



# SCIENCE - ETHICAL INNOVATION & THE COSMETICS INDUSTRY



Smell is an important sense. Bad scents can warn us of danger by telling us that food may be harmful or that something is burning, while good or familiar scents can relax us, lead us to delicious food or provoke an emotional response.

## STARTER: PROUSTIAN MOMENTS

Whether it's a biscuit dipped in tea or a familiar washing powder, sometimes a scent can trigger a thought or feeling. These are 'involuntary memories' which occur when we smell or taste something.

Name a scent (for example, freshly-cut grass) that would trigger you to think of the following:

- 1. Summer \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_
- 2. Primary school \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_
- 3. Holidays \_\_\_\_\_  
 \_\_\_\_\_  
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- 4. Birthdays \_\_\_\_\_  
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- 5. History \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_


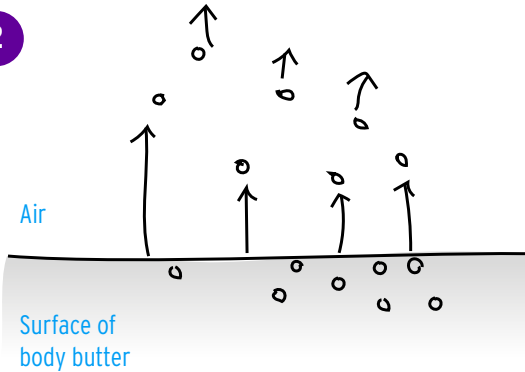

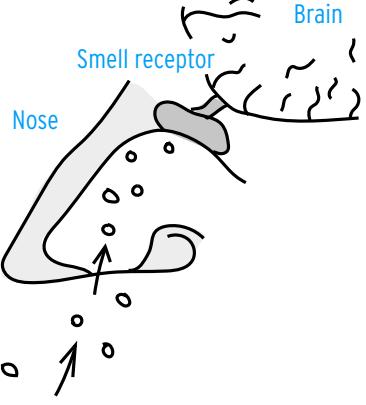


### ACTIVITY 1. THE SCIENCE OF SCENTS

Smells are made from compounds called 'odorants'. These are molecules that have escaped from a liquid into the air as vapour, which have a distinctive scent. Some solid objects such as wood also contain odorants, but this is often due to liquid oils contained within them.

Write a description under each diagram to show how an odorant reaches your nose from a pot of, for example, The Body Shop Coconut Body Butter. Add a description below each using the following key words:

- Odorant
- Diffuse
- Liquid
- Gas
- Air
- Smell receptor
- High
- Low
- Vaporise
- Specialised

<p><b>1</b></p>  <p>First, the Coconut Body Butter tub is opened.</p>	<p><b>2</b></p>  <p>Odorant molecules ..... from the Coconut Body Butter turning from a ..... to a .....</p>
<p><b>3</b></p>  <p>The ..... particles then ..... into the air, moving from a ..... concentration to a ..... concentration.</p>	<p><b>4</b></p>  <p>The odorant particle then moves into the nose, travelling to a ..... . These ..... cells then send a signal to the brain.</p>



## ACTIVITY 2. HOW DO HUMANS SMELL?

Although scientists know that we smell using specialised cells called smell receptors in our nose, scientists still disagree over how they work. Read these two different theories, and then answer the questions.

### The particle shape theory

According to this theory, we smell using thousands of smell receptors found on a patch of skin called the olfactory epithelium at the back of the nasal cavity. These smell receptors work like a lock and a key - requiring an odorant particle of the right shape to bond with it and switch it on. It then sends a message to the brain describing the type of smell. We therefore tell the difference between the smells of particles by their shape, similar to how enzymes bond to particles in other parts of the body.

### The particle vibration theory

In this theory, our thousands of smell receptors are not switched on by 'shape', but by molecular vibrations. Each type of molecule has a different vibration and when they bond to our smell receptors, the smell receptor reads the frequency of the vibration. It then sends a message to the brain describing the type of smell. This theory was created to explain why some odorants with the same molecular structure can smell different. Particle vibrations can also be affected by heat or light.

a) Where are the cell receptors found?

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b) How are smell receptors switched on in the particle shape theory?

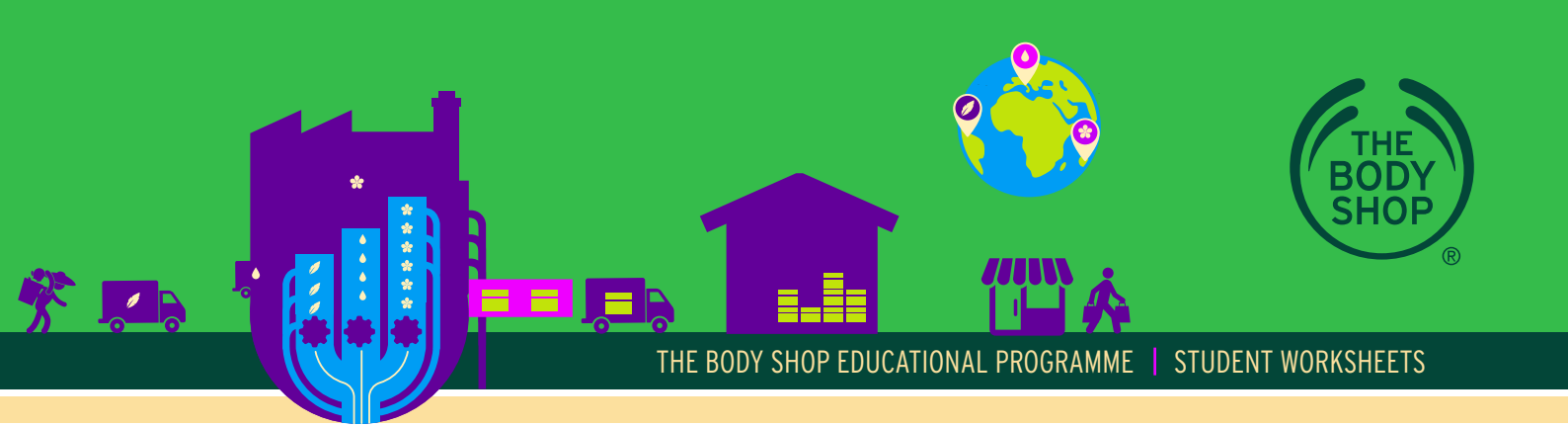
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c) How are smell receptors switched on in the particle vibration theory?

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d) What are the challenges to the particle shape theory?

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e) What do the two theories have in common?

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f) Which is the most convincing theory for you? Why?

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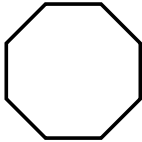
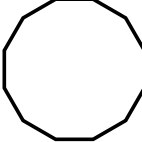
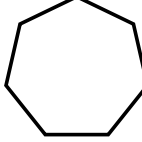
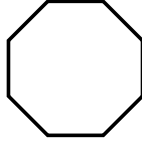


### ACTIVITY 3. CHOOSING SYNTHETIC SCENTS

We all like to smell good, but at what cost? Some odorants can only be produced naturally from sources which are environmentally unsustainable, or are derived from animals (for example, natural musk or ambergris) and so sometimes synthetic odorants made by scientists are used instead.

You have been commissioned by a cosmetics company to choose a synthetic odorant product for their in-development Coconut Body and Bath range, as this would work better in the formula.

Using the table below and the theories from Activity 2, explain which odorant product you would pick and why. Your product must be sustainable, ethically sourced and cost effective.

Name	Coconut extract	A	B	C
<b>Odorant molecule shape</b>				
<b>Vibration frequency (hz)</b>	2000	2100	2400	2150
<b>Scent</b>	fresh, tropical, coconut	nutty, tropical, coconut, sweet	nutty, tropical, coconut, apricot	tropical, woody, coconut
<b>Production</b>	natural	synthetic	synthetic	synthetic
<b>Ethical factors</b>	<ul style="list-style-type: none"> <li>Deforestation caused by intense farming</li> <li>Loss of natural habitats</li> <li>High pesticide use</li> <li>Large carbon footprint</li> </ul>	<ul style="list-style-type: none"> <li>Vegan</li> <li>From a carbon neutral factory</li> <li>Not tested on animals</li> </ul>	<ul style="list-style-type: none"> <li>Made in unsafe factory conditions</li> <li>Made using animal products</li> <li>Not tested on animals</li> </ul>	<ul style="list-style-type: none"> <li>Tested on animals</li> <li>Factory is not carbon neutral</li> <li>Factory had recent chemical leak</li> </ul>
<b>Cost per 100ml</b>	£12	£14	£11	£13



Handwriting practice lines consisting of 15 horizontal dotted lines.

**A NOTE ON CHOOSING SYNTHETIC ODORANTS**

Another important factor to take into consideration when choosing synthetic odorants is that while synthetics are often much safer for us in products than natural odorants, much less is known about the long-term effects of their build-up in nature. Sometimes, even when they have undergone rigorous testing for safety in cosmetic or commercial use, synthetics can cause problems in other areas for which they have not been tested.

Some synthetics, for example, cannot be broken down by nature and assimilated into its cycles, causing severe problems. Chlorofluorocarbons (CFCs), which are synthesized for use in refrigerators, are a very good example of this, and have built up in the atmosphere as a greenhouse gas.

**EXTENSION - MOTIVATIONS AND DECISIONS INTERACTIVE**

As a grower or retailer or consumer, making sustainable decisions is not simple and it is important to understand the impact that decisions have on the environment, people and products.

Follow the online interactive, 'Buy for Good - Enriching the Future', and design your own sustainable product.