** investigates how sounds travel through gases, liquids and solids to our ears so we can hear the noise



Science  
Science of Hearing  
Sensory Science – Science of Hearing  
Activity 1: Good Vibrations  
Teachers' Notes

## Activity 1: Good Vibrations – Teachers' Notes

Aims: To show how sounds are made because objects are vibrating

Safety: Hold onto the ruler tightly and take care that the ruler does not snap.

Apparatus: Ruler (ideally plastic)  
Heavy book  
Table

Method:

1. Put the ruler on the table with half of the ruler hanging over the edge of the table.
2. Place the book on top of the ruler on the table.
3. Using one hand, press down firmly on the book, holding it and the ruler in place. With the other hand, pluck the other end of the ruler. Watch the ruler and listen to what happens. Record your results in the results table below.
4. Repeat this experiment with different lengths of ruler hanging over the edge of the table. Record your results each time.

Suggested questions to ask the pupils [and expected results]:

- What happened to the ruler? [The end vibrated up and down.]
- What did you hear? [Your ear picks up the vibrations and turns them into sound.]

What happened when the length of ruler changed? Why? [When the ruler is plucked with only a short length hanging over the end of the table, the ruler cannot vibrate much (lower amplitude), but vibrates quickly (higher frequency). This causes a quieter, higher sound. When the ruler is plucked with a longer length having over the edge of the table, the ruler vibrates more (bigger amplitude), but slower (lower frequency). This causes a louder, lower sound. You sense these differences in vibrations to be able to hear sounds at different volumes and pitches.]







## Activity 1: Good Vibrations – Student Worksheet

In this experiment, you will demonstrate how sounds are made because objects are vibrating.

Safety: Hold onto the ruler tightly and take care that the ruler does not snap.

Apparatus: Ruler (ideally plastic)

Heavy book

Table

Method:

1. Put the ruler on the table with half of the ruler hanging over the edge of the table.
2. Place the book on top of the ruler on the table.
3. Using one hand, press down firmly on the book, holding it and the ruler in place. With the other hand, pluck the other end of the ruler. Watch the ruler and listen to what happens. Record your results in the table.
4. Repeat this experiment with different lengths of ruler hanging over the edge of the table. Record your results each time.

**What happened when the length of ruler changed? Why?**

Distance the ruler was over the edge of the table in cm	Description of the what happened to the ruler	Description of the sound
15 cm		



## Sensational Science – Science of Hearing

### Activity 2: Travelling Sound

### Teachers' Notes

#### Activity 2: Travelling Sound – Teachers' Notes

**Aims:** To investigate sound waves travelling through a solid, liquid and gas.

**Safety:** The pupils should only tap the table, not bang it. Any water spills should be cleaned up quickly.

**Apparatus:** Table  
Sealable bag full of water (tape all the sides)  
Paper towels to wipe up any spills  
Antibacterial wipes

**Method:**

1. Tap the table lightly, listening to the sound.
2. With your ear on the table, again tap the table lightly and listen to the sound. Compare it to the previous sound. Record your results in Table 1.
3. Put the bag of water on the table, and being careful not to press too heavily, rest your ear on the bag of water, again tap the table lightly and listen to the sound. Compare it to the previous sound. Record your results in Table 1.

Table 1: Travelling sound results table

Sound	Describe the sound	Compare to the sound produced in step 1
Tapping the table lightly.		-----
Tapping the table lightly, listening to sound with your ear on the table		
Tapping the table lightly, listening to sound with your ear on the bag off water		

Suggested questions to ask the pupils [and expected results]:

- What difference did it make when you put your ear on the table? [The sound was louder.]
- What difference did it make when your ear was next to the bottle? [The sound was louder.]
- Why? [When you are listening without your ear on the table, the sound waves are moving through air (a gas) to your ear. The gas particles are far spaced. When your ear was on the bag of water, you were listening to the sound waves mainly moving through the water (a liquid) then to your ear. The particles are a bit closer together so the vibrations seem louder. When your ear was on the table, you were listening to the vibrations moving through a solid then to your ear. A solid has particles that are tightly packed together. The sound is much louder.]

Extension:

The class could demonstrate this concept by each pupil being a molecule or atom a gas (far spaced, lots of movement), liquid (closer together, less movement) and then a solid (tightly packed, not much movement at all) and try to pass an object to each other as a model of how the vibrations are “passed” between the particles in each of the three states. Plenty of clear space is required for this activity.



# Sensational Science – Science of Hearing

## Activity 2: Travelling Sound

### Student Worksheet

## Activity 2: Travelling Sound – Student Worksheet

In this experiment, you will investigate sound waves travelling through a solid, liquid and gas.

**Safety:** Only tap the table, do not bang it.  
Any water spills should be cleaned up quickly.

**Apparatus:** Table  
Sealable bag full of water (all sides taped up)

**Method:**

1. Tap the table lightly, listening to the sound.
2. With your ear on the table, again tap the table lightly and listen to the sound. Compare it to the previous sound. Record your results in the table.
3. Put the bag of water on the table, and being careful not to press too heavily, rest your ear on the bag of water, again tap the table lightly and listen to the sound. Compare it to the previous sound. Record your results in the table.

Sound	Describe the sound	Compare to the sound produced in step 1
Tapping the table lightly.		-----
Tapping the table lightly, listening to sound with your ear on the table		
Tapping the table lightly, listening to sound with your ear on the bag of water		

## Topic 4: Science of Taste – Introduction

### Overview:

The sense of taste is something we all use every day. Some people will have a very sensitive sense of taste, while for others this sense will be duller.

On your tongue there are tiny bumps, each of these is covered in taste buds with taste receptors. The molecules in your food are dissolved in your saliva and detected by the taste receptor cells in your taste buds. This then sends a signal to your brain which processes the signal to give the taste.

There are five basic tastes that you sense: sweet, salty, sour, bitter and umami (savory flavour). Many people think that your tongue is a “map” with each of the tastes being detected at different parts of the tongue. This is a myth. The original research suggested that there may be areas of the tongue that are more sensitive to some of the basic tastes, but that the differences are very minor and that you can sense all the tastes at all parts of your tongue. This minor effect was exaggerated to give the tongue map.

These basic tastes combine with texture, smell and temperature so that you experience the different flavours of the food.

This topic uses three activities to test your taste buds:

- **On the Tip of Your Tongue** investigates tastes on the tip of your tongue.
- **Saliva and Taste** investigate the role of saliva or liquid in sensing tastes.
- **Tongue Twisters** demonstrate how your sense of smell helps you taste different flavours.



## Sensational Science – Science of Taste

### Activity 1: On the Tip of Your Tongue

#### Teachers' Notes

### Activity 1: On the Tip of Your Tongue – Teachers' Notes

**Aims:** To investigate tastes on the tip of your tongue to see whether the tongue “map” exists.

**Safety:** This experiment requires the pupils to taste different foods so care should be taken that there are no illnesses or allergies to the foods or the cotton buds. The pupils should only test the food on the tip of their tongues. The cotton buds should not be re-used.

**Apparatus:** Cotton buds  
Sugar  
Salt  
Lemon juice

**Method:**

1. Put a small amount of sugar on the tip of your tongue and record the taste.
2. Put a small amount of salt on the tip of your tongue and record the taste.
3. Put a small amount of lemon juice on the tip of your tongue and record the taste.

**Suggested questions to ask the pupils [and expected results]:**

- Was each of the tastes as you expected? [To most pupils, they will taste as expected. There may be a minority that taste the sugar most strongly. This disproves the tongue “map” that most people think of. In fact, the original experiments showed that there were only very small differences in sensitivity, but this was exaggerated to give the tongue “map”.]



## Activity 1: On the Tip of Your Tongue – Student Worksheet

In this experiment, you will investigate tastes on the tip of your tongue to see whether the tongue “map” exists.

**Safety:** This experiment requires you to taste different foods so please let your club leader know if you cannot test sugar, salt or lemon, or if you are allergic to cotton buds.  
You should only test the food on the tip of their tongues.  
The cotton buds should not be re-used.

**Apparatus:** Cotton buds  
Sugar  
Salt  
Lemon juice

**Method:**

1. Put a small amount of sugar on the tip of your tongue and record the taste.
2. Put a small amount of salt on the tip of your tongue and record the taste.
3. Put a small amount of lemon juice on the tip of your tongue and record the taste.

**Was each of the tastes as you expected?**



## Sensational Science – Science of Taste

### Activity 2: Saliva and Taste

#### Teachers' Notes

## Activity 2: Saliva and Taste – Teachers' Notes

Aims: To investigate the role of saliva and liquid in how we taste.

Safety: This experiment requires the pupils to taste different foods so care should be taken that there are no illnesses or allergies to the foods or the cotton buds. The pupils should only test the food on the tip of their tongues. The cotton buds should not be re-used.

Apparatus: Cotton buds  
Kitchen roll  
Sugar  
Sugar water (as a rough guide, 1 teaspoonful of sugar in a cup of water would be enough)

Method:

The first step is a control that you use to compare with all the other results.

1. Put a few grains of sugar on the tip of your tongue and immediately record how this tastes and if it tasted as you expected it to.

Compare the following results with the previous controls; record your results in the table.

2. Dab the kitchen roll on the tip of your tongue to “dry” it then immediately put a few grains of sugar on the tip of your tongue and immediately record how it tastes.
3. Dip the cotton bud in the sugar water then dab it on the tip of your tongue and immediately record how it tastes.
4. Dab the kitchen roll on the tip of your tongue to “dry” it then immediately dip the cotton bud in the sugar water then dab it on the tip of your tongue and immediately record how it tastes

Table 2: Saliva and taste results table

Test	Description of Taste	Does it taste like you had expected?
Put a few granules of sugar on the tip of your tongue		
Dab the kitchen roll on the tip of your tongue to “dry” it then immediately put a few grains of sugar on the tip of your tongue		
Dip the cotton bud in the sugar water then dab it on the tip of your tongue		
Dab the kitchen roll on the tip of your tongue to “dry” it then immediately dip the cotton bud in the sugar water then dab it on the tip of your tongue		

Suggested questions to ask the pupils [and expected results]:

- How would you describe the taste of the sugar granules? [Sweet]
- After using the kitchen roll, did the sugar still taste sweet? [No. It will not have a taste until there is more saliva in their mouth. Saliva is needed to ensure that your taste buds are working.]
- Did the sugar water have the same effect? [No, the water in the sugar water makes up for the lack of saliva.]

Extension:

- Repeat with salt and salty water.

5.



Table 2: Saliva and taste results table

Test	Description of Taste	Does it taste like you had expected?
Put a few granules of sugar on the tip of your tongue		
Dab the kitchen roll on the tip of your tongue to “dry” it then immediately put a few grains of sugar on the tip of your tongue		
Dip the cotton bud in the sugar water then dab it on the tip of your tongue		
Dab the kitchen roll on the tip of your tongue to “dry” it then immediately dip the cotton bud in the sugar water then dab it on the tip of your tongue		

Suggested questions to ask the pupils [and expected results]:

- How would you describe the taste of the sugar granules? [Sweet]
- After using the kitchen roll, did the sugar still taste sweet? [No. It will not have a taste until there is more saliva in their mouth. Saliva is needed to ensure that your taste buds are working.]
- Did the sugar water have the same effect? [No, the water in the sugar water makes up for the lack of saliva.]

Extension:

- Repeat with salt and salty water.



# Sensational Science – The Science of Taste

## Activity 2: Saliva and Taste

### Student Worksheet

## Activity 2: Saliva and Taste – Student Worksheet

**In this experiment, you will investigate the role of saliva in how we taste.**

**Safety:** This experiment requires you to taste different foods so please let your club leader know if you cannot test sugar, salt or lemon, or if you are allergic to cotton buds.

You should only test the food on the tip of their tongues.

The cotton buds should not be re-used.

**Apparatus:** Cotton buds  
Kitchen roll  
Sugar  
Sugar water

**Method:**

The first step is a control that you use to compare with all the other results.

1. Put a few grains of sugar on the tip of your tongue. In the table, record how this tastes and if it tasted as you expected it to.

Compare the following results with the previous controls; record your results in the table.

2. Dab the kitchen roll on the tip of your tongue to “dry” it then immediately put a few grains of sugar on the tip of your tongue and immediately record how it tastes.
3. Dip the cotton bud in the sugar water then dab it on the tip of your tongue and immediately record how it tastes.
4. Dab the kitchen roll on the tip of your tongue to “dry” it then immediately dip the cotton bud in the sugar water then dab it on the tip of your tongue and immediately record how it tastes.

Test	Description of Taste	Does it taste like you had expected?
Put a few granules of sugar on the tip of your tongue		
Dab the kitchen roll on the tip of your tongue to “dry” it then immediately put a few grains of sugar on the tip of your tongue		
Dip the cotton bud in the sugar water then dab it on the tip of your tongue		
Dab the kitchen roll on the tip of your tongue to “dry” it then immediately dip the cotton bud in the sugar water then dab it on the tip of your tongue		



## Sensational Science – Science of Taste

### Activity 3: Tongue Twisters

#### Teachers' Notes

### Activity 3: Tongue Twisters

This activity investigates if confusing our senses affects the way we think about the food we eat. Scientists at Unilever in collaboration with the University of Manchester have discovered that even sound can affect how food tastes!

In this activity students will investigate:

- Whether a jelly has to be the “right” colour to taste good?
- If our sense of smell over-rules our sense of taste?

#### Required:

- 3 or 4 different flavours of jelly (prepared); 3 or 4 different flavours of jelly cubes; assorted food colouring; strong smelling food (e.g. peppermint or vanilla essence), ice cube tray or disposable cups; stirrer; blindfold.

#### Investigation:




- Dissolve the jellies following the packet instructions and pour into the ice cube tray or disposable cups.
- While the jelly is still liquid, add a few drops of food colouring to each so that the colours no longer match the flavour. For example strawberry flavour coloured green and blue.
- Test student’s reactions when they sample the jellies. Do they feel the colour affected the flavour?
- Ask the food taster to put on the blindfold. Hold a jelly cube under their nose while asking them to taste jelly of a different flavour. Which flavour has a smell that masks the taste of the other jellies?
- Repeat the experiment, this time ask the food taster to smell the vanilla or peppermint essence while they taste the jelly. Can they still taste the original flavour?





**Sensational Science – Science of Taste**  
**Activity 3: Tongue Twisters**  
**Student Worksheet**

**Activity 3: Tongue Twisters**

Reactions to Jelly Colour Test				
Jelly Flavour	Jelly Colour			

Flavour and Smell of Jelly – Taste Results			
Jelly to Smell	Jelly to Taste	Flavour Tasted	Right or Wrong?

**Flavour and Strong Smells – Taste Results**

<b>Food Sample</b>	<b>Smell Sample</b>	<b>Tester</b>	<b>Flavour Tasted</b>	<b>Right or Wrong?</b>

**What did your effect of colour of food experiment show?**

**What did your effect of smell of food experiment show?**

**Which smell seemed most effective at masking the true flavour?**

**Did you get the same result across all age groups? Can you investigate why this might be?**

## Topic 5: Science of Touch – Introduction

### Overview:

The sense of touch is essential to differentiate between textures and temperatures, and also to sense pain. This occurs through sensory receptors in the skin which register what is happening on your body's surface. They then send messages to the spinal cord which are sent to the brain. These signals are processed to determine what the feeling is (e.g. hot, cold, pain, pressure).

The number of receptors varies throughout your body. For example, it is important for your fingers to have lots of sensory receptors as these are used most for touch. However, other areas have less – the middle of your back is the least sensitive to touch.

This topic uses two activities to demonstrate the sense of touch:

- **Smooth or Rough?** challenges their sense of touch by grading sandpaper.
- **Hot and Cold** tests sense of touch and temperature determination.
- **Touch Sensations** looks at the differences in touch receptors.

### Extension:

If you access to Braille, the pupils could try to see if they can differentiate between some of the letters.



# Sensational Science – Science of Touch

## Activity 1. Smooth or Rough?

### Teachers' Notes

## Activity 1: Smooth or Rough? – Teachers' Notes

Aims: To try to grade sandpaper by its roughness.

Safety: Touch the sandpaper lightly. Don't rub it too roughly.

Apparatus: Blindfolds

Mixed pack of sandpaper grades (from very fine to rough), cut into sections and labelled.

Method:

1. With a blindfold on (or your eyes closed), touch each of the sandpaper samples lightly and try to put them in order from the smoothest to the roughest.

Suggested questions to ask the pupils [and expected results]:

- Were you correct? [Most people will be able to work out the roughest grades from the smoothest grades. The hardest points will be to differentiate between two grades of sandpaper that are next to each other.]



## Sensational Science – Science of Touch

### Activity 1. Smooth or Rough?

#### Student Worksheet

### Activity 1: Smooth or Rough? – Student Worksheet

**In this experiment, you will try to grade sandpaper by its roughness.**

**Safety:** Touch the sandpaper lightly. Don't rub it too roughly.

**Apparatus:** Blindfolds

Mixed pack of sandpaper grades (from very fine to rough), cut into sections and labelled.

**Method:**

1. With a blindfold on (or your eyes closed), touch each of the sandpaper samples lightly and try to put them in order from the smoothest to the roughest.

**Were you correct?**



# Sensational Science – Science of Touch

## Activity 2: Hot and Cold

### Teachers' Notes

## Activity 2: Hot and Cold – Teachers' Notes

Aims: To test your sense of touch measuring temperature

Safety: None

Apparatus: Metal baking tray  
Wooden chopping board  
Both the tray and chopping board should be left in the same location prior to the experiment so they both are at the same room temperature.

Method:

1. The metal tray and wooden board should be lying next to each other on a table at room temperature.
2. At the same time, put one hand on the metal and the other on the wood.

Suggested questions to ask the pupils [and expected results]:

- Do both surfaces feel the same temperature? [No. The metal tray will feel colder.]
- Why do you think this happens? [Metal is a better conductor of heat than wood. This means that the heat is conducted away through the metal and so it makes it feel colder than the wood.]



**Sensational Science – Science of Touch**  
**Activity 2. Hot and Cold**  
**Student Worksheet**

## Activity 2: Hot and Cold – Student Worksheet

In this experiment, you will test your sense of touch measuring temperature.

Apparatus: Metal baking tray  
Wooden chopping board

Method:

1. The metal tray and wooden board should be lying next to each other on a table at room temperature.
2. At the same time, put one hand on the metal and the other on the wood.

**Do both surfaces feel the same temperature?**

**Why do you think this happens?**



# Sensational Science – Science of Touch

## Activity 3: Touch Sensations

### Teachers' Notes

## Activity 3: Touch Sensations – Teachers' Notes

In this experiment, be aware of any sensitivity with the pupils testing each other in this way.

**Aims:** To test skin touch receptor sensitivity.

**Safety:** This experiment uses a paper clip. You must only lightly touch the ends to skin. Do not press down on them. You should not mark the skin in any way.

**Apparatus:** Paperclips – two per pupil  
Ruler  
Blindfold

**Method:**

1. Working in pairs, one pupil should be blindfolded. The other will place the end of one or two paperclips on the person's finger. The blindfolded person should say whether they felt one or two.
2. The tester should place the ends of the two paperclips (at the same time, 1 mm apart) on the person's finger. If the person wearing the blindfold says one, then re-test by moving the two paperclips apart another mm and testing, continuing until the person says two. Measure the distance between the ends of the paperclips at this point and record it in Table 3.
3. Continue to test the other areas listed in Table 3.
4. Change over and repeat the experiment.

Table 3: Touch sensations results table

Test	Distance between paperclips in mm
Tip of finger	
Palm	
Back of hand	
Forearm	



Upper arm	
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Suggested questions to ask the pupils [and expected results]:

- Did both of you get the same results? [It should be similar.]
- Where the results the same for each area tested? [No.]
- Why? [There are more touch receptors on some areas of the body than others.]
- Why would this be important? [It is important that your fingertips are very sensitive as they are used most for sensing objects. For example, if something is too hot, your fingers detect it quickly so you can let go. With fewer sensors, this would be slower/harder to detect.]

## Activity 3: Touch Sensations – Student Worksheet

**In this experiment, you will test skin touch receptor sensitivity.**

**Safety:** This experiment uses a flattened paper clip. You must only lightly touch the ends to skin. Do not press down on them. You should not mark the skin in any way.

**Apparatus:** Paperclips – two per pupil  
 Ruler  
 Blindfold

**Method:**

1. Working in pairs, one pupil should be blindfolded. The other will place the end of one or two paperclips on the person’s finger. The blindfolded person should say whether they felt one or two.
2. The tester should place the ends of the two paperclips (at the same time, 1 mm apart) on the person’s finger. If the person wearing the blindfold says one, then re-test by moving the two paperclips apart another mm and testing, continuing until the person says two. Measure the distance between the ends of the paperclips at this point and record it in the table.
3. Continue to test the other areas listed in table.
4. Change over and repeat the experiment.

Test	Distance between paperclips in mm
Tip of finger	
Palm	
Back of hand	
Forearm	
Upper arm	

**Did both of you get the same results?**

**Where the results the same for each area tested?**

**Why do you think this is?**