Food Science

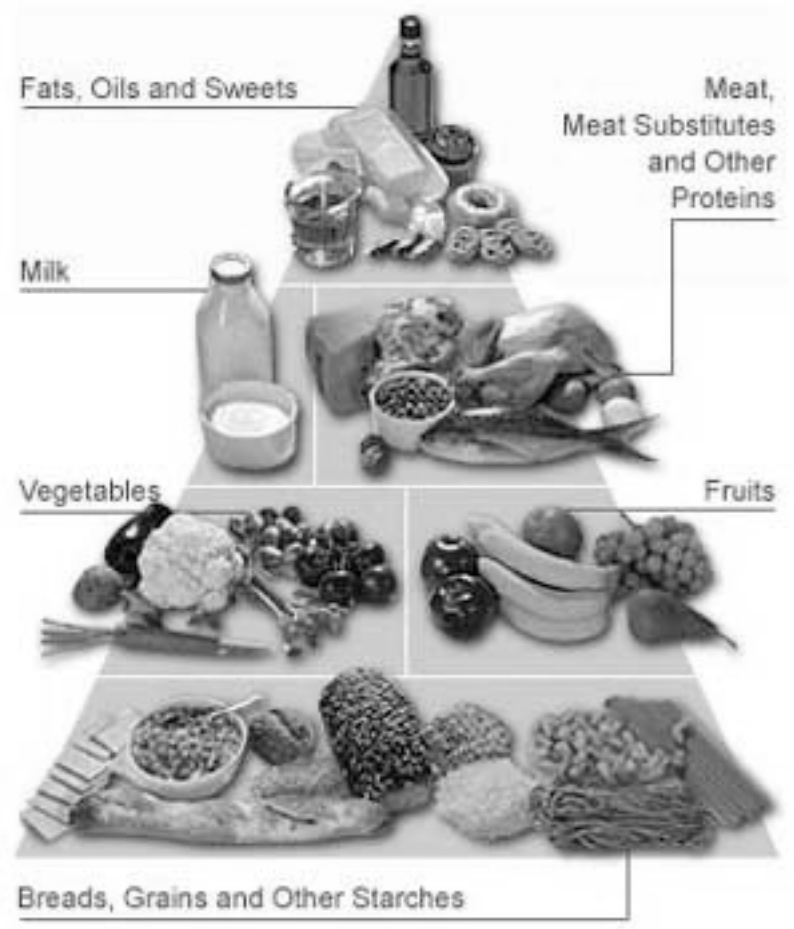


Image Sourced: http://www.diabetes.org/ueimages/Food-Pyramid.jpg

Transition Year Science Module

Student Handbook

Written By: Anne O' Dwyer

Version 2.1

Table of Contents

Safety in the Laboratory!

Image sourced: http://nobel.scas.bcit.ca/debeck_pt/science/images/labsafety.jpg

Please note the following:

- Personal Protection must be worn at all times during experimentation i.e. white laboratory coat, laboratory goggles, gloves etc.
- All long hair must be ties back away from the face and the working area.
- No eating or drinking is allowed in the laboratory. All food tastings must take place outside of the lab e.g. Home Economics Kitchen.
- Any food prepared or used in an experiment in the laboratory should not be consumed afterwards.
- All accidents (no matter how small) and breakages should be reported to the teacher immediately.
- Clean up spills immediately and in the appropriate and safe manner.
- Wash hands before leaving the laboratory.
- Follow all safety instructions carefully for each individual experiment!

Unit 1 - A taste for more…

This is the first of eight units through which the science of food, its' uses, its' properties, its' dangers etc. will all be explored. In this first unit, we look at our own diets, the types of food we eat and the nutritional value we are gaining from these foods.
We will investigate the different nutrients as well as the functions and importance of each.
The final lessonin this unit will explore the different dietary requirements of different people and why these dietary requirements change.

Lesson 1

Looking into food

Single Lesson

This is the first lesson of the first unit, so the aim is to become more aware of what we eat, our own eating habits and that the many different ingredients in the food we eat. We will refer to the Food Pyramid which helps to provide us with eating guidelines and what quantities of each food should be consumed.

What is your favourite food?

_____

Why?

_____

_____

How often do you eat this food ?

_____

Do you think this food is 'good' for you? Why do you think so?

_____

_____

What have you eaten so far today?

_____

_____

_____

_____

What is your regular daily intake of food? What types of food do you eat most? How often do you eat?

_____

_____

_____

_____

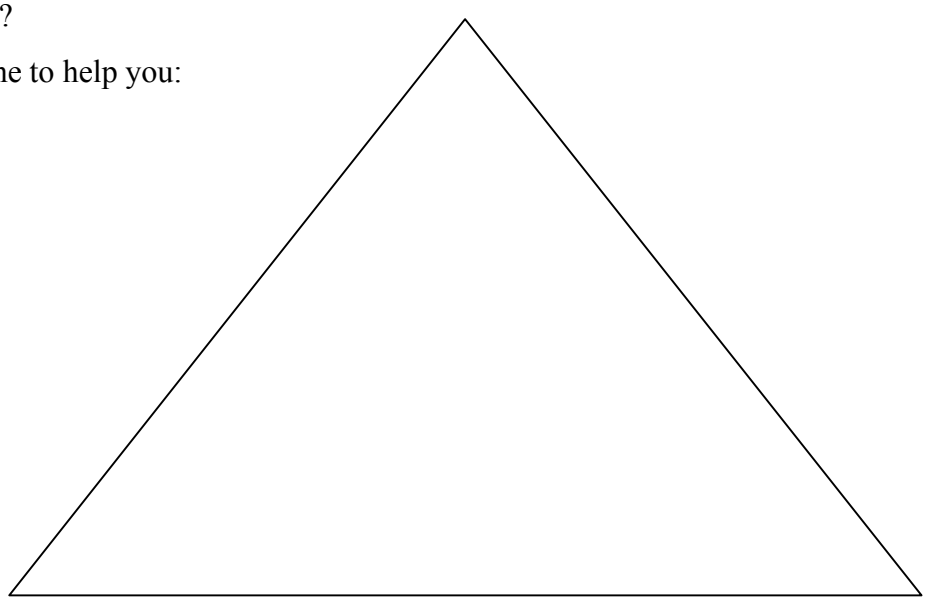
Do you know what the Food Pyramid is?

_____

_____

Can you draw it?

Here's an outline to help you:



Do you think this is important? Why?

_____

_____

_____

_____

Where would you place soft drinks on the food pyramid? Why?

_____

_____

Investigation of what makes Fizzy drinks different:

Can you recall the advert on television in the past where it showed a man at a party painfully persisting to keep his hand in the iced water until he found the drink he wanted? Some of the cans were floating but some had sunk… why had his drink sunk?

_____

_____

Materials needed per group:

- Two 500ml cans of Fizzy drinks
- A large beaker
- Water

Method:

1. In groups of three, examine the contents of the two cans of soft drinks that you are given.
2. Identify whether the following ingredients are present or not. Record this in the table provided by simply indicating 'yes' or 'no'.
3. Carefully fill your large beaker with water. Do not fill it to the top. Why?
4. Slowly place the can in the water to avoid splashing. Most fizzy drink cans have a curved bottom that could trap an air bubble. When placing the can in the water, tilt it slightly so you don't trap an air bubble underneath the can. How would this affect the result?
5. Once you have released the can, decide whether it is floating or has sunk. If the can is floating, quickly push on the top of the can so it is temporarily submerged. If it floats back to the surface, record that the can floats; otherwise record that it sinks. Record these results in your table.

Table of Results:

Ingredient	Name of soft drink:	Name of Soft drink:
Sugar		
Artificial sweetener		
Colour		
Caffeine		
Did the can float or sink?		

Can you identify which ingredient influenced whether your cans floated or sank?

_____

_____

Conclusion:

Compare your results with the rest of the class. As class can you identify which ingredient determines whether the cans sink or float?

_____

_____

Can you explain how this ingredient causes the can to float?

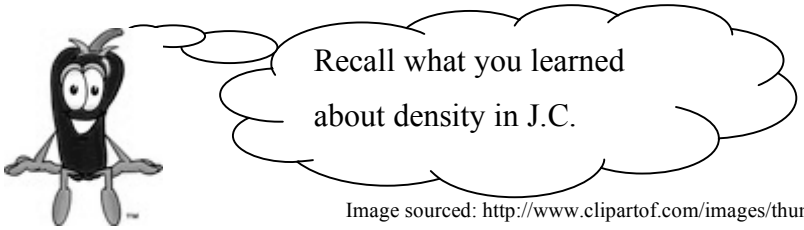


Image sourced: http://www.clipartof.com/images/thumbnail/6855.jpg

_____

_____

_____

Why does a shaken fizzy drink over-spill when opened? – Boyle's Law

Safety:

This experiment should be carried out over a sink or outdoors in case of over-spilling.

Materials required per pair of pupils:

Two bottles of the same fizzy drink e.g. 7-up.

Method:

1. Each pupil shakes his or her own bottle of drink vigorously.
2. One pupil opens their bottle slowly holding it over the sink (or outdoors).
3. Observe and record what happens.
4. Close the bottle again, after some of the drink has been lost.
5. The second pupil flicks the side of the bottle with their fingers a number of times before opening.
6. Open the second bottle slowly over the sink (or outdoors).
7. Observe and record what happens.
8. Close the bottle again.

Results:

Boyle's Law states that at a constant temperature, the volume of a gas is inversely proportional to the pressure.

How can you use this law to explain what happened?

What happened when the first bottle was opened? Why?

_____

_____

_____

_____

What happened when the second bottle was opened? Why?

_____

_____

_____

_____

Lesson 2

Our source of Energy

Double Lesson

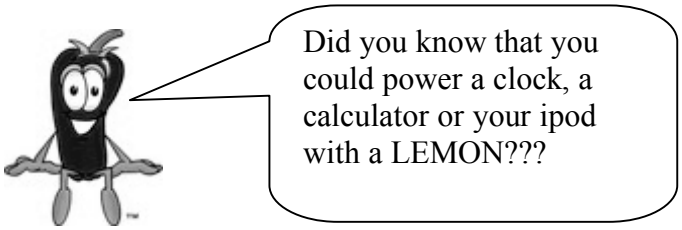


Image sourced: http://www.clipartof.com/images/thumbnail/6855.jpg

Image Sourced: http://keetsa.com/blog/wp-content/uploads/2008/12/lemon-powered-clock-300x286-150x150.jpg

To make a Lemon-Powered Battery cell:

Materials required:

- A lemon
- A copper nail / coin
- A zinc nail / galvanised nail
- A multi-meter to measure the current and voltage
- Two ungalvanised nails.

Method:

1. Push the zinc object into the fruit
2. Push the copper object into the fruit close to the zinc one (but make sure they don't touch or they will short out), if you are using a lemon, try to get it in the same segment.
3. Measure the voltage between the zinc and copper objects
4. Now measure the current it will produce.
5. Try using different metals, see what happens.

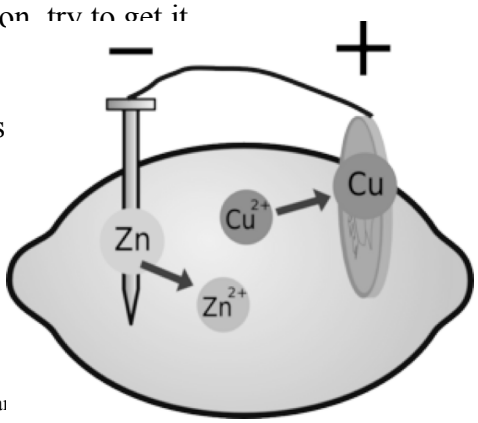


Image sourced: http://www.thenakedscientists.com/HTML/content/kitchenscience/exp/chai
ipods-with-lemons/

Examine the copper coin after the investigation, does it look any different? Why?

Nutrients:

The main focus of this lesson is to help us to recognise food as a source of energy, and to understand that different foods contain different nutrients and therefore provide us with different amounts of energy.

What is a nutrient?

_____
_____
_____

What does 'Nutritional Value' mean? Where would you see this written?

_____
_____
_____

How many different nutrients are there? Can you name these?

_____
_____
_____

Can you outline the importance of each of these nutrients?

_____
_____
_____
_____
_____
_____
_____
_____
_____

Looking at the packages used in the last class, are all of the nutrients found in all foods?

What implications does this have for you when planning a meal or even deciding on which snack food to choose?

_____
_____
_____

Where have you seen the letters RDA before? What do these mean?

_____
_____
_____

What other letter have you seen on Food packaging instead of R.D.A. Do you know what these letters stand for?

_____
_____
_____

Can you make a link between RDA and something else that was covered in the previous lesson?

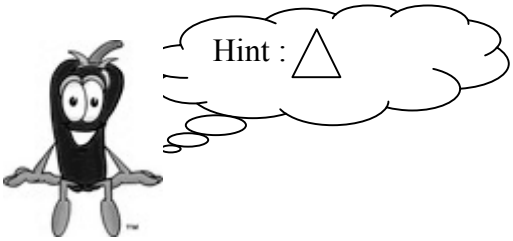


Image sourced: http://www.clipartof.com/images/thumbnail/6855.jpg

_____
_____
_____

Does RDA ever differ? Why?

Is food an actual energy source?

People must consume food to survive. Living cells use potential energy stored in food molecules and oxygen molecules to carry out the chemical processes that support life.

Energy is sometimes measured in calories (cal). One calorie is defined as 4.184 joules, approximately the quantity of energy required to increase the temperature of 1 ml of pure water by 1°C. This calorie is not the same as the "food calorie" on nutritional labels. This unit, a Calorie, is equivalent to 1,000 calories or 1 kilocalorie (kcal). Not all types of food release the same quantity of energy in calories when they burn or are metabolized. Whether the food is fat, protein, or carbohydrate makes a difference in calorie counting.

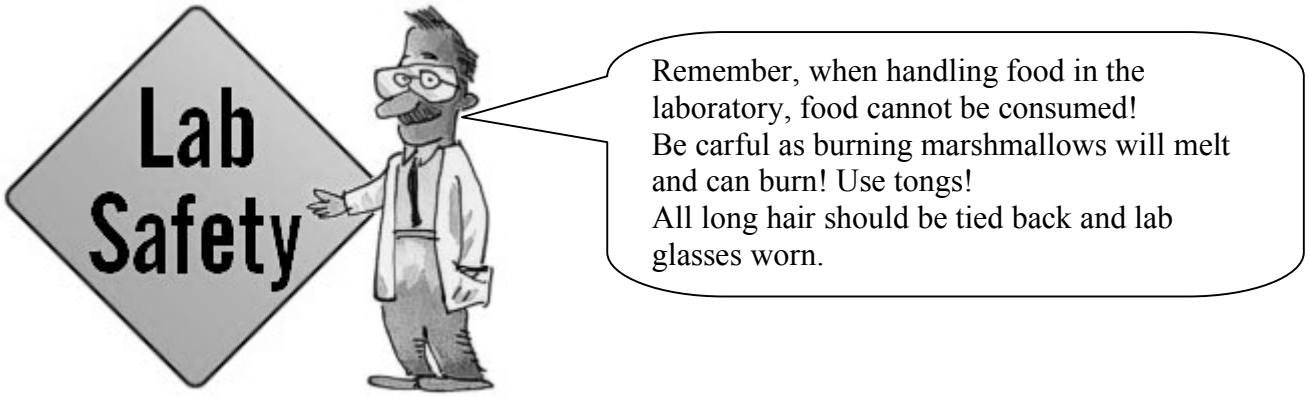


Image sourced: http://nobel.scas.bcit.ca/debeck_pt/science/images/labsafety.jpg

Materials required per pair of pupils:

- Tripod stand
- Beaker
- Paperclip
- Access to a balance
- Thermometer
- Pipette
- Stirrer
- Two food samples (marshmallow and a cashew nut)
- Matches / lighter

Method:

1. Weigh the food smple to be tested on the balance.
2. Record the weight here : _____
3. Using a pipette and beaker add 100ml of water to a beaker
4. Put the beaker on a tripod stand.
5. Place a thermometer into the beaker.
6. Record the temperature in the table.
7. Holding the food sample with the tongs, light the food sample.

8. Then hold the lighting food sample under the beaker. Why do you not light the food sample when it is under the beaker?
9. Stir the water using the thermometer. Why is it important not to let the thermometer touch the bottom of the beaker?
10. Record the new temperature when all of the food sample has been burned.
11. Calculate the change in temperature.

If time allows, repeat these steps for another food sample. Ensure you use a different beaker and tongs. Why?

Table of Results:

Food Sample	Initial Temp of water	Final Temp of water	Temp Change

Conclusion:

What conclusion can you make from these results? Hint: What caused the temperature change in the water? What does this mean?

_____

_____

_____

_____

Now can you calculate the amount of heat produced by your food sample in the box below?

Hint: Use this equation:

Heat = mass (of the water .1kg) x Specific heat capacity (of the water) x Temperature change

What is the unit for heat?

Did the different food samlples produce different amounts of heat? What does this mean?

Do your results comply with what is stated on the Nutritional value of the packets?

Hint: You may need to weigh the cashew nut or marshmallow to find how many are needed to weigh up to 100g (or whatever the serving size is listed as on the pachaking)

E.g. if 20 cashews = 100g, you will have to multiply your answer as calculated for one cashew by 20 to make the comparison valid.

Image sourced: http://www.clipartof.com/images/thumbnail/6855.jpg

Do all nutrients provide the same amount of energy?

Examine the nutritional values indicated on a food package:

Nutrition Facts

Serving Size 159g

Amount Per Serving

Calories 223	Calories from Fat 42
	% Daily Value*
Total Fat 5g	7%
Saturated Fat 1g	3%
Trans Fat	
Cholesterol 65mg	22%
Sodium 110mg	5%
Total Carbohydrate 0g	0%
Dietary Fiber 0g	0%
Sugars 0g	
Protein 42g	

Vitamin A	6%	• Vitamin C	0%
Calcium	10%	• Iron	9%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

NutritionData.com

But how can we tell if their listed number of calories per serving (223) is true?

Could you solve this problem knowing:

- 1g fat = 9 calories
- 1 g of carbohydrate = 4 calories
- 1g of protein = 4 calories

Lesson 3

Who's Diet?

Single Lesson

In this lesson, we will become more aware of our own dietary habits and how dietary requirements vary for different people. What factors do you think influence the dietary requirements of different people?

What do you think is the most inportant meal of the day? Why?

_____

_____

_____

_____

Did you know that eating breakfast helps you to perform better in school? Why do you think this is so?

Image sourced: http://www.clipartof.com/images/thumbnail/6855.jpg

Did you eat a breakfast this morning? What did you eat? Do you think this was a good choice? Why?

_____

_____

What would you recommend to eat for breakfast? Justify each of your choices using what you have learned in the last two lessons:

_____

_____

_____

Using this table, record your diet for one week:

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Breakfast							
Lunch							
Dinner							
Other snacks throughout the day (include the time they were eaten)							

Are you eating food from all levels of the food pyramid? Are you getting your RDA of each nutrient?

_____

_____

_____

_____

_____

In pairs, use other resources e.g. internet, books etc as well as what you have learned in this class to investigate the dietary requirments for an Olympic athlete and an elderly person:

Could you now plan a diet for a day for an Olympic Athlete? What types of food would they need in their diet and what foods should they avoid? Why?
Provide a dietary plan for one day

Diet of Michael Phelps (Olympic Swimmer):
Holder of 5 Gold medals at the Beijing Olympics 2008
Typical Daily intake of 12,000 calories!

Breakfast	Three fried-egg sandwiches loaded with cheese, lettuce, tomatoes, fried onions and mayonnaise. Two cups of coffee. One five-egg omelet. One bowl of grits. Three slices of French toast topped with powdered sugar. Three chocolate-chip pancakes.
Lunch	One pound of enriched pasta. Two large ham and cheese sandwiches with mayo on white bread. Energy drinks packing 1,000 calories.
Dinner	One pound of pasta. An entire pizza. More energy drinks

(Rubenstein, 2009)

Could you also plan a diet for a week for an elderley person? What types of food would they need in their diet and what foods should they avoid?
Provide a Dietary plan for one day.

Why would the diets of both these people be different?

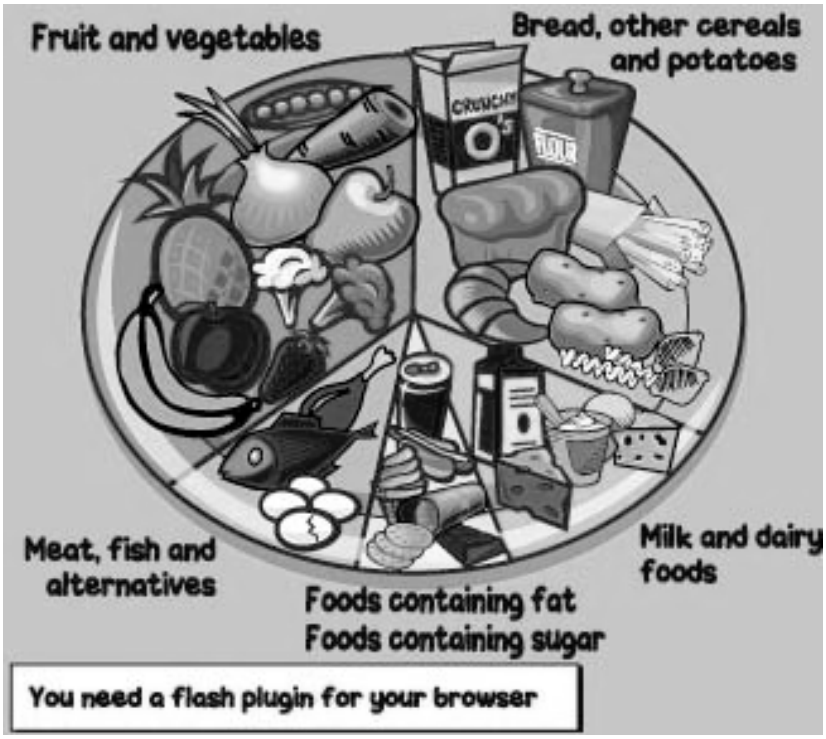


Image sourced: http://www.bbc.co.uk/northernireland/schools/4_11/uptoyou/images/flash_plate.jpg

Unit 2 - The nutrients

In this unit, we will take a closer look at the different food groups and in particular the different nutrients that make up the different foods. We will identify the fuction and source of the different nutrients and also how to identify them in unlabelled food!

We will investigate the use of food supplements by athletes and others. Have you ever taken any type of a food supplement? why ?

Lesson 1

The Nutrients

Single Lesson

In this lesson, we will recall what we have already learned about the nutrients, their sources and functions.

To solve the scenario in this lesson, you will have to work together in small groups.

Can you recall the food tests from your Biology in Junior Certificate Science to determine which nutrient these foods contained and to help understand why the players were eating this food?

Do you know what makes up the food that you eat?

What did you eat for lunch today? What exactly was in that food? How do you know?

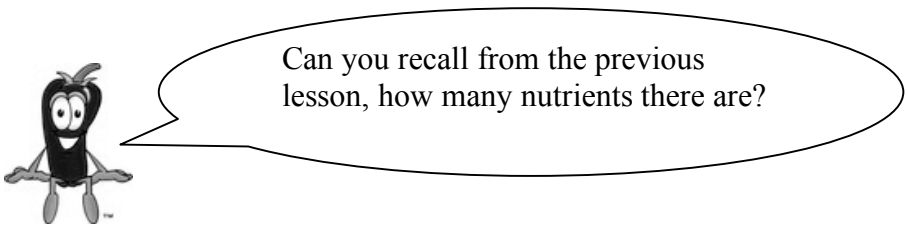


Image sourced: http://www.clipartof.com/images/thumbnail/6855.jpg

Can you list these?

Which nutrient provides the most energy?

Knowing this, when do you think it would be important to eat foods containing this nutrient? How many foods can you name which contain this nutrient?

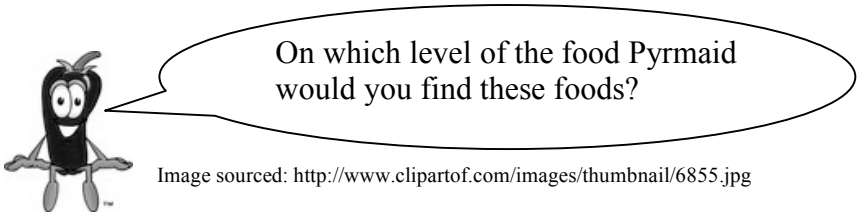


Image sourced: http://www.clipartof.com/images/thumbnail/6855.jpg

Working together and perhaps with the help of your teacher, can you fill in the table below?

Nutrient	Function	Source

Use food labels of any snacks that you eat regularly and the traffic light guide below to determine the classification of the snack:

	Low	Medium	High
Fat	Less than 3.0 g/100g	3.0 – 20.0g/100g	More than 20.0g/100g
Sugar	Less than 5.0g/100g	5.0 – 12.5g/100g	More than 12.5g/100g
Salt	Less than 0.3g/100g	0.3g/100g – 1.5g/100g	More than 1.5g/100g

Source – FSA traffic light guidelines.

Scenario:

How do you know the nutritional value of foods that may not be packaged or labelled e.g. fruit and vegetables just like us?

Image sourced: http://www.clipartof.com/images/thumbnail/6855.jpg

These scraps of food were found in the dressing room after a football game. Which nutrient do you think the team may have needed before the game? Since no packaging was left behind, how can we investigate the ingredients in these foods?

Can you identify the foods that were eaten from the scraps that were left?

_____

What nutrient do you think will be found in these foods?

_____

Guesstimate your results in the table below:

Food Sample	Presence of sugar	Presence of Starch

In groups of three, half of the class test both food samples for sugar and the other half test both samples for starch:

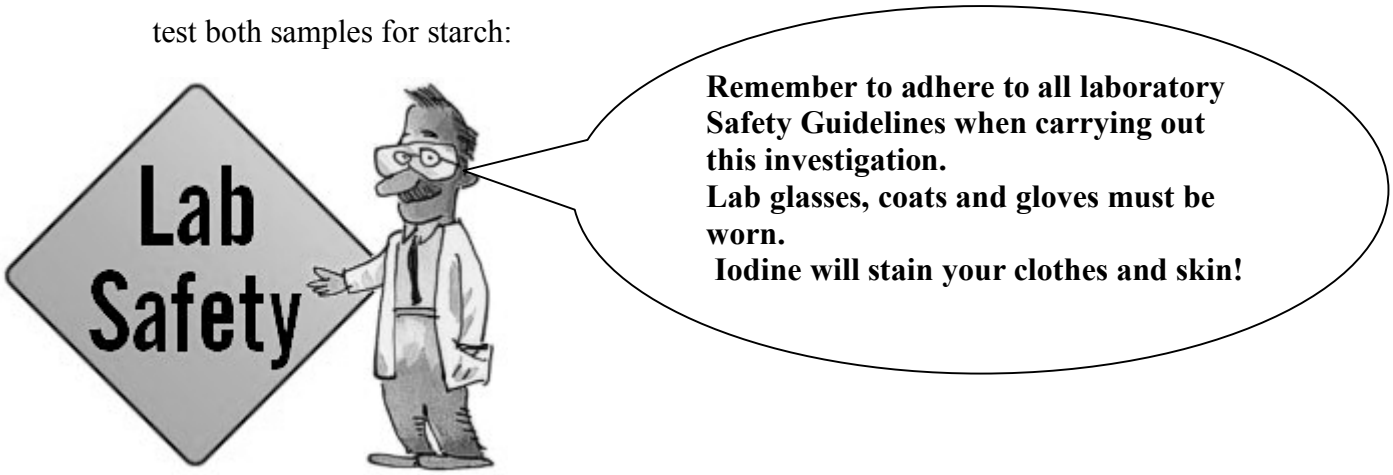


Image sourced: http://nobel.scas.bcit.ca/debeck_pt/science/images/labsafety.jpg

Can you remember these food tests from your Junior Certificate Science?
…..what needs to be done to the sample when testing for the presence for sugar?

Repeat this same method for your second food sample.

Complete this table and then make a conclusion to your investigation of the presence of sugar in each sample of the foods left in the dressing room:

Food Sample	Colour Change	Presence of sugar

Complete this table and then make a conclusion to your investigation of the presence of starch in each sample of the foods left in the dressing room:

Food Sample	Colour Change	Presence of starch

Lesson 2

Let's 'C' all about Vitamins

Double Lesson

From the experiment in the previous lesson, you can now realise that one food may contain more than one nutrient and so the same nutrient can be sourced from more than one food or food group.
In this lesson, we will take a closer look at the functions, sources and deficiency diseases in relation to each of the main vitamins. The experimental activity in this lesson requires much more detail and understanding than other activities in the previous lessons. It will require precise laboratory skills, measuring, observing and recording.

Examining the various food labels available to you, can you identify which nutrients are found in each food. Use the box below to record your findings:

Food	Proteins	Fats	Carbohydrates	Vitamins	Minerals	Water
E.g. Brown Sliced Pan	Yes	Yes	Yes	No	Yes-sodium	Yes

From the investigation, it is apparent that one food may contain more than one nutrient and so the same nutrient can be sourced from different foods.

How many different vitamins are there? Can you name these?

Did you know that Vitamins can be classified as Fat soluble and Water Soluble ?

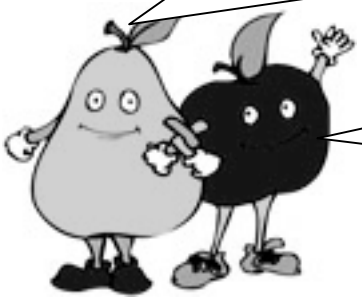
Image sourced: http://www.clipartof.com/images/thumbnail/6855.jpg

Can you match each vitamin with its' function?

- A
- C
- D
- B
- E
- K

- Necessary for growth, healthy eyes, nose and throat
- Necessary for formation of bones and teeth
- Necessary for the clotting of blood
- Necessary for healthy skin
- Necessary for healthy gums and blood vessels, absorption of Iron.
- Controls release of energy from food. Helps the nervous system

On long sea voyages during the age of exploration, (1500-1600), many sailors died from scurvy. Captain Cook (1700) gave limes to his sailors to prevent scurvy. Years later scientists began to understand the importance of vitmains…. Not just for the sailors!



Here's some more you should know about Vitamins:

- There are all of 6 different vitamins in the B Group
- Carotene is a substance which is converted into Vitamin A in the body.

Image sourced:
http://its.stgeorges.bc.ca/athletics/row/images/prgm/nutrition/nutrition_cartoon.jpg

Using food packages and wrappers available or otherwise, can you list some different sources of each vitamin?

Vitamin	Sources
A	
D	
E	
K	
B	
C	

Investigation of three anonymous Orange Juice Samples:

You may have listed Orange Juice as one of best sources of Vitamin C in the table above.

But how do we know which brand and type of Orange Juice contains the most Vitamin C? Can we trust the stated Nutritional Value?

Knowing that Vitamin C is an important vitamin for healthy gums and skin and knowing that it is found in citrus fruits and blackcurrants, investigate which is the best source of vitamin C. why can't you use Blackcurrant Juice in your investigation?
Using the reaction between ascorbic acid (Vitamin C) and an iodide solution, observe which source contains the most amount of Vitamin C.

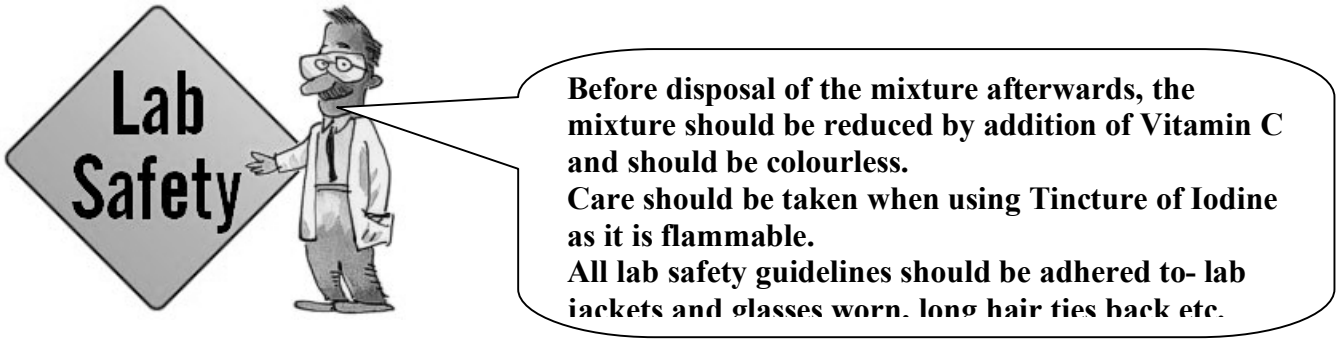


Image sourced: http://nobel.scas.bcit.ca/debeck_pt/science/images/labsafety.jpg

Materials:

- 2.5 ml cornstarch 1000 ml distilled water
- 2.5% tincture of Iodine
- One 250 mg Vitamin C tablet
- Three juices to be tested
- 100 ml graduated cylinder
- 10 ml pipette
- 4 Beakers
- Retort Stand
- Pestle and mortar
- Hot plate
- Iodine
- Starch
- Cornstarch
- Dropper
- Burette
- Conical Flask

Method:

Preparing the Vitamin C Standard:

Great care must be taken when preparing this standard as all of the results will be based on this.

1. 250 mg per 250 ml = 1 mg/1ml
2. Crush one 250 mg Vitamin C tablet using the Pestle and mortar.
3. Transfer the crushed tablet into a beaker jar labeled " Vitamin C Standard".
4. Rinse out the pestle and mortar into the beaker using a wash bottle.
5. Add 250 ml distilled water to the beaker using a graduated cylinder.
6. Step 5 was repeated 3 times.
7. The remaining water was poured into the jar.
8. The jar was sealed and placed in a dark cupboard when not in use.

Stock Starch Solution:

1. Pour 250 ml distilled water into beaker
2. Add 2.5 ml of corn starch and the mixture.
3. Stir over low heat on a hot plate until dissolved.
4. Allow the mixture to cool.

Working Starch/ Iodine Solution:

1. Pour 250 ml distilled water into a jar labeled " Working Starch/ Iodine Solution".
2. Add 5 ml of the Stock Starch Solution to the water and mix well.

3. Add 5 drops of iodine to the jar and was mixed well. The starch/ iodine complex was dark blue in colour.

I: Titration of Vitamin C Standard:

1. Rinse all of the titration materials before use; pipette, burette, conical flask. Note: The burette is rinsed with the material to be tested (Standard Vitamin C) before titration was carried out.
2. Using a pipette measure 50 ml of working starch/iodine reagent into a beaker.
3. Fill the burette with the Vitamin C standard.
4. Use the tap to titrate the Vitamin C standard into the starch iodine reagent drop by drop.
5. Gently swirl the conical flask after the addition of every few drops of standard.
6. Record the volume of Standard Vitamin C to be added before the iodine/ starch solution changed colour.
7. Repeat steps 1 to 7 to ensure precision.

Results I:

Trial	Volume Vit C Standard	Volume Starch/Iodine
1		50ml
2		50ml
3		50ml
Average Volume		

II: Titration of Juices:

1. Rinse all of the titration materials before use; pipette, burette, conical flask. Note: The burette is rinsed with the material to be tested (Standard Vitamin C) before titration was carried out.
2. Pipette 50 ml of starch/iodine reagent into a conical flask
3. Fill the burette with Orange Juice Sample.
4. Slowly add the Orange Juice to the iodine/starch solution.
5. Swirl the conical flask and observe any colour changes.
6. Record the volume of Orange Juice added before the colour change.
7. Repeat steps 1 to 7 to ensure precision.

Results II:

Trial	Volume Orange Juice Added	Volume Starch/Iodine
1		50ml
2		50ml
3		50ml
Average Volume		

Test the other Orange Juice Sample using this same method.

Knowing the standard Orange Juice sample contained 1mg Vit C / 1 ml, use the results from the standarisation titration and the titration of the samples to calculate the amount of Vitamin C in each of the unknown Orange Juice Samples.

Present your results on a graph
From your graph and the table of results can you make a conclusion about which

How do your results compare with the whole class? Is there much deviation?

_____

_____

_____

If the nutritional labels of the Orange Juices used are available, compare your results to the actual Vitamin C value stated on the cartons. Had you listed the samples in the correct order according to your results? How can you explain any discrepancies in your results?

_____

_____

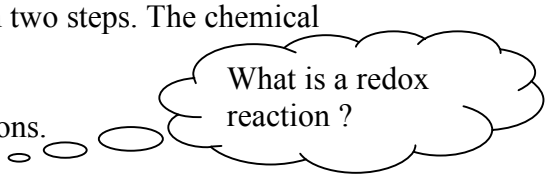
_____

_____

_____

Were you surprised with which brand had the most Vitamin C?

The reaction involved in this experiment took place in two steps. The chemical equations for these reactions are written below.
These reactions may also be described as redox reactions.



Can you identify what is being oxidised and what is being reduced in both?
Begin by identifying the oxidation numbers of each element…

$$IO_{3(aq)}^{-} + 6\ H^{+}_{(aq)} + 5\ e^{-} \rightarrow \tfrac{1}{2}\ I_{2(aq)} + 3\ H_2O$$

$$2\ I^{-}_{(aq)} \rightarrow I_{2(aq)} + 2\ e^{-}$$

$$2\ IO_{3(aq)}^{-} + 10\ I^{-}_{(aq)} + 12\ H^{+}_{(aq)} \rightarrow 6\ I_{2(aq)} + 6\ H_2O$$

Lesson 3

Supplementary & Functional Foods

Single Lesson

In this lesson we will take a look at food supplements and explore the advantages and disadvantages of these. Through your own research, you will learn about other supplements such as protein drinks taken by athletes for example when weight training.
By researching and reading genuine articles about real people, this will help the your understanding.

Do you take any supplements in your diet? What is meant by 'dietary supplements' ?

_____
_____
_____
_____
_____
_____

Why should one need to take a 'dietary supplement'?

_____
_____
_____
_____

Do you think supplements should be taken by everyone? Justify your answer.

_____
_____
_____
_____

What does a ‘deficiency’ mean in relation to RDA of vitamins and minerals?

Can you match the deficiencies with the vitamins and minerals?

- A
- Iron
- D
- E
- C
- Calcium
- Zinc
- B
- Iodine
- K
- Sodium
- Potassium

- Anaemia – reduced level of Haemoglobin in blood. Delayed healing of wounds
- Night blindness, Dry lining of breathing organs
- Retarted Growth, loss of appetite, skin disorder
- Blood does not clot properly
- Muscular weaknesses
- Scurvy, delayed healing of wounds
- Beri-beri ; a nerve disease common in Eastern countries. Pellagra, tongue and skin become sore.
- Goitre- enlargement of the thyroid gland.
- Rickets, brittle bones, unhealthy teeth
- Unhealthy skin, aging of the skin.
- Muscular Cramps
- Stunted growth, poor quality of bones and teeth, rickets, osteoporosis in adults.

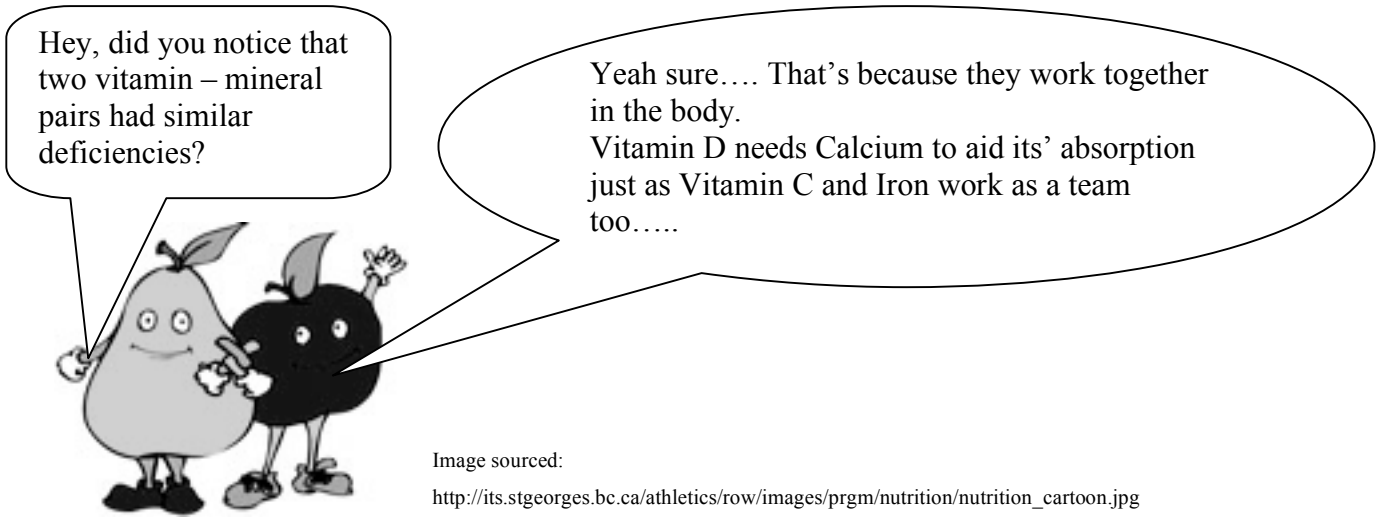
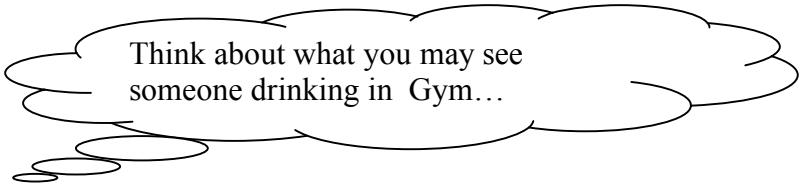


Image sourced:
http://its.stgeorges.bc.ca/athletics/row/images/prgm/nutrition/nutrition_cartoon.jpg

Apart from Vitamin and Mineral Supplements, what other supplements do people take?



_____

_____

_____

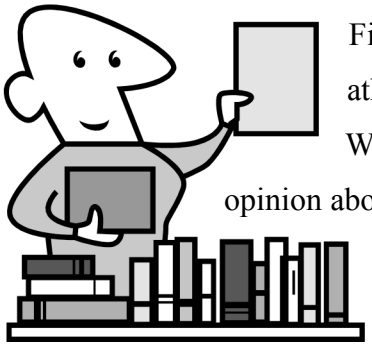
_____

Look at the different people in the following pictures. How do you think their dietary requirements vary? Which vitamin or mineral supplement would you recommend for each?

A

B

C



Find a newspaper or web article about supplements taken by athletes in the Olympic Games to improve their performance. Write a 150 word response to this article outlining your own opinion about this topic.

Find a newspaper or web article outlining any recommendations, advantages or disadvantages of dietary supplements. Write a 150-word response to this article voicing your own opinion.

Functional foods or medicinal food refers to any fresh or processed food claimed to have a health-promoting or disease-preventing property beyond the basic function of supplying nutrients.

Can you think of any functional foods?
The general category of functional foods includes processed food or foods fortified with health-promoting additives, like "vitamin-enriched" products.

Working in pairs, make a list of as many functional foods as possible that you can think of …….
E.g. Probiotic yoghurts or other fermented foods contain live cultures, these may be considered as functional foods.

Image sourced: http://images.crateandbarrel.com/is/image/CrateandBarrel/EvolutionSaltPepperShakers?lg

Unit 3- Food Additives

We all may have a favourite condiment to add to our food, but what exactly is added to the food before it reaches the dinner table?

In this unit we will become more aware of what our food is made up of. We will learn about what exactly is added to food before it reaches the table, during processing and why this is added. Will we be able to isolate these ingredients from the processed product? Some natural ingredients in unprocessed foods may also surprise us!

Lesson 1

Do you know what you are actually eating?

Single Lesson

This lesson highlights the amount of additives, natural and artificial added to almost all of the food that we eat everyday. But what exactly are these and why are these added? Are they all necessary?

Examining the food packaging that you have looked at before, do you know what all of the ingredients are?
What ingredients do you not recognise? Make a list of these.

_____

_____

_____

_____

Try to look up these ingredients on the internet.

Image sourced: http://www.clipartof.com/images/thumbnail/6855.jpg

Can you see any numbers in the ingredients list? What are these numbers? What do they mean?

_____

_____

_____

_____

Can you match these numbers to what they stand for?

- E100-E199
- E200-299
- E300-399
- E400-499
- E500-599
- E 600 – 699
- E700-799

- Preservatives
- Antioxidants
- Antibiotics
- Flavour Enhancers
- Colours
- Emulsifiers
- Acidity regulators

Testing emulsifiers:

Materials:

- One egg
- 3 Beakers (one small and two large)
- Stirrer
- Graduated Cyliner
- Water
- Cooking Oil

Method:

1. Crack the egg and separate it, place the yolk into the small beaker.
2. Make two mixtures containing 1 part water (20ml) and 5 parts vegetable oil (100ml)
3. To one of these mixtures add the egg yolk.
4. Shake or stir both of these mixtures for about half a minute
5. Let both mixtures stand undisturbed for 15 minutes
6. Record your observations.

Results:

Did both mixtures settle out into layers? Can you explain your observations?

Where is this applied to food processing?

_____

_____

_____

_____

_____

_____

Working in small groups to examine different food packagings, are there any numbers common to more than one packaging that you are examining?

_____

_____

How many of the packagings which you have examined admitted that they “conatain artificial flavours or colourings”?

_____

Why do you think that artificial flavourings and colourings are added to food?

_____

_____

_____

_____

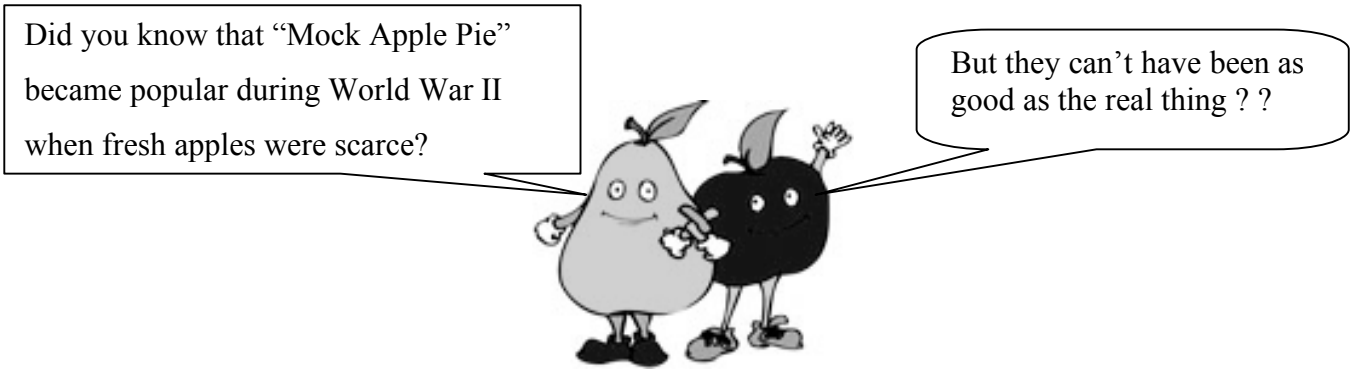


Image sourced: http://its.stgeorges.bc.ca/athletics/row/images/prgm/nutrition/nutrition_cartoon.jpg

Investigation:
Can you make your own "Apple Pie"…….. *without* apples?

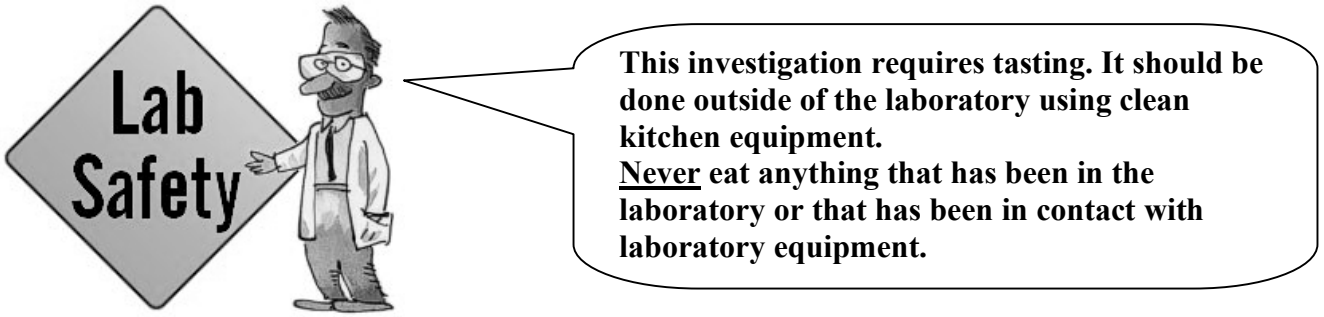


Image sourced: http://nobel.scas.bcit.ca/debeck_pt/science/images/labsafety.jpg

Materials needed for each group:

- Small dish
- Tasting spoons
- Measuring spoons
- 4-5 cream crackers
- Sugar (or an artificial sweetener)
- Cream of Tartar
- Water

Method

1. Crumble 1-2 crackers into the bowl
2. Add 1 teaspoon (5mg) of sugar.
3. Add ¼ of a teasspoon (1-2 ml) of Cream of tartar.
4. Add 2 teaspoons (10ml) of water.
5. Stir.
6. Add more water until the consistency of the mixture is the same as applesauce.
7. Record the proportions used.
8. Using clean spoons, allow each person in the group to taste the cracker mixture.
9. Does it have a fruity flavour like real applesauce?
10. *Optional :* Heat the cracker mixture in the microwave for 10-20 seconds. Season with cinamon or cloves and taste it again. Does it taste more like applesauce now?
11. Record your observations.
12. Repeat the method again, but his time vary the amounts the ingredients using the feedback from your original sample.
13. Record the proportions used this time.
14. Taste the cracker mixture cold and heated again,
15. Record your observations.

Table of Results:

Quantities of each ingredient used	Response to cold tasting	Response to heated tasting

Your teacher may have prepared a sample of real apple sauce.
Describe the appearance and smell of your cracker mixture compared to the real apple sauce. Did it differ? How?

_____

_____

_____

_____

Discuss your results with the rest of the class.
If time allows, taste another groups cracker mixture, Does it taste more like apple sauce than yours?

_____

_____

_____

As a class can you decide which cracker mixture was the most believeable?

What made did this mixture taste more like real apples?

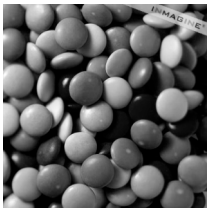
_____

_____

_____

_____

Carry out research with a partner to investigate whether many more foods are prepared in this way, using ‘mock’ ingredients?



Lesson 2

Can we take away the additives?

Double Lesson

We have learned about E numbers and artificial colourings in the last lesson, but why are these artificial additives added to food? Are natural colouring and flavourings not sufficient?

Can you identify what this ingredient list belongs to?

Image sourced: http://www.clipartof.com/images/thumbnail/6855.jpg

Milk fat and non-fat milk, sugar, sweet whey, high-fructose corn syrup, guar gum, monoglycerides and diglycerides, cellulose gum, sodium phosphate, carrageenan, citric acid, E129 and artificial strawberry flavour.
And what does "artificial strawberry flavour" contain? Just these few yummy chemicals: amyl acetate, amyl butyrate, amyl valerate, anethol, anisyl formate, benzyl acetate, benzyl isobutyrate, butyric acid, cinnamyl isobutyrate, cinnamyl valerate, cognac essential oil, diacetyl, dipropyl ketone, ethyl butyrate, ethyl cinnamate, ethyl heptanoate, ethyl heptylate, ethyl lactate, ethyl methylphenylglycidate, ethyl nitrate, ethyl propionate, ethyl valerate, heliotropin, hydroxyphrenyl- 2-butanone (10% solution in alcohol), ionone, isobutyl anthranilate, isobutyl butyrate, lemon essential oil, maltol, 4-methylacetophenone, methyl anthranilate, methyl benzoate, methyl cinnamate, methyl heptine carbonate, methyl naphthyl ketone, methyl salicylate, mint essential oil, neroli essential oil, nerolin, neryl isobutyrate, orris butter, phenethyl alcohol, rose, rum ether, undecalactone, vanillin and solvent.

Can you guess what food this ingredient list is from?

Image sourced: http://www.clipartof.com/images/thumbnail/6855.jpg

Water, sugar, cellulose, flavour enhancer, monosodium glutamate, colours E160(a), E160 (d), E101, antioxidant: E300, Plant acids, flavourings.

From your study and examination of food packagings, what are the two most common food additives?

-
-

Why do you think each of these are added to foods?

1.

_____

_____

_____

2.

_____

_____

_____

Why can't natural flavourings and colourings be used all of the time?

_____

_____

_____

_____

What else could be added to food during processing? Why?

Hint: Can you recall what you covered in the final lesson of Unit 2…..

_____

_____

_____

Examining a cereal box, can you name some of the minerals and vitamins added to cereals? Make a list of these:

Examining different cereal boxes, can you identify from the nutritional value, which cereal has the most minerals added?

Which cereal contains the greatest amount of Iron

Investigation:Can we see and measure the Iron in a bowl of cereal?

Why do we need Iron in our bodies?
Where exactly is it stored?
Can you remember how to draw the electronic configuration of elemental Iron?

Remember:
Even though, you will be working with a cereal in this investigation, you cannot eat or taste any food or drink in the Laboratory.
All Laboratory safety guidelines must be adhered to!

Image sourced: http://nobel.scas.bcit.ca/debeck_pt/science/images/labsafety.jpg

Materials needed for each group:

- 2 cups of whole grain cereal e.g. Cherios
- plastic bowls
- A plastic seal tight bag
- A rolling pin
- Filter paper
- Water
- Dropper
- Graduated Cylinder
- Spoon
- Magnetic wand
- Access to a balance

Method:

1. Place the empty plastic bowl on the balance.
2. Tare the balance.
3. Add 10g of the cereal to the bowl and record the exact weight.
4. Empty the contents of the bowl into the plastic bag.
5. Seal the bag after allowing the air to escape.
6. Use the rolling pin to crush the cereal into fine pieces.
7. Pour the crushed cereal back into the plastic bowl.
8. Add about 10ml of water. (as measured using the graduated cylinder)
9. Use the spoon to stir ad mix the solution until the mixture resembles a soup.
10. Allow the mixture to sit for 15-20 minutes.
11. Weigh the filter paper on the balance.
12. Record this mass.
13. Use the magnetic wand to stir the ceral –water mixture for 2 minutes.
14. Remove the wand. Besides the cereal can you see anything else sticking to the wand?
15. Using the dropper, carefully rinse off the brown cereal pieces from the magnetic wand.
16. What colour is the remaining residue?
17. Carefully remove the remaining residue onto the filter paper.
18. Repeat steps 13 – 17 until no more Iron filings can be removed from the cereal-water mixture.
19. Allow the filter paper with the Iron filings to dry thoroughly.
20. Record the mass of the dry filter paper with the iron filings.

Results:

Mass of cereal used: _____

Mass of empty dry filter paper: _____

Mass of dry filter paper with the filings: _____

Mass of the Iron filings in the cereal sample: _____

Use these results to calculate the % w/w of Iron Filings in the cereal sample.
Compare this result with the % w/w of Iron as stated on the Nutitional Infrmation on the box.

As well as preservatives, colourings, flavours etc. being added to food, different foods are also added to other products for different reasons.

Did you know:

Fish scales can be added to some make-up to create a shimmer?

Feathers can be added to shampoo for protein to strengthen hair.

Stearic Acid (fatty substance from the stomach of pigs) is added to tyres for structural support.

Can you find more examples of where foods are added to other products and why they are added.

Are you smarter than a smartie?

Materials needed per group:

- Filter paper or blotting paper
- Tube of smarties (or M&M's)
- Small cup of water
- Plate

Image Sourced:
http://janetwilliams.files.wordpress.com/2009/05/smartieshexnoartificialcolo.jp

Method:

1. Fill in the table below which colours you hypothesise will come from each of the different coloured smarties.
2. Cut the blotting paper into circles about 15cm across.
3. Place the plate on a flat surface and the paper on the plate.
4. Place a smartie in the center of the paper.
5. Dip your finger into the water and hold it above the smartie allowing a little water to rip onto the sweet.
6. Repeat fairly slowly until the sweet is quite wet and the circle of water on the blotting paper is about 5 cm across.
7. Leave and observe what happens.
8. In a little while you should be able to see rings of colour round the smartie.

Colour of Smartie	**Hypothesise the colours making up the smartie colour**	**Actual colours observed**
Blue		
Orange		
Red		
Green		
Brown		

Can you explain why the different colours move out from the smartie in different orders?

Lesson 3

How influenced are you by labels?

Single Lesson

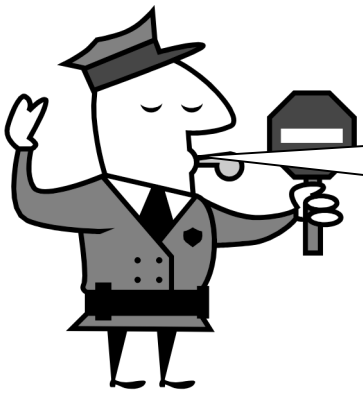
Do you think this image is realistic? Do you think some advertising companies disguise such negative facts about their products? Why do you think this is so? Have you ever seen packagings with such warnings? Why?.....
What influences you as a consumer to chose one product over an other?

Do you examine and read your food packaging before purchasing?
What information should be shown on food packaging? Why is this important?

What information can you tell from the list of ingredients? Are the ingredients in any particular order? Why is it important to know the ingredients used in processing?

Food Patrol!

Can you identify the item of food from its' passport?



Working in groups of three, can you identify the food from its Nutritional Information and Ingredient listing?
Follow the steps I have set out to aid the investigation!

Analyse the Nutirtional Information and Ingredient list:

1. Using the known calorific value for fats, proteins and carbohydrates and the mass of each of these in each serving, calcualte, how many calories are in each serving? Is this calorie value per serving given? Does your calculated value deviate much from this?

2. Does this food provide a lot of energy? How do you know this?

3. Can you identfy any particular artificial colours, flavours of preservatives in this food? Can you identify any of the E numbers?

_____

_____

_____

_____

4. Using the list of ingredient and the Nutritional table, could you guess what type of food the label belongs to? Give a reason for your choice.

_____

_____

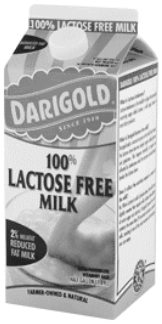
Were you surprised when the anontmous food was revealed?

Was your identification correct?

_____

_____

_____



SPECIAL DIETS:

Investigate any special medical disorder or illness which would affect your dietary decisions? (e.g. diabetes, coeliac) What changes would somone with this condition have to make to their diet? Why?

Present your findings on a poster for the rest of the class. Use books, newspapers, magazines, the internet etc. to aid your research.

Do you know anyone with a special dietary requirement? Could you interview this person? ….

Image sourced at: http://purzone.com/images/food-processing.jpg

Unit 4 - Food Processes

In this unit, we will trace the steps backwards to see what the food on our table once looked like and where it once grew or lived!

Most of the food that we eat today has been changed in some way from its natural state, but why is food changed and processed? Is all food processing industrial or does some happen in our homes?

Lesson 1

From the farm to the shelf to the table…

Single Lesson

In this lesson we will identify the natural and original ingredients in many of our well known processed foods. We will also learn more about the different methods of processing foods and why some are more suitable than others. We will also recognize how you too are involved in the food processing industry!

Examining the ingredient lists from many well-known foods, can you identify the main natural ingredients that the food was made from?
E.g. taytos from potato, bread from flour etc.
Make a list of these:

_____

_____

_____

_____

Working with the person beside you, can you clearly distinguish between a 'natural' food and a 'processed' food?

_____

_____

_____

_____

Have you ever been involved in processing food? ……Changing the food you eat in any way? Think about it!

Why are foods processed?

_____

_____

_____

_____

How do you think ‘natural’ foods are ‘processed’ into different food products? Can you name any of these processes? Working with the person beside you, how many can you think of?

1.
2.
3.
4.
5.
6.

Drying (Dehydration)

Enzymes and micro-organisms cannot live without moisture. When food is dried or dehydrated, the water is drawn out of the cells. This preserves the food. Some dehydrated foods are re-hydrated (water is added) to return them to their normal moisture content before using. Food should be treated as perishable after the water is added.

Can you think of any foods that are dried in processing?

_____

_____

_____

Chemical Preservation:

Many well-known chemicals, which you may have seen, handled and tasted before have been used in food processing over the centuries. These include, salt, sugar, acid (vinegar) and smoke!

Other manufactured chemicals are often now used in food processing also.

Can you name different foods processed using salt, sugar, acid and smoke?

Salt:_____

Sugar: _____

Acid: _____

Smoke:_____

Canning and bottling:

Nearly all food can be canned. In the canning process food is cooked and sterilized in air-tight containers. Sometimes another preservative is also added to the food in the can e.g. sardines in brine (what is brine?)

Canned food will keep for many years. However, like many other processes, canning often results in loss of nutrients, colour and flavour.

How do you think the food industry combats this problem?

_____

_____

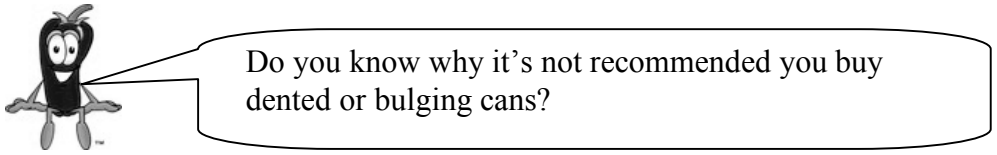


Image sourced: http://www.clipartof.com/images/thumbnail/6855.jpg

Irradiation:

This is a relatively modern method of processing and preserving food. In this method, gamma rays (which are some-what like x-rays) are sent through the food. This kills the micro-organisms, which may cause the food spoilage.

From the brief outline given on each food process above and from your own knowledge and other research can you outline the advantages and disadvantages of each of these methods of processing food.

Hint: Think about the effect on nutritional value, flavour and colouring, the cost of the process, how effective the process is, are there any harmful risks to the consumer or those working in the industry etc.

Type of Processing	**Advantages**	**Disadvantages**
Dehydration		
Addition of Chemicals		
Canning & Bottling		
Irradiation		

As a class, discuss your listed advantages and disadvantages for each method.
Can you conclude on the one most suitable method of food processing? Why?

_____

_____

_____

_____

Working together in teams of two or three, every two teams choose one food item from the box below or other natural foods that you can think of, and make a list of how many processed foods you can think of that are made from that natural food in one minute. (as timed by your teacher)
When the time is up, compare your lists, which team thought of the most processed foods? Was there much of a difference between the lists?
E.g. tomato: pesto sauce, ketchup, tomato puree etc.

Potato	Apple
Oats	Milk
Tomato	Sugar cane

Lesson 2

The Basics about Baking

Double Lesson

In this lesson, we hope to gain a clear understanding of fermentation and to be able to recognise examples in the world around us. We will examine a slice of bread to recognise and understand how yeast causes it to rise. '*Accomplished Cuisine'* have asked for our help in investigating the use of different raising agent. We will gain a clearer interpretation of these by working in small groups discussing results and sharing ideas.

From the previous lesson, can you recall what the main ingredients in bread are? Can you explain how these ingredients are combined to make bread?

_____

_____

_____

_____

What is a raising agent?

_____

_____

_____

Can you name any raising agents that you may have seen listed in the ingredients bread labels that you have examined or raising agents you may have used yourself baking scones or seen someone else use at home?

_____

_____

_____

_____

How does bread rise? Can we see the yeast?

Materials needed per group:

- 1 slice of bread
- Access to a bright source of light (e.g. window or lamp)

Hypothesise how do you think bread rises. Explain the importance of the different ingredients used.

Most bread bakers use a strain of yeast as their raising agent which scientists call 'Saccharomyces cerevisiae'.

Being a living organism, yeast needs food. On mixing flour and sugar with water, the warmth of the water nudges the yeast awake, and then the yeast 'eats' the sugar. As the yeast metabolises (breaks down) the sugar, it emits carbon dioxide and alcohol gases. These gases form those bubbles that foam up.

Yeast may be tiny, but millions of spores can double the volume of bread dough in just a few hours in the oven.

Why do you think bread has to be put into an oven to rise?

_____

_____

Examine your slice of bread by looking at it against the light:

What do you observe? Can you explain your observation?

_____

_____

_____

_____

_____

_____

_____

Can you write the equation of the reaction that takes place as bread rises in the oven:

Word Equation:

_____

Chemical Equation:

_____

Make a Yeast-Air Balloon:

Materials:

- 1 packet of active dry yeast
- 1 cup very warm water (43 C)
- 2 tablespoons sugar
- 1 rubber balloon
- 1 empty water bottle (750ml bottle)
- Spoon

Method:

1. Stretch out the balloon by blowing it up repeatedly, and then lay it aside.
2. Add the packet of yeast and the sugar to the cup of warm water and stir.
3. Once the yeast and sugar have dissolved, pour the mixture into the bottle. You'll notice the water bubbling as the yeast produces carbon dioxide.
4. Attach the balloon to the mouth of the bottle, and set both aside.
5. Observe what happens in the bottle.
6. After several minutes, you'll notice the balloon standing upright. If you don't see anything happen, keep waiting. Eventually, the balloon will inflate.

Observations:

What happenend the balloon? Can you explain why?

_____

_____

_____

Why was it important that the water was heated before the experiment? Try the same experiment with warmer and colder water. What effect will this have?

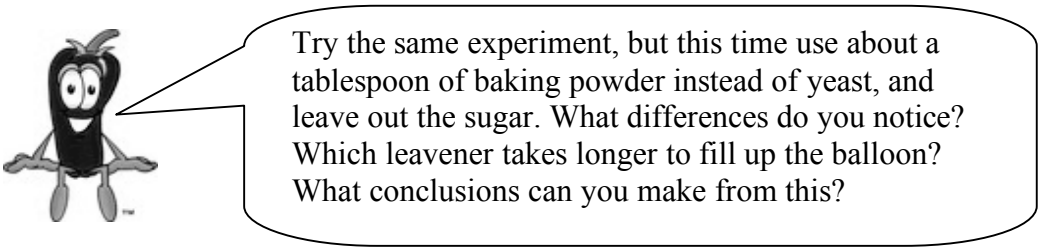


Image sourced: http://www.clipartof.com/images/thumbnail/6855.jpg

'Accomplished Cuisine' are a well established bakery company in disagreement about two issues:

A: The company are involved in baking bread, scones, tarts and biscuits. The dispute lies between the head baker who prepares the scone dough and the baker who prepares the pastry for the tarts. They cannot agree on a raising agent.
The Managing Director has sent four different raising agents to the laboratory for testing. Can you help with the investigation?

B: In the past, the baker who prepares the dough for the scones has always prepared the dough the night before and stored it in the refrigerator before baking in the oven the following day. Is this the best way to prepare and store the dough for the scones?

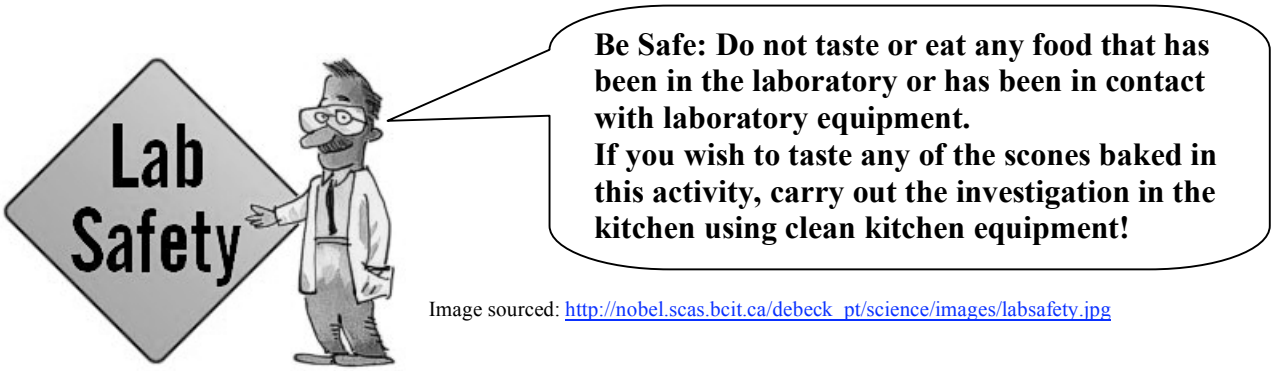


Image sourced: http://nobel.scas.bcit.ca/debeck_pt/science/images/labsafety.jpg

A: Which raising agent should we use?

Materials needed per group:

- Beaker (that can be safely heated)
- Measuring cup
- Teaspoon
- Stirring rod
- A marking pen
- Cold tap water
- Access to a hotplate or a microwave oven
- Baking Powder / Baking Soda & Cream of tartar / Baking Soda / Double Baking Powder *

* *Each group will investigate the properties of just one of these raising agents so will only need one of these.*

Method if ***using Baking Soda:***

1. Using the measuring cup, add half a cup of cold water to the beaker
2. Add one teaspoon of baking soda to this.
3. Stir the contents of the beaker with a stirring rod.
4. What happens in the beaker?
5. Record your observations.
6. When you cannot see or hear anything more happening, heat the beaker with its' contents over a hot plate or in the microwave. Careful: Do not boil!
7. Record your observations.

Observations Table:

Observation after stirring	Observation after heating
Colour: Sound: Activity: Other:	Colour: Sound: Activity: Other:

Method if ***using Baking Soda and Cream of Tartar:***

1. Using the measuring cup, add half a cup of cold water to the beaker
2. Add a half-teaspoon of baking soda.
3. Add a half-teaspoon of cream of tartar.
4. Stir the contents of the beaker with a stirring rod.
5. What happens in the beaker?
6. Record your observations.
7. When you cannot see or hear anything more happening, heat the beaker with its' contents over a hot plate or in the microwave. Careful: Do not boil!
8. Record your observations.

Observations Table:

Observation after stirring	Observation after heating
Colour: Sound: Activity: Other:	Colour: Sound: Activity: Other:

Method if ***using Baking Powder / Double Acting Baking Powder:***

1. Using the measuring cup, add half a cup of cold water to the beaker
2. Add one teaspoon of Baking powder / Double-acting Baking Powder.
3. Stir the contents of the beaker with a stirring rod.
4. What happens in the beaker?
5. Record your observations.
6. When you cannot see or hear anything more happening, heat the beaker with its' contents over a hot plate or in the microwave. Careful: Do not boil!
7. Record your observations.

Observations Table:

Observation after stirring	Observation after heating
Colour: Sound: Activity: Other:	Colour: Sound: Activity: Other:

Discuss your results with the other groups who tested a different raising agent.
Why do you think the different raising agents reacted differently?

_____

_____

_____

Which raising agent would you recommend to the M.D. as most suitable for use in making dough for scones? Why?

_____

_____

_____

How would this raising agent cause the dough for the scones to rise in the oven?

_____

_____

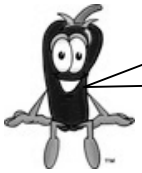
_____

Which raising agent would you recommend to the M.D. as most suitable for use in making the pastry for the tarts? Why?

_____

_____

_____



Do you know why is the pastry in a tart often pricked with a fork before it is put into the oven?

Image sourced: http://www.clipartof.com/images/thumbnail/6855.jpg

The M.D. of '*Accomplished Cuisine'* has decided to buy large batches of Baking Soda and Baking Powder. Is this a good idea?
Examine the packages for both of these. Is there an expiration date? Why?

_____

_____

_____

B: Where should the dough be stored?

Materials needed per group:

- A sample of dough made using:
  - Self-Raising Flour
  - Margarine
  - Egg and milk (beaten together)
  - Sugar
- 4 Pieces of tin foil (large enough to place the scone in)
- Ruler
- Marker
- Access to a preheated oven at 220ºC / 425ºF
- Access to small ice bath (basin filled with ice) / Fridge
- Scone cutter
- Flour
- Rolling pin

Method:

1. Using the floured rolling pin, roll out the dough to a thickness of 1cm on a floured worktop.
2. Carefully cut the dough into even sized scones using the scone cutter.
3. Place each scone on a piece of tin foil.
4. Number each of the scones by marking the foil.
5. Measure the height of each scone using the ruler. Measure the highest point of the scone
6. Record the height of each scone
7. Place each scone under a different condition:
   - No. 1: In the ice / Fridge
   - No. 2: Anywhere in the room (at room temperature)
   - No. 3: A warm place in the room (near the oven)
   - No. 4: Straight into the preheated oven on a tray.
8. After 12-15 minutes, retrieve each of your scones.
9. Measure their height using the ruler again. Measure at the highest point again.
10. Record the height of each scone.
11. Place scones no. 1, 2, 3 into the preheated oven.
12. After 12-15 minutes, record their heights again in the same manner as before.

Table of Results:

Scone No.	Height (cm) After cutting	Height (cm) After 12-15 minutes under specified condition	Height (cm) After being in the oven
1			
2			
3			
4			

From the table above, can you identify which condition caused the scones to raise the most?

_____

_____

_____

Did each of the other conditions (1,2,3) have any effect on the height of the scone?

_____

_____

_____

What conclusion can you make from this investigation to report to the Managing Director of *'Accomplished Cuisine'* about where the scone dough should be stored and whether it is best to make it the night before or freshly daily?

_____

_____

_____

_____

_____

_____

Lesson 3

Let's agree to disagree

Single Lesson

In this class, we will look at some of the recent pressing issues realted to food processing. Different groups of pupils will investigate different topics and then each issue will be debated !

The class is divided into 6 even teams of 4-5 pupils per team:

- Two teams research **Genetically Modified (G.M.) foods**.

Motion: *G.M. Foods are seriously harmful to your health*

Use the following questions to prompt your investigation:

What are they?

How are they modified?

Why are they modified?

What are the advantages and disadvantages of G.M. foods?

- Two teams research **Organic Foods**

Motion: *Everyone should buy organic food produce because it's the healthier option*

Use the following questions to prompt your investigation:

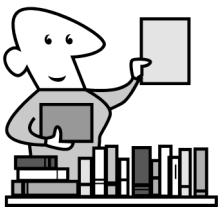
What does 'organic' food mean?

How do they differ?

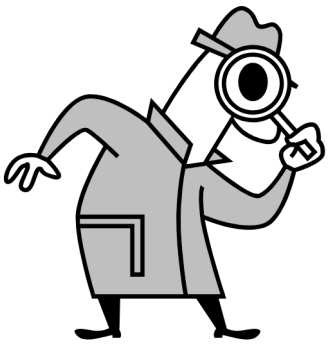
Where are they available?

Are they more expensive? Why?

What are the advantages and disadvantages of organic foods? Are they healthier?



- Two teams research **Processed Foods**



Motion: *All processed foods are harmful for young children*

Use the following questions to prompt your investigation:

What harmful ingredients may be added to processed foods?

Why are these added?

How are these harmful to young children?

Are they harmful to adults also?

Is it possible for young children to avoid processed foods?

After the research, each team is given 5 minutes to prepare their debate.

One team proposes the motion while the other opposes it.

Each team has 2 minutes to present their argument to the class! Good luck to all!

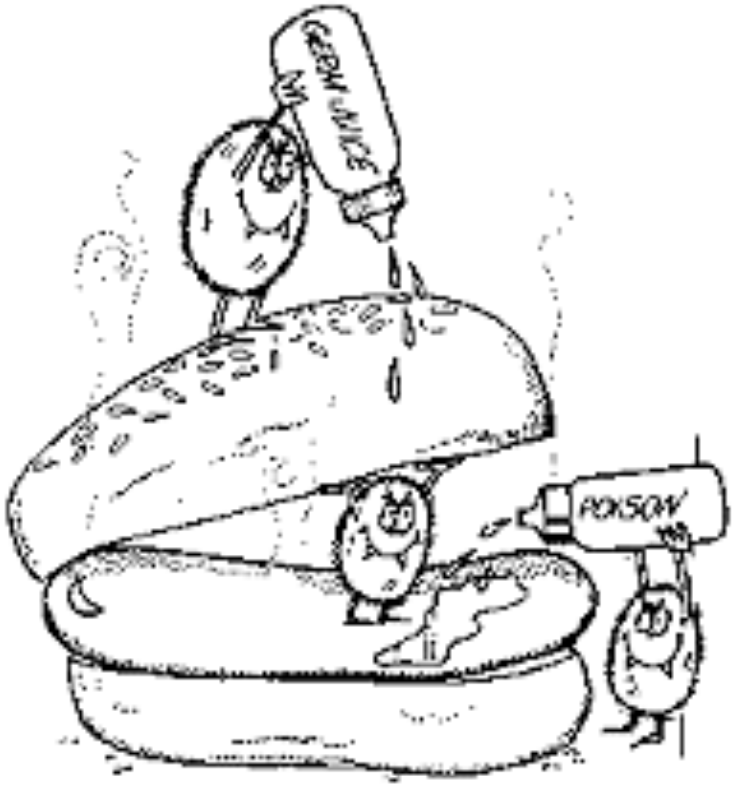


Image sourced: http://www.ccc.govt.nz/Health/images/burger.gif

Unit 5 - Food Spoilage

In this unit we will look at food spoilage. We will investigate how different types of food are preserved and why they spoil differently.
We will investigate the different methods of preserving food before they go into storage and during storage. We will see how preservation techniques have developed throughout history and also how many home preservation techniques mirror the large scale industrial methods. Through experimentation, we will learn to understand what causes the food spoilage, the dangers of it and so how to minimise it!

Lesson 1

Food Preservation

Single Lesson

Food is preserved to prevent it from spoiling. Any method of treating food that makes it last longer is known as food preservation. In this lesson we will recall some of the food preservation techniques used by our ancestors and also link what we have learned about food processing in the previous unit to help in our comprehension of some of the industiral preservation techniques used today.

In previous lessons, we have looked at different methods of food processing. Can you recall the reasons for processing food?

_____

_____

_____

_____

Many of the processes we looked at (irradation, canning etc) required industrial equipment and modern scientific technology.
So, How do you think people were able to preserve food in the past?

Image sourced: http://www.clipartof.com/images/thumbnail/6855.jpg

From your History class, or from speaking to older people can you recall any of the different preservation techniques that may hve been used?

_____

_____

_____

_____

Do you understand how these work?

Hint: They may be similar to some of the industrial food processes outlines in Unit 4.

Do you think any of these historic methods of food preservation are still used today?

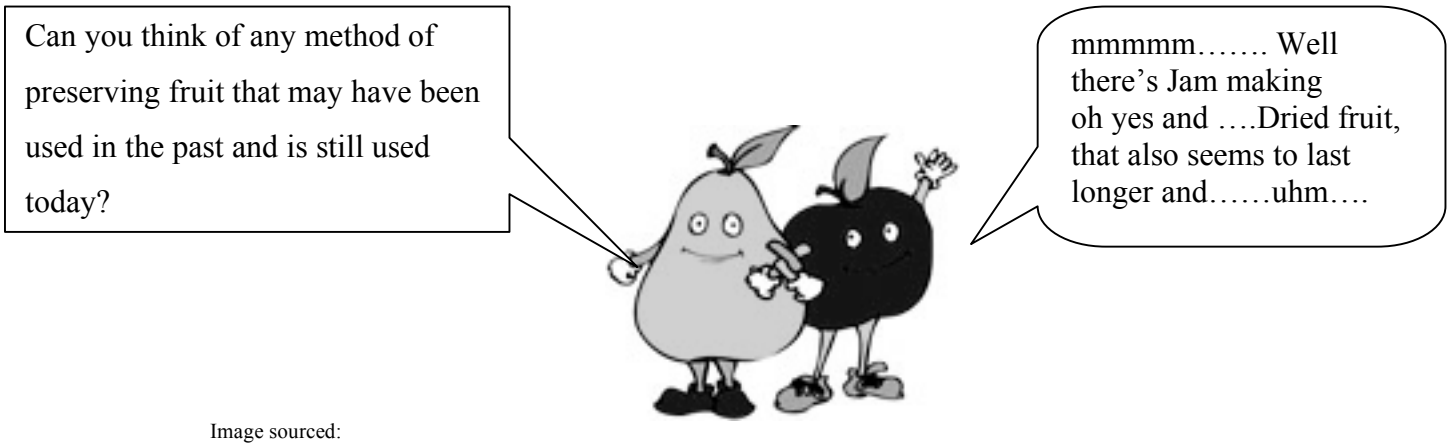


Image sourced: http://its.stgeorges.bc.ca/athletics/row/images/prgm/nutrition/nutrition_cartoon.jpg

How else can we preserve food in our homes today? Make a list of the different methods with the person sitting next to you.

Hint: Think of the basics….e.g. how do you keep your lunch fresh when carrying it into school?

Image sourced: http://www.eskimo-oils.com/ESKIMO%20CARTOON.jpeg

For hundreds of years eskimos have preserved food by freezing it. Freezing is a widely used method of preservation both commercially and at home. Food in a freezer is kept at a temperature that is too low for bacteria to grow. When water is changed to ice, the bacteria become inactive until the ice thaws.

Food may be damaged if it is frozen slowly. Can you exlplain why?

_____

_____

_____

_____

Blast freezing is carried out commercially. This method freezes food quickly to -33ºC. Small ice crystals are formed as a result and these do not damage cell walls.

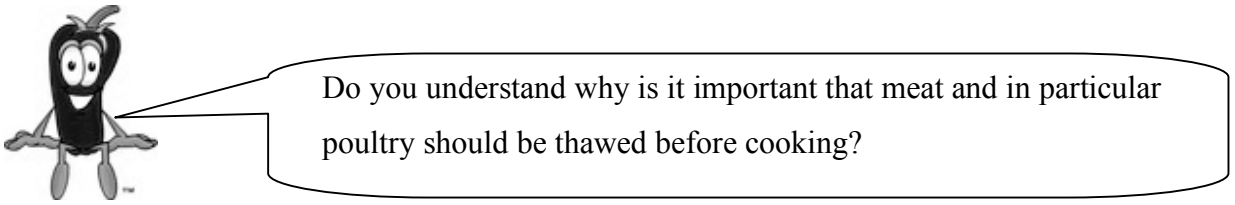


Image sourced: http://www.clipartof.com/images/thumbnail/6855.jpg

Tom recently took over his family fruit and vegetable stall from his uncle. However, Tom is careless with his orders and is having trouble gauging the correct amount of fruit and vegetables to buy each week.
This week he ordered three times too many bananas!
Where do you think is the best place for him to store them until the market opens on Friday morning?

Materials needed for each group

- One green banana
- Ruler
- Access to each of the following :
  - A brown paper bag
  - A plastic bag
  - A refrigerator
  - A cool dark press
  - A close hanger and tape

Method

1. In your group decide which storage option you think will keep the banana in the best condition for the next week.
2. Provide a rational for your choice.
3. Examine your banana. Measure the length of the banana.
4. Record the colour, firmness, size of the banana in the table.

5. Using a red biro, mark one of your initials on the banana or the storage material e.g. the bag.
6. Place your banana in your chosed place of storage.
7. When one week has passed, take your banana from its storage place.
8. Examine your banana. Describe its appearance.
9. Record the colour, firmness size of the banana in the table.
10. Has the banana changed in any way?
11. Evaluate your storage place.

Name of storage place selected:

Rationale for this choice:

_____

_____

_____

_____

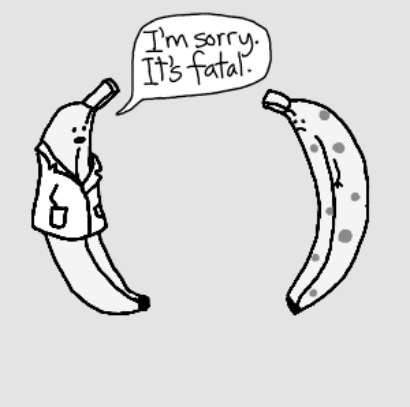


Image sourced: http://farm2.static.flickr.com/1039/528736348_115eb992ed_o.gif

Description of the banana on Day 1	**Storage place and conditions for banana for the 7 days**	**Description of the banana on Day 7**	**Evaluation of your storage place**
Colour Firmness Size Smell Other		Colour Firmness Size Smell Other	

As a class can you decide on the most suitable storage place for Tom's bananas?

It may not even be one of these options given above!

_____

_____

_____

_____

"One bad apple spoils the box"

Once again, Tom has been careless with his storage of the fruit. He has put two left over apples from last week in the box with this week's fresh apples. Will this have any effect on the condition of all of the apples?

Whole class Investigation

1. Place one ripened apple in a box with three fresh apples.
2. Mark the corner of the box where the ripened apple is. Why?
3. Place four fresh apples in another box.

Description of the ripened apple on Day 1	**Description of the ripened apple on Day 7**	**Description of the fresh apple on Day 1**	**Description of the fresh apple on Day 7**
Colour	Colour	Colour	Colour
Firmness	Firmness	Firmness	Firmness
Size	Size	Size	Size
Smell	Smell	Smell	Smell
Other	Other	Other	Other

Conclusion:

As a class, can you decide of one apple did in fact spoil the box?

Can you explain why this is so?

Could you find out how placing a bowl of fruit beside a vase of flowers would affect the flowers or the fruit? Why? How?

Do you think the ripening process have an effect on the nutritional value of fruit and vegetables?

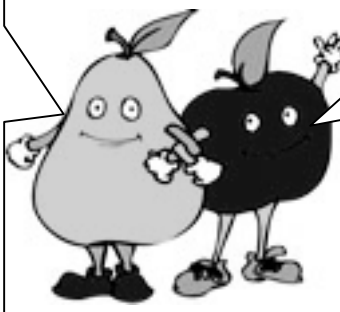
Lesson 2

Food Spoilage and how to prevent it

Double Lesson

In the last lesson, we have looked at food preservation and storage, and recognised a clear link between each of these. In this lesson, we will take a closer look at food spoilage and the conditions that cause it. This will help us to understand how the different preservation and storage methods work!

Modern science has developed many ways of preserving food. Poorer third world countries may need simpler ways to preserve and store food. What methods would you suggest?



Not sure actually….but during natural disasters like flood, drought or famine, many charities send preserved food to help the people. Why don't they send fresh food?

Image sourced: http://its.stgeorges.bc.ca/athletics/row/images/prgm/nutrition/nutrition_cartoon.jpg

This table gives a number of preservation methods for popular foods. Can you tick in the correct row for each of the foods.

Hint: There may be more than one way to preserve each food..

	Milk	**Fruit**	**Meat**	**Fish**	**Yoghurt**	**Herbs**
Freezing						
Drying						
Vacuum Packing						
Pasteurisation						
Chemical Preservatives						
Irradiations						
Biological Action						

Now let's take a closer look at the preservation techniques that we are very familiar with. What exactly do they do?

Match up these two lists:

- Chemical Preservatives	- Uses Gamma rays on food
- Irradiation	- Adds chemicals
- Freezing	- Heat Treatment
- Dehydration	- Removes air / oxygen
- Vacuum Packing	- Removes moisture
- Pasteurisation	- Removes warmth

Food should be eaten when it is in its' prime condition. Fresh food contains more essential nutrients and it also looks and tastes better.

Image sourced: http://www.clipartof.com/images/thumbnail/6855.jpg

Food can 'go bad' in two ways:

- Fruit and vegetables may be *under attack from within*. There are natural **enzymes** in fruit and vegetables. These are necessary to help the fruit and vegetables to ripen. E.g. to convert the starch to sugar in fruit.
  However, these enzymes continue to work after the fruit has ripens, so if the fruit or vegetables are not eaten, they will become over-ripe!
  This leads to bruising and softness e.g. a black banana.
  Do you think the action of enzymes has an effect on the nutritional value of the fruit or vegetable?

Image sourced: http://home.pacific.net.hk/~ppleung/Chem/70a.jpg

- Food is also *under attack from the outside.* **Micro-organisms** are tiny plants or animals which live on food and leave which are sometimes poisonous or toxic. This is why it is harmful to eat spoiled food!
  There are three main types of micro-organisms:
  - Moulds
  - Yeasts
  - Bacteria

Describe the appearance of different spoiled foods that you have seen in the past, and can you identify the type of spoilage?

Type of food	Description of the spoilage	Type of spoilage
E.g. Banana	The skin had turned black, the banana felt softer, the inside had blackened a bit also. It smelt different than a fresh banana.	Enzymatic spoilage from within.

So,now can you make the link between what causes food spoilage and the methods of food preservation that we have learned about?

Image sourced: http://www.clipartof.com/images/thumbnail/6855.jpg

Most food preservation techniques eliminate one or more of the conditions that favour the growth of bacteria.
Bacteria are like humans, they need food, warmth, moisture and time to grow and reproduce.

Do you know what type of food bacteria like most?

_____

_____

_____

What temperature accommodates bacterial growth?

_____

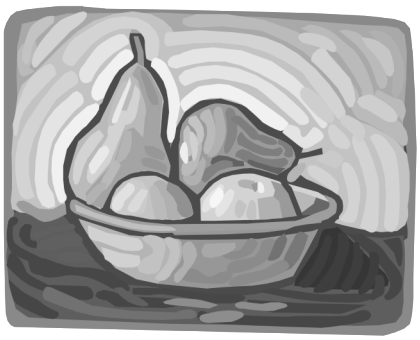
What temperature slows it down?

_____

What temperature is needed to kill bacteria?

_____

In Unit 4 (see page 69 of the Student Handout) you investigated how different conditions affected the growth of yeast in baking. Can you relate this to the different conditions that affect the growth of micro-organisms?



Juice 'V' Jelly

Most enzymes are proteins that function as catalysts for chemical reactions in living systems. Like all catalysts, enzymes increase the rate of a reaction. Without an enzymatic catalyst, many important chemical reactions in living systems would not be completed within days or even years, and most organisms—including people—could not survive. One type of enzyme is a protease. Proteases catalyze reactions that break down (or cut apart) certain protein molecules. Some fruits contain proteases; for example, pineapple, kiwi, and figs contain the proteases bromelain, actinidin, and ficin, respectively. Since gelatin contains a network of protein molecules, the preparation of a gelatin offers the opportunity to observe the action of a protease. Will fruit containing a protease break down the gelatin to form something more like fruit juice than jelly? Can anything be done to the fruit to denature (or disrupt) the protease so that it no longer functions?

Materials needed per group

- Package of any brand of flavoured or unflavoured gelatine
- Water
- Mixing bowl
- Spoon
- Measuring cup
- Toothpicks
- Marker
- 4 small cups
- 2 cubes of fresh pineapple
- Cube of canned pineapple
- Cube of frozen (fresh) pineapple
- Access to a microwave oven, and refrigerator.

Method

1. Using the marker, mark the cups numbers 1-5
2. Using the mixing bowl, spoon and water, prepare the gelatine according to the directions on the packet.
3. Divide the gelatine equally into the five cups. Place the cups into the refrigerator to allow them to set.

4. Microwave one of the fresh cubes of pineapple at high power for one minute. Allow it to return to room temperature.
5. Remove the cups from the refrigerator after the gelatin has set.
6. You can test to see if it has set by poking the surface with a toothpick.
7. Place the following on the surface of the gelatin in each of the cups:
   Cup 1: add nothing
   Cup 2: a piece (about 1-inch cube) of fresh pineapple
   Cup 3: a chunk of canned pineapple
   Cup 4: the piece of pineapple micro-waved in step 4
   Cup 5: the piece of frozen pineapple
8. Examine the cups every five minutes. Push each piece of pineapple aside with a toothpick to observe its effect on the gelatine, and then return the piece to its original position.
9. Record your observations.
10. After 15 minutes (three sets of observations), return the cups to the refrigerator.
11. Make a final observation an hour or two later, or the next day.

Cup no:	Observation after 5 minutes	Observation after 10 minutes	Observation after 15 minutes	Observation after 1-2 hours or longer
1				
2				
3				
4				
5				

After your final observation, did the gelatine remain like jelly of did it look more like juice?

Cup 1:

Cup 2:

Cup 3:

Cup 4:

Cup 5:

Can you explain each of these results? Were the enzymes active in all of the pineapple samples? Why?

_____

_____

_____

_____

Why was there one cup in the experiment that had no pineapple added to it?
Was it really necessary?

_____

_____

_____

_____

All of the pineapple used in this investigation had been canned or was fresh and stored appropriately. Can food decay even when stored under appropriate conditions?

_____

_____

Lesson 3

Polar Pathogenic Perspectives

Single Lesson

Read the two articles below.

"Maker of the Miracle Mould" sourced at:
http://www.abc.net.au/science/slab/florey/story.htm

"Maker of the Miracle Mould"

The story of penicillin - the first antibiotic used successfully to treat people with serious infectious diseases - begins with a bit of luck. Alexander Fleming, a British scientist, noticed in 1928 that mould had prevented the growth of bacteria in his lab. But the main plot of the story involves the rediscovery of penicillin 10 years later by an Australian scientist born one hundred years ago this year. Howard Florey and his dedicated team's systematic, detailed work transformed penicillin from an interesting observation into a lifesaver.

Breaking the Mould

Florey gathered a team of scientists at Oxford University in Britain in the 1930s, when working together on scientific discoveries, as a group was not at all common. Nowadays scientists work together all the time, but Florey realised that science had reached a point where a team of specialists was needed - the job was too big for one person.

His team commenced a careful investigation of the properties of anti-bacterial substances that are produced by mould. One member of the team, Ernst Chain, found an article about Alexander Fleming's work while flicking through a medical journal, and this prompted them to begin looking at penicillin.

In May 1940 they performed one of the most important medical experiments in history. The work was so urgent that they came in to begin the experiment on the weekend, and on Saturday 25 May, Flores's team tested penicillin on eight mice injected with a lethal dose of streptococci bacteria. Four of the mice were treated with penicillin, while four were used as controls. By the next day, the treated mice had recovered and the untreated mice were dead. In the early days of World War II, the lives of eight mice may seem insignificant. But

their rescue by penicillin led to the treatment of Allied soldiers as early as D-Day, in June 1944, and probably influenced the outcome of the war.

The First Patient

The results were so exciting Florey knew that it was time to test the drug on humans. A rose thorn had scratched the first patient in 1941. Albert Alexander's whole face, eyes and scalp had swollen. He had already had an eye removed and abscesses drained; even his remaining eye had to be lanced to relieve the pain of the swelling. He was given penicillin, and within a day he began to recover. But Florey's team didn't have enough of the drug to see the patient through to a full recovery. Their efforts to recycle the penicillin by extracting it from his urine failed, and he unfortunately had a re-lapse and died. Because of the awful experience, the team then concentrated their efforts on sick children, who did not require such large quantities.

In 1943 Florey travelled to North Africa to test the effects of penicillin on wounded soldiers. His trials were seen as a miracle. Instead of amputating wounded limbs or simply leave them to heal, he suggested soldiers' wounds be cleaned and sewn up, and that the patients then be given penicillin. Thanks to Florey and his team, the drug was available to treat Allied troops by the end of World War II. It has since revolutionised medical science, saving millions of lives.

Fabulous Fungus

Penicillin was the first naturally occurring antibiotic discovered (Prontosil, the first chemical used to cure certain infectious diseases, had been discovered in 1933 but had serious side effects). There are now more than 60 antibiotics, which are substances that fight bacteria, fungi and other microbes harmful to humans - the word means against (anti) life (bio).

An antibiotic is a drug produced by microbes. Penicillin is obtained in a number of forms from Penicillium moulds. Penicillin G is the most widely used form, and is the one that killed bacteria during Duchesne's work in 1896, Fleming's work in 1928 and Florey's work in 1939.

"The Dangers of Food Bacteria"

Food borne illnesses are very common and are apparent through a wide range of symptoms that can be as simple as an upset stomach but can be more serious as dehydration, vomiting, diarrhea, fever, and abdominal cramps. While most food borne illnesses go undiagnosed, it is believed that almost 76 million people in the United States suffer every year, out of which 5,000 people die. Harmful food bacteria present in food and beverages are mainly responsible for food borne illnesses.

Bacteria may be already present in the food you purchase or may develop later, if not stored properly. Raw or undercooked meat and poultry may contain Campylobacter jejuni, E. coli O157:H7, L. monocytogenes, and/or Salmonella and if consumed may cause diarrhea, nausea, abdominal pain, and vomiting. Similar conditions are caused when you consume unpasteurized milk and dairy products that are a rich source of bacteria like L. monocytogenes, Staphylococcus aureus, C. jejuni, Salmonella, and. Shigella. We use raw eggs in number of home cooked preparations such as salad dressings, mayonnaise, frostings, sauce, and ice creams.

Not many people know that one in 10,000 eggs may have Salmonella inside the eggshell, which is known to cause food borne illnesses. Raw and undercooked shellfish is known to cause fever, collapse, and chills if it's contaminated with bacteria like Vibrio vulnificus and Vibrio parahaemolyticus. C. botulinum present in improperly canned products may cause serious conditions, such as difficulty to swallow or speak, breathing difficulties, and double vision. Such conditions need immediate medical attention and should not be ignored. Contaminated water is a reservoir of bacteria that include L. monocytogenes, E. coli O157:H7, Salmonella, Yersinia enterocolitica, and Shigella, along with parasites and viruses.

While it may not be possible to refrain from using all these items, a little caution may help you fight the health hazards of food bacteria. Bacteria multiply rapidly if food is stored between 40°F and 140°F, and you must therefore refrigerate cooked food immediately. Proper cooking and processing is crucial to ensure that you and your family are saved from illnesses caused by food bacteria.

It is also important to avoid cross contamination by ensuring that bacteria is not allowed to spread from one food item to another through knives, countertops, sponges, or cutting boards. Hygiene is of utmost importance in the kitchen so make sure that you wash your hands with warm, soapy water before you start cooking. Ideally, you must avoid marinating food at room temperature to rule out the chances of bacteria formation.

The safest way is to refrigerate it while marinating. Unpackaged fruits and vegetables must be consumed only after washing them thoroughly under running water.

Currently, a lot of care is being taken and stringent hygiene standards are followed to ensure that consumers get high quality food products. For this purpose, a process called "food irradiation" is followed as a means of cold pasteurization by using high energy rays such as gamma rays or electronic beams. The process is successfully used to kill living bacteria and thus put a check on food borne illnesses.

Having read these two articles, can you make a list including more of the advantages and disadvantages of micro-organisms and enzymes?

Advantages	**Disadvantages**

Image sourced: http://www.exploratorium.edu/cooking/icooks/images/Turkey_cooking_c.gif

Unit 6- Science of Cooking

In this unit, we will move to the kitchen as we take a closer look at the science of food.
We will begin by investigating the different methods of food preparation and the effects of these on the nutritional value, the appearance and taste of the food.
The different methods of cooking food and their effects will be dicscussed and observed through experimental investigation. We will discuss why some of these different methods are used.
We will also learn about and research different food bourne illnesses and the dangers of these.

Lesson 1

Safe Food Preparation

Single Lesson

In previous lessons, we have looked at food processing , food preservation techniques and food storage, can you recognise how these three are related to each other?

Hint: Does the way in which food is processed and preserved affect how it is stored?

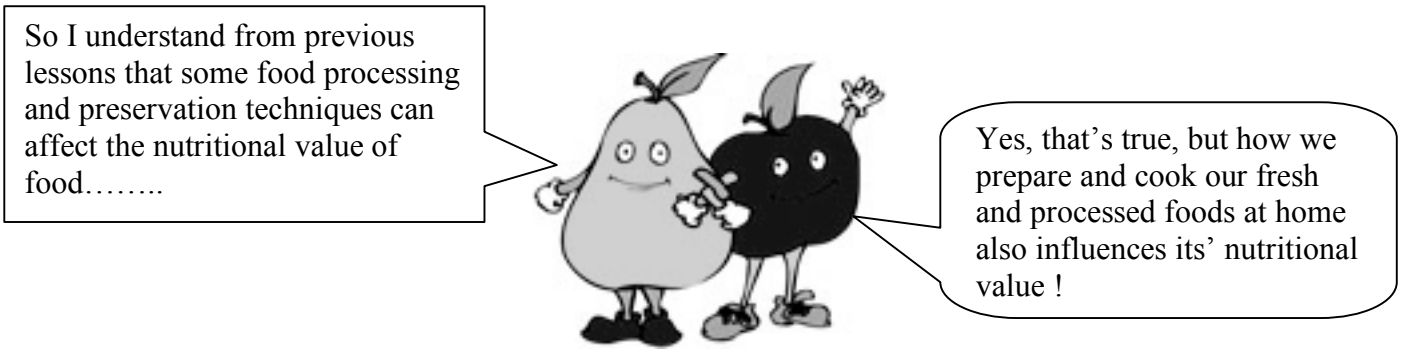


Image sourced: http://its.stgeorges.bc.ca/athletics/row/images/prgm/nutrition/nutrition_cartoon.jpg

Is it *always* necessary to prepare food before cooking? Explain.

In what ways is food prepared before it is cooked? Give examples using different food types?

Working with the person beside you, how many different ways to preapre food can you think of?

Can you outline the advantages and disadvantages of each of these?

Methods of Preparation	Advantages	Disadvantages
E.g. Blanching	*Improves colour of vegetables*	*Loss of vitamins*

If you can recall….. Food is processed, preserved and stored in a specific manner to help protect it from micro-organisms….. so is there any futher precautions that need to be taken when it comes to when preparing food in the kitchen?

Image sourced: http://www.clipartof.com/images/thumbnail/6855.jpg

Is it always safe to reheat food? Why?

_____

_____

_____

'Bacteria are like hitch-hikers'

Can you explain what is meant by this statement?

_____

_____

_____

_____

What risks does "cross – comtamination" pose?

How can it happen? Can you give an example?

_____

_____

_____

_____

How can we prevent such risks in the kitchen?

In groups of three, design a poster for the Home Economics Room, to ensure all pupils use safe food preparation techniques.

Clearly list your guidelines.

Refer HACCP or Bord Bia Guidelines in your research.

What type of pictures could you include?

Helpful Hint: Some of the Lab Safety guidelines may be used….can you recall these?

Lesson 2

How Cooking changes food

Double Lesson

In this lesson, we look at different methods of cooking. We will investigate if we are using the correct cooking methods and consider why some methods are used more than others. We will then investigate the effect of heat on food and the different changes and effects that it has on different types of food.

From your experience of Junior Certificate Home Economics and in your kitchen at home, how many different methods of cooking can you think of?
Can you describe how each of these cause changes to occur in the food?

Cooking method	Description	Suitable Foods	Equipment
E.g. Boiling	*Cooking food in rapidly boiling liquid, often water.*	*Pasta, rice, joints of meat, some vegetables.*	*Saucepan with a lid. (The lid speeds up the process, how?)*

It can be seen from your previous exercise that various methods can be used to cook food…
But why do you think some methods are used more than others? What factors influence our choice of cooking method?

Factors influencing our choice of cooking method:

- *Equipment available*
-
-
-
-
-
-
-
-

What changes occur in food as a result of cooking?

_____

_____

_____

Here is a list of foods. Can you describe the effect of heat on each of these?

Food	**Effect of heat and cooking**
E.g. cheese	*Melts and may become brown, becomes more difficult to digest.*
Milk	
Meat	
Pasta	
Soup	
Fish	

When foods are cooked using the most appropriate method, their appearance is often improved. For instance, cooked lamb chops smell and look much more appetising than red raw meat! Cooking food can often make the food more digestable. E.g. Raw potatoes would be very difficult to digest.
During the cooking processed many bacteria and micro-organisms are also killed, this makes food safer. A boiled egg is much safer than a raw egg that may contain samonella!

Have you ever burned your finger? What did you notice happened to your skin?
Do you think that over cooking food can damage the food cells? How will this affect the nutritional value of the food?

_____

_____

_____

Some cooking methods destroy much of the nutritional value of the food e.g. boiling vegetables leads to a loss of the vitamins. However, in this case, these lost nutrients can be regained by using the water the vegetables were boiled in to make a sauce or using broth to make a soup or gravy.

What makes the popcorn 'pop' ?
So, we have all made pop-corn in the micro-wave before…. a child could!
However, have you ever considered what actualy makes the popcorn 'pop'?
Let's investigate the science behind the kernel of corn and what causes it to 'pop'.

Be Safe! When popcorn is heated in a microwave oven, the bag and its contents get very hot. Use caution when handling the bag. Heating popcorn too long in a microwave oven can cause the popcorn and/or the bag to burn.
Wear gloves and goggles when handling the povidone–iodine solution.

Image sourced: http://nobel.scas.bcit.ca/debeck_pt/science/images/labsafety.jpg

Teacher's Demonstration

1. Remove the plastic over-wrap from the bag of microwave popcorn. What purpose might the over-wrap serve?

_____

_____

_____

2. Examine the adhesives that seal the top and bottom of the bag. Record your observations.

_____

_____

_____

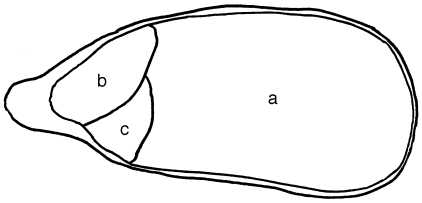
3. Tear or cut open the top of the bag. Pour the bag contents into a small container. Record your observations of the contents.

_____

_____

_____

Below is a diagram of a popcorn kernel as found in the bag before it is popped?



Features enclosed by the per carp: a. hard (vitreous) endosperm, b. germ, c. soft (floury) endosperm.

Microwave heating is the result of the friction created as polar molecules, such as water molecules inside an un-popped kernel of popcorn, oscillate at the microwave frequency. When a kernel bursts in response to the vapor pressure of superheated water, the hot gelatinous starch inside the kernel first expands and then cools to form a solid foam as water evaporates.

Now, you will investigate microwave popcorn, including its packaging, the behavior of popcorn flakes, and the popping process itself.

Materials needed per group

- One bag of 'high fat' micro-wave popcorn
- Scissors
- Small container
- Toothpicks
- Large bowl
- Hot water
- Access to a balance and a micro-wave oven

Method

1. Examine the inner and outer surfaces of the bag. Locate the "This Side Up" and "Open This End" instructions on the outside of the bag and a dark rectangle (the suspector) on the inside of the bag. The susceptor is vacuum-deposited aluminum on a polyester film.
2. Using the balance, record the weight of the bag of un-popped kernels.
3. Using a microwave oven, pop the unopened bag of microwave popcorn according to the package instructions.
4. Carefully touch the susceptor; what do you notice about its temperature?
5. Examine the adhesives that seal the top and bottom of the bag. What do you notice?
6. Using the balance, record the weight of the bag of popped kernels.
7. Pour the contents into a large bowl. Record your observations.
8. Fill the clear cup with hot water. Add about 10 popcorn flakes to the cup, one at a time, to the water.
9. Listen! Look! Mix the water and flakes with a toothpick. Record your observations.
10. Can you recall from a previous unit, what the test for starch is?
11. While wearing gloves and goggles, add a few drops of iodine solution to the flake/water mixture. Stir the mixture with a toothpick and allow it to stand for a few minutes.
12. Record your observations. What does this tell you?
13. Transfer the flakes to a plastic bag before disposing. Pour the remaining liquid into a sink for disposal.

What purpose do you think the susceptor serves?

Table of Observations:

Description of un-popped kernels as shown by the teacher	
Description of popped kernels	
Description and explanation of what happened when the flakes of popcorn were added to the hot water.	
Description and explanation of any colour change that happened in the cup of water after the iodine was added	

Table of results:

Weight of unpopped kernels in bag	
Weight of popped kernels in bag	
Mass of water that was lost in cooking	

$$\% \text{ water} = \frac{\text{mass of water}}{\text{mass of unpopped kernels}} \times \frac{100}{1}$$

Does your answer deviate much from the % of water stated on the packet?

Can you explain why?

_____

_____

_____

Minimising Bacteria in the thawing and cooking of meat:

The purpose of this project is to determine which method of defrosting meat is safest and which method of cooking kills the most bacteria.

Which is the safer way to thaw frozen meat: at room temperature or in the refrigerator? For cooking meat safely, is a microwave as good as a conventional oven?

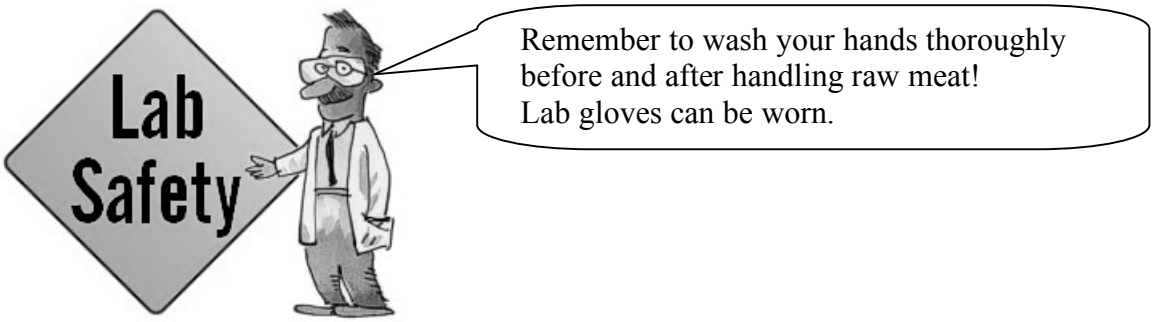


Image sourced: http://nobel.scas.bcit.ca/debeck_pt/science/images/labsafety.jpg

Materials needed per group:

- 10 ml graduated cylinder
- Droppers
- 10 sterile, disposable 10 ml pipettes
- Access to a digital scale (grams)
- Sterile, disposable 15 ml test tubes
- 4 L sterile water
- Styrofoam chest
- 2 thermometers
- Blender
- 40 tryptic-soy agar plates
- Bent glass rod for spreading bacteria on plates
- Bunsen burner
- Ethanol
- Aluminum foil
- Plastic wrap
- Access to a microwave oven
- Access to an oven
- Stereo microscope
- 2 lbs. boneless, skinless meat (e.g., beef, chicken, or pork).

Method:

Your teacher may have prepared the frozen meat before hand or in a previous lesson:

1. Cut, measure, and weigh 14 pieces of meat (approx. 5 cm × 5 cm × 2 cm, about 65 g each).
2. Set aside two pieces of meat for a baseline bacterial count.
3. Divide remaining meat pieces into two piles, wrap each in plastic wrap & foil, and freeze (up to 14 days).

Test 1 - Thawing Meat at Room Temperature vs. In Refrigerator:

1. Thaw one package of meat pieces at room temperature until the internal temperature of meat the reaches room temperature. Record how long this takes and the room temperature in your lab notebook.
2. Thaw the other package of meat pieces in the refrigerator until soft. Record how long this takes and the temperature in your lab notebook.
3. Measure bacterial count for two samples from each condition.

Test 2 - Cooking Meat in Microwave

1. Take two samples of meat thawed at room temperature and two samples thawed in the refrigerator and cook in microwave until the internal temperature of the meat reaches the recommended temperature: beef, 72°C; pork, 77°C; chicken, 85°C
2. Measure bacterial counts of cooked meat samples.

Test 3 - Cooking Meat in Standard Oven

1. Take two samples of meat thawed at room temperature and two samples thawed in the refrigerator and cook using a standard oven heated to 190°C (375°F). Recommended cooking times are: beef, 20 min.; pork, 17 min.; chicken, 15 min.
2. Measure bacterial counts of cooked meat samples.

Measuring Number of Bacteria Present in a Meat Sample

1. Puree a piece of meat in sterilized blender with a small amount of sterile water (use the same amount of water each time). Note: to sterilize the blender, clean the jar and blade assembly with warm, soapy water and allow to dry. Wrap the blender jar and blade assembly only (*not* the base with the electric motor) in aluminum foil, and heat in an oven at 250°F for 30 minutes. Use oven mitts when removing it from the oven. Unwrap the foil just before use.
2. Do 10-fold serial dilutions (9–11 times) and then plate a 100 µl sample. You will have to determine how many times to dilute. We suggest plating 100 ul of solution from each of the last three dilutions (on three separate plates) to see which dilution works best for counting colonies.

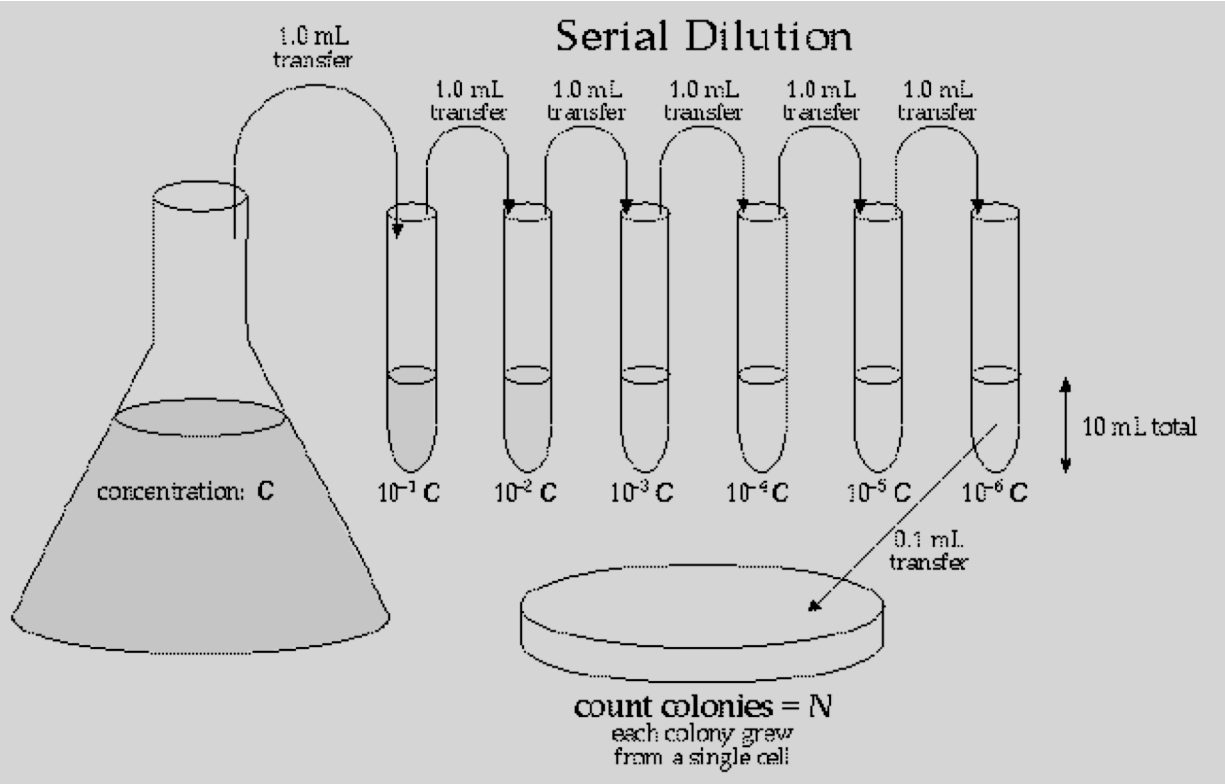


Image sourced: http://www.sciencebuddies.org/science-fair-projects/project_ideas/MicroBio_p015.shtml?from=Home

3. Incubate the plates at 37°C, overnight or longer. Once you have determined the procedure (serial dilution and incubation time) that works best, stick with it for all of your counts.
4. Divide plate into 4 quadrants, and use the stereo microscope to count colonies in one quadrant. Multiply count by 4 to get total CFU/100 µL for the diluted sample. Then multiply by the total dilution factor to get CFU for each piece of pureed meat. You can then divide by the original weight of the meat to get CFU/g of meat.

Why are the samples diluted so many times before plating them on agar?

_____

_____

_____

What are some potential sources for error in the bacterial counts in this experiment?

_____

_____

_____

What can you do to minimize those sources of error?

_____

_____

_____

What can you do to estimate the size of the error in the bacterial counts?

_____

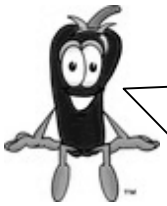
_____

_____

Lesson 3

Why heat what we eat?

Single Lesson



Did you know that there are eighty million species on earth (about 700,000 of which are animals) that thrive on raw food? Only humans apply heat to what they eat!

Humans on average as a race, die at or below half their potential life span of chronic illness that is largely diet and lifestyle related. Domesticated pets also are fed cooked, processed, packaged food that likewise is denatured by heat. As a consequence, they suffer human-like chronic ailments including cancer, arthritis and other degenerative diseases.

Image sourced: http://www.clipartof.com/images/thumbnail/6855.jpg

When food is cooked above 117 ºF for three minutes or longer, the following deleterious changes begin, and progressively cause increased nutritional damage as higher temperatures are applied over prolonged periods of time:

- Proteins coagulate- high temperatures denature protein molecular structure, leading to deficiency of some essential amino acids.
- Carbohydrates caramelize.
- Overly heated fats generate numerous carcinogens including acrolein, nitrosamines, hydrocarbons, and benzopyrene (one of the most potent cancer-causing agents known).
- Natural fibers break down, cellulose is completely changed from its natural condition: it loses its ability to sweep the alimentary canal clean.
- 30% to 50% of vitamins and minerals are destroyed.
- 100% of enzymes are damaged - the body's enzyme potential is depleted which drains energy needed to maintain and repair tissue and organ systems, thereby shortening our lifespan.
- Pesticides are restructured into even more toxic compounds.
- Valuable oxygen is lost - free radicals are produced.
- Cooked food pathogens enervate the immune system.
- Cooking causes inorganic mineral elements to enter the blood and circulate through the system, which settle in the arteries and veins, causing arteries to lose

their pliability. The body prematurely ages as this inorganic matter is deposited in various joints or accumulates within internal organs, including the heart valves.

Comparing Cooked and Raw liver:

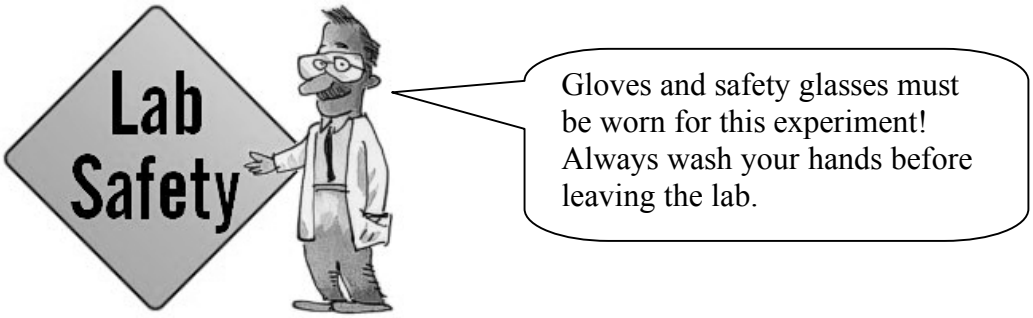


Image sourced: http://nobel.scas.bcit.ca/debeck_pt/science/images/labsafety.jpg

Materials needed per group:

- Raw Liver sample
- Cooked liver sample
- Hydrogen Peroxide
- Washing Up liquid
- Large Graduated Cylinder
- Small Graduated Cyliner
- Basin / sink

Method:

1. Place one of the liver samples in the bottom of the Large graduated cylinder.
2. Using the graduated cylinder add 10-20ml of washing up liquid to the large cylinder.
3. Place this large graduated cylinder into a basin or sink.
4. Use the small graduated cylinder to measure 20ml of Hydrogen Peroxide. Add this the large graduated cylinder.
5. Observe and record what happens.
6. Rinse out the graduated cylinders.
7. Repeat the same procedure with the other liver sample.

Results:

Observations with Raw Liver Sample	Observations with Cooked Liver Sample

How can you explain what happened when the Hydrogen Peroxide was added to both samples of liver?

How can this illustration be used to explain what happens when meat is cooked?

_____

_____

_____

How can we see heat changing food?

Cooking denatures protein. "Denature" means to change the structure of the protein. This change that takes place due to heat is irreversible.

Looking at the nutritional value on the milk carton, how much protein does milk contain?

_____

Classroom Demonstration:

Materials needed

- Saucepan
- Milk
- Toothpick
- Spoon
- Access to a hot-plate

Method:

1. Pour the milk into the saucepan.
2. Notice the level of the milk in the saucepan. (mark the level with a spoon)
3. Sit the saucepan on the heat.
4. Do *not* stir!
5. After heating allow the milk to sit.

Observations:

What did you notice as the milk began to heat ? Did the volume of milk appear to increase or decrease?

_____

_____

_____

What did you notice about the surface of the milk as it heated?

What happened when you stirred the toothpick in the rested heated milk?

_____

_____

_____

Repeat the same investigation, but this time, *stir the milk* constantly as it is heated.
What did you notice about the surface of the milk as it heated?

What happened when you stirred the toothpick in the rested heated milk?

_____

_____

_____

Food for Thought….

Working with the person beside you, can you plan a menu including three meals for one day (breakfast, lunch and dinner) made up of raw / uncooked foods.

Try to make the meals appetising. Would you eat them yourself?

Also consider the nutritional value of the foods. Will you need to refer to the Food Pyramid for guidance.

Image Sourced: www.questacon.edu.au

Unit 7 - Mmm… Tasty

In previous units, we have examined food from its' source to processing and packaging, to it's cooking and preparation. In this unit, we have brought the food closer to the table.

We will explore the sense of taste and the science behind what makes your mouth water with the thought of your favourite food. We will also investigate why that same food may cause someone else to gag! Other interesting questions will also be answered such as "how can the smell of a food make you hungry?"

Lesson 1

Tasting the Difference

Single Lesson

In this first lesson, we will begin by understanding the importance of taste in our lives. Have you ever imagined how it would be if all food tasted the same? What influences the taste of food? Why do some people add vinegar to their chips while others don't?

We will also investigate how accurate your tastebuds actually are in a triangle sensory test?

Have a quick discussion with the person sitting beside you about your favourite foods.
Do you both like the same types of food?

Image sourced: http://www.clipartof.com/images/thumbnail/6855.jpg

Can you recall which level of the Food Pyramid this food would be found on?

What is your favourite food?

_____

_____

_____

How would you describe the taste of this food?

E.g. Is it a savoury food? Is is sweet, sour, crunchy, chewy, juicy ?..... etc.

_____

_____

_____

What effect does cooking have on the taste of food?

Hint: Think of one particular food to use as an example. Does its' flavour or texture change?

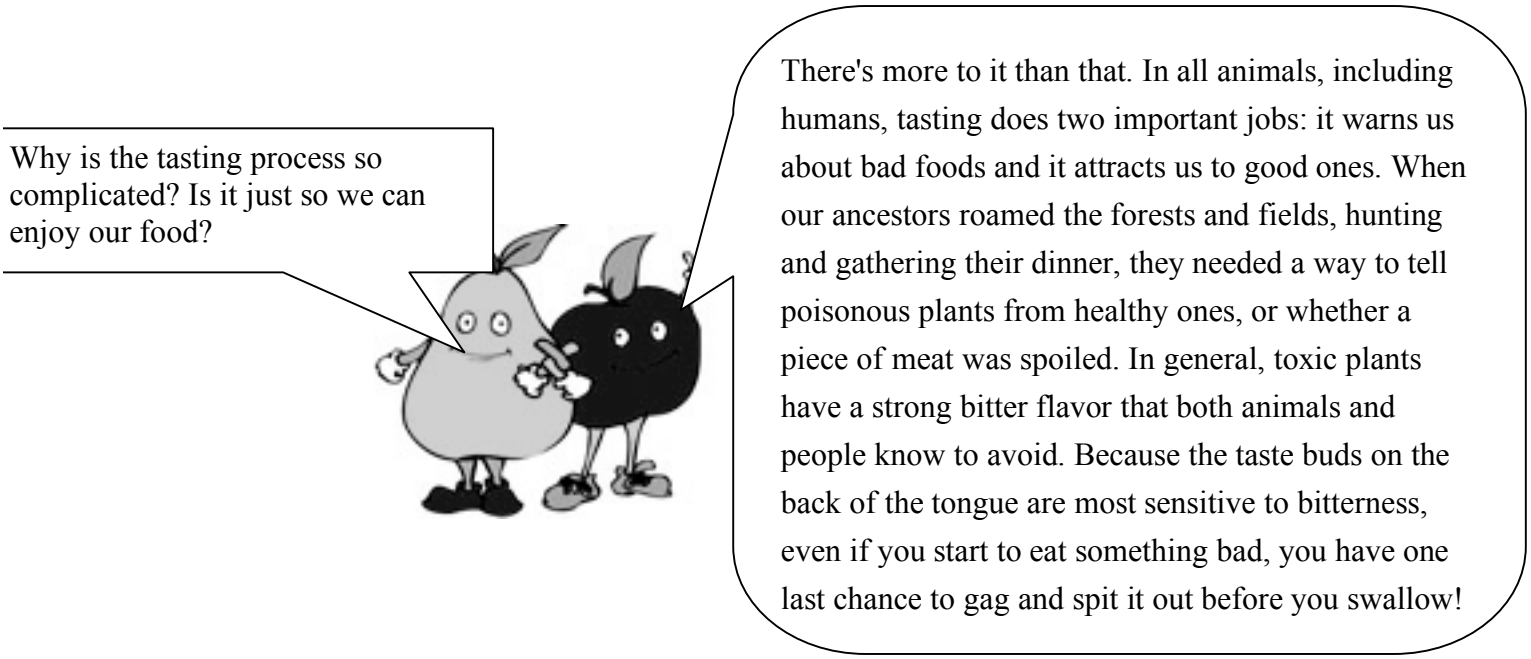


Image sourced: http://its.stgeorges.bc.ca/athletics/row/images/prgm/nutrition/nutrition_cartoon.jpg

Two of the conveyor belts on the production line in the biscuit factory were out of order. However, the technician linked up the belts wrong after solving the stoppage. This has resulted in a lot of confusion! The low-fat biscuit range has now been mixed up with the regular biscuits. Unfortunately, both biscuits look exactly the same.

Image sourced: http://69.90.174.249/photos/display_pic_with_logo/54535/54535,1171206520,2.jpg

Can you help the Production Manager to identify the different biscuits?

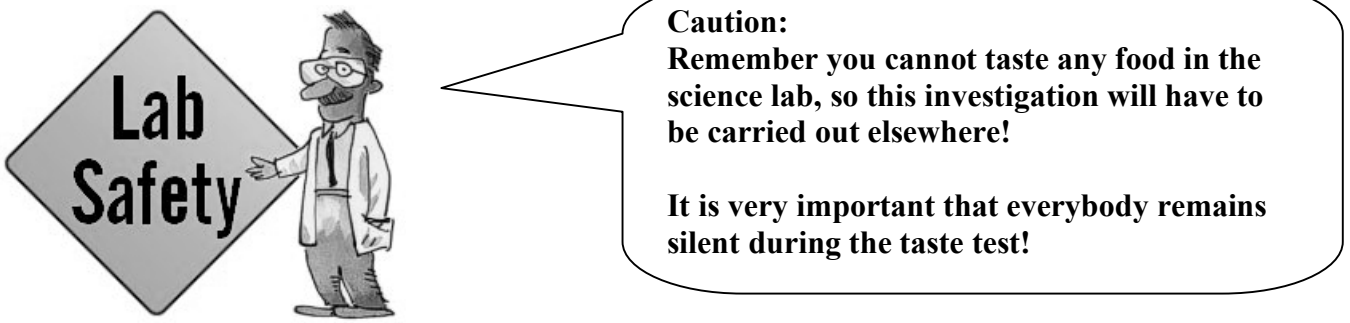


Image sourced: http://nobel.scas.bcit.ca/debeck_pt/science/images/labsafety.jpg

Material needed per pupil:

- Cup of water
- Sensory Ballet
- A biro
- A cracker
- Three numbered anonymous biscuits (A combination of low-fat and regular biscuits)

Method:

Follow the instructions on the sensory card

Triangle Sensory Test on Biscuits

Please take a drink of water before and after tasting each biscuit sample.

Note the biscuit identification numbers in the spaces below.

Place an "x" under the biscuit that you think is different form the other two:

Biscuit no. : _____ _____ _____

Why was it important to take a drink of water between each tasting?

_____

_____

_____

What sort of sensory difference did you recognise between the two samples?

Explain.

_____

_____

_____

Compare your results with the rest of the class.

Did everyone recognise the same pairs of biscuits within the three samples that they were given?

_____

_____

_____

When your teacher reveals the identification of the regular and low-fat biscuits, compare this with your decision after tasting.
Was your judegment accurate and correct? Why?

_____

_____

_____

_____

_____

_____

Do you think the manufacturing company would find these results interesting or useful? Why?

_____

_____

_____

_____

_____

_____

Take Home Activity:
Investigate abnormalities or diseases of the human taste system. Try finding these words: hypogeusia, ageusia. Can you imagine not being able to taste? How would this affect your decisions about what you eat?

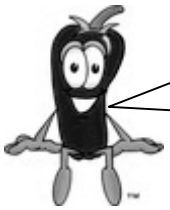
Lesson 2

Can you taste with just your mouth?

Double Lesson

One lick of your tongue and you know if it's yucky or good. How does this little muscle in your mouth give you so much information? The surface of your tongue is covered with thousands of tiny bumps. In this lesson, we will learn more about these little bumps and how they actually work. Taste buds can detect four basic kinds of taste: sweet, sour, salty, and bitter. When you take a bite of food, the food spreads over you tongue. Taste buds detect chemicals in the food and send signals to your brain. In this lesson, you will be involved in an investigation to recognize how many of our senses are actually used when we 'taste' food!

Image sourced: www.kidcyber.com.au



Can you recall the last time you had a cold? Did you feel as though your nose was blocked and you could not breath through it?
Did you find that you could not taste what you were drinking or eating as well as normal?
This is because most of what we actually taste is being sensed by our **olfactory system**.

Image sourced: http://www.clipartof.com/images/thumbnail/6855.jpg

How many different senses have humans? Can you name these? What is the function of each?

_____

_____

_____

_____

So…anyway what is this "Olfactory" system?

Well…the word olfaction is actually based on the Latin word olfacere, which means to smell. In contrast to taste, where humans can only perceive five qualities (sour, bitter, sweet,

Imag Image: Image::http://its.stgeorges.bc.ca/athletics/row/images/prgm/nutrition/nutrition_cartoon.jpg

Have you ever noticed how the smell of food can make you hungry? Can you explain this?

_____

_____

_____

Smells can reach the olfactory epithelium by two routes.

The first route, *orthonasal olfaction*, is the detection of a scent through the nostrils by sniffing or inhalation.

The second route, *retronasal olfaction*, is the detection of a scent when it is released from food in your mouth during chewing, exhalation, or swallowing. During this process, the smell passes through the back of the nose.

Once in the olfactory epithelium, the odour molecules bind to olfactory receptors, which are expressed in olfactory sensory neurons in the nose. Once an odourant binds to the receptor, the olfactory receptors trigger a series of signals to the cells' interiors that ultimately results in the opening and closing of ion channels. The opening of the ion channels increases the concentration of positive ions inside olfactory cells. This depolarization causes the olfactory cells to release tiny packets of chemical signals called neurotransmitters, which initiate a nerve impulse. Odour information is then relayed to many regions throughout the brain. Each odourant binds to a unique combination of olfactory receptors, which means that a unique signal is sent to the brain for each odorant. In fact, there are at least 400 functioning olfactory receptors, which is why we can smell hundreds of different smells!

Since all humans are made with the same standard anatomical features, can you explain why a food that you may love, may be detested by someone else?

It may surprise you that some people just can't smell certain odorants. This is called a specific anosmia. Differences also exist in how sensitive people are to different odorants. Some people are more sensitive to some odorants than others. Individual genetic differences in the expression of the hundreds of olfactory receptors may explain the variation.

Can you taste with your nose and eyes?

Caution:
Remember you cannot taste any food in the science lab, so this investigation will have to be carried out elsewhere!

It is very important that everybody remains silent during the taste test!

Image sourced: http://nobel.scas.bcit.ca/debeck_pt/science/images/labsafety.jpg

Materials needed per pair of pupils

- 3-4 crackers
- 2 cups of water
- Result card
- Blindfold (hankerchief / bandana can be used)
- Nose plug (optional)
- 10 different sweets of 4-5 different flavours

Method

As part of this investigation, you will be responsible for filling out your partner's table of results. It is important that you do not give any feedback or show the results to your partner until after the all of the tests are finished.

1. With your partner, give each other a number; 1 and 2.
2. Pupil number 1 puts on the blindfold.
3. Pupil number 2 randomly chooses a sweet and hands it to their partner.
4. Pupil number 2 records the actual flavour of the sweet AND what flavour that pupil number 1 tastes. After the first tasting, the blindfolded pupil should clear their palate with cracker and water.
5. Pupil number 2 randomly chooses a second sweet for pupil number 1 to taste.
6. The blindfolded pupil should clear their palate with cracker and water again.

Exchange roles, and repeat steps 2-6.

Resume to your original roles (number 1 as taster and number 2 as recorder):

7. Now repeat the test as before, following steps 2-6, wearing the blindfold but *also*

with your **nose blocked**.

Trades places again, and repeat the second test with blindfold and blocked nose.

Tables of Results for Pupil No. 1:

Flavour of the sweet while blindfolded

Actual Flavour	Tasted Flavour	Correct / Wrong

Flavour of the sweet while blindfolded and with blocked nose

Actual Flavour	Tasted Flavour	Correct / Wrong

Table of Results for Pupil No. 2:

Flavour of the sweet while blindfolded

Actual Flavour	Tasted Flavour	Correct / Wrong

Flavour of the sweet while blindfolded and with blocked nose

Actual Flavour	Tasted Flavour	Correct / Wrong

Did you correctly identify all flavours while blindfolded?

_____

_____

Did you correctly identify all flavours while blindfolded and blocking your nose?

_____

_____

Were your answers affected by orthonasal olfaction, retronasal olfaction, or both?

_____

_____

_____

_____

Combining the whole class' results, can you calculate the percentage of pupils who tasted the flavour correctly when blindfolded?

$$\frac{\text{Number of correct tastings}}{\text{Total number of pupils Involved in the test}} \times \frac{100}{1} =$$

Combining the whole class' results, can you calculate the percentage of pupils who tasted the flavour correctly when blindfolded and with a blocked nose?

$$\frac{\text{Number of correct tastings}}{\text{Total number of pupils involved in the test}} \times \frac{100}{1} =$$

Why do you think the percentage of correct answers differed in both tests?

_____

_____

_____

What type of graph do you think would best represent these results? Why?

E.g. Pie chart, bar graph, line graph etc.

Decide on one type of graph with your partner and draw that graph on a sheet of graph paper.

Lesson 3

The Digestive System

Single Lesson

This lesson takes a closer look at what happens food after it passes from our mouth. We will take a close look in particular at how proteins are broken down.

Can you recall from your Junior Certificate Science how to label each part of the Digestive System and the function of each organ?

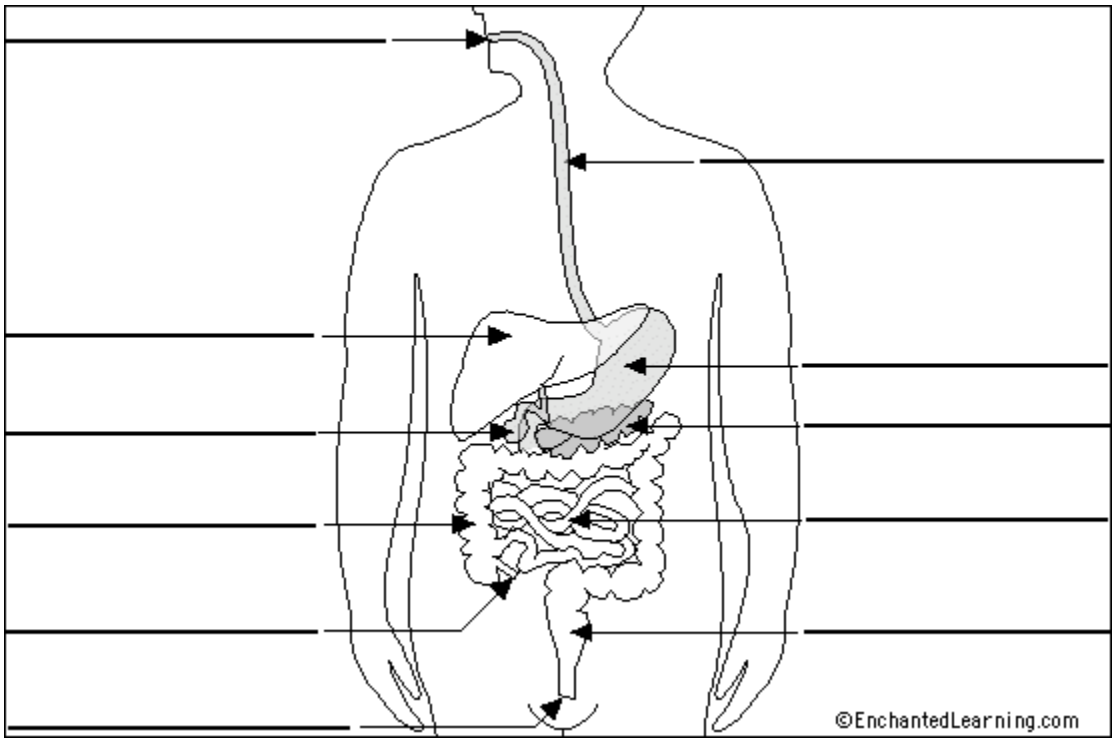


Image Sourced: http://www.enchantedlearning.com/subjects/anatomy/digestive/labeleasy/

Does the Concentration of Pepsin Affect How Thoroughly Proteins Are Digested?

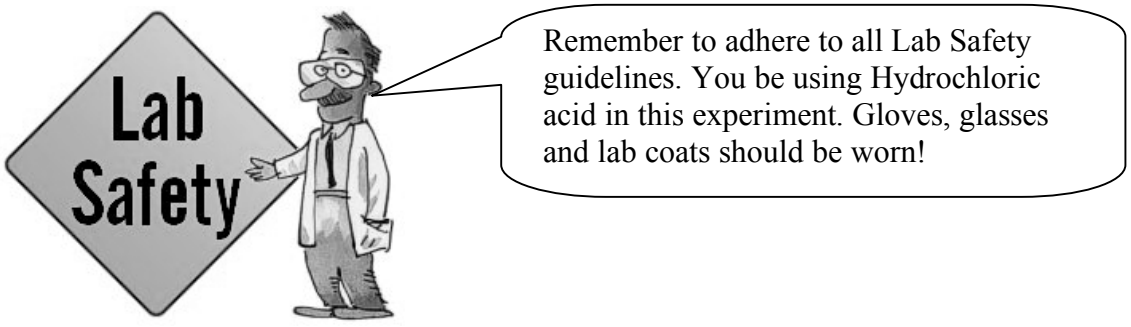


Image sourced: http://nobel.scas.bcit.ca/debeck_pt/science/images/labsafety.jpg

The purpose of this investigation is to determine whether or not the concentration/pH of pepsin will affect how thoroughly proteins are digested.

Materials needed per group:

- One boiled egg
- Slice of beef
- Slice of chicken
- Knife
- Chopping board
- 4 test-tubes
- Hydrochloric acid
- Pepsin Solution
- Sodium Carbonate solution
- Small graduated Cylinder / dropper

Method:

1. Separate the albumin, or white of an egg, from a hardboiled egg.
2. Dice the slice of beef and chicken and egg white into very small pieces
3. Place equal amounts into four test tubes.
4. Number your test tubes; then pour these substances into the tubes using the dropper or graduated cylinder:
    - Tube 1: 5 ml of a pepsin solution (0.5% pepsin)
    - Tube 2: 5 ml of 0.4% HCl
    - Tube 3: 5 ml of pepsin-HCl mix (add two drops HCl to pepsin solution)
    - Tube 4: 5 ml of pepsin solution plus two drops of 0.5% sodium carbonate
5. Maintain all the tubes in an incubator for 24 hours.
6. Inspect contents of each tube for visual signs of digestion.

Table of Results:

Test-tube number	**Contents of test-tube**	**Description of contents after 24 hours**
1		
2		
3		
4		

What other foods could have been used for this investigation?

_____

_____

_____

How could these foods be tested for the presence of protein? Explain.

_____

_____

_____

What conclusions can be made from these results?

_____

_____

_____

Why was it important to keep all test tubes at the same temperature?

_____

_____

_____

Which of these conditions do you think most closely represents your stomach?

_____

_____

_____

Which of these conditions do you think most closely represents your small intestine?

_____

_____

_____

Image sourced: http://www.comesatradehub.com/images/products/848504901.jpg

Unit 8 - Milk it!

In this synoptic unit, we will review and combine all of what has been learned, investigated, debated and discussed in the past seven units.

Through the study of the Science of Milk, we will explore its' nutritional value and composition, the different types of milk available to the consumer, how milk can be treated and processed into other dairy products.

We will investigate the production method and storage guidelines for these products. Could you make cream, butter, yoghurt or cheese at home?

We will also investigate different career oppportunities in the Food Science industry.

Lesson 1

Just Milk

Single Lesson

In this lesson, we will take a closer look at one of the main food comodities found in every fridge.

What nutritional value does milk provide?

How many different types of milk are available to the consmer?

We will also carry out a taste test to see if subjects can identify different types of milk!

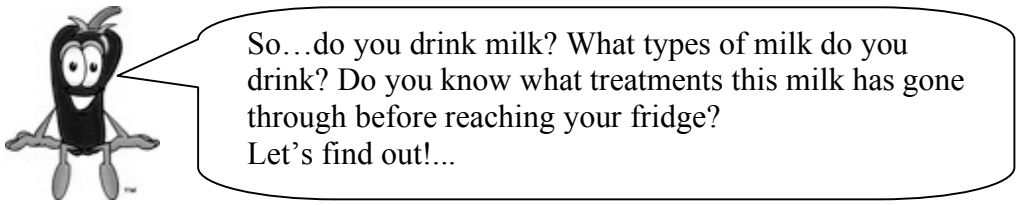


Image sourced: http://www.clipartof.com/images/thumbnail/6855.jpg

So why is milk such as important part of our diets?

Babies need breast or formula milk as this is the only form of nutrition they receive for the first months of their lives. Children and adolescents need a concentrated form of animal protein as they are growing rapidly. Milk is easily digested. Children and adolescents can also gain energy from the fat (cream) and sugar (lactose) in milk. Pregnant and nurseing mothers require caciumand Vitamin D for bone formation and as a source of protein for the foetus, placenta and for milk production. If a pregnant woman has insufficiant calcium, it will be drawn from her own bones and lost during breat feeding. Over repeated pregnancies, this may lead to osteoporosis.

Elderly people require the digestable protein available from milk for the repair and replacement of damaged cells. Calcium, vitamin D and phosphorus prevent osteoporosis in this group. One glass of milk provides 1/5 of their R.D.A. of calcium.

Covalescents can drink watered milk to prevent dehydration and to provide them with animal protein to repair diseased, damaged and wasted tissue. Milk is an alkaline so it should not upset the digestive system.

Do you know what your R.D.A. of calcium is?

What is a ‘dairy product’? How many different examples can you think of?
Can you recognise which of these are ‘natural’ products and which are ‘processed’?

_____

_____

_____

_____

On what level of the Food Pyramid would milk and other dairy products be placed?
How many servings of dairy products should we eat each day?

_____

_____

_____

What nutrients are found in milk?

_____

_____

_____

Homogenisation	This is the even distribution of fat globules throughout the milk, by forcing the milk through very tiny holes that break up the fat globules and disperse them evenly throughout the milk. Although, this is not a heat treatment, it does help the milk to last longer as it improves texture and flavour.
Pasteurisation	This is the most lidely used milk treatment. The milk is heated to 72ºC for 15 seconds and then cooled rapidly. This helps the milk to last longer as all of the pathogenic and some of the scouring bacteria are destroyed. However, the B vitamin, Thiamine is destroyed in this process and the taste is alterled slightly.
Ultra Heat Treatment (UHT)	This is the long life milk used on aeroplanes, ships and trains etc. In this process, the milk is heated to 132ºC for 1 second and then cooled quickly and put into sterile containers. This milk can last for months as all spores, pathogneic and scouring bacteria are destroyed. However, all of the B group vitamins are destroyed and the taste is altered greatly.
Evaporation	Evaporated milk is mainly used in desserts. It is pasteurised milk which is evaporated to half its' volume, them homogenised, sealed in cans and heat treated to 115ºC for 2 minutes. The B vitamins are lost but the milk keeps indefinitely.
Dehydration	Dried milk is useful when fresh milk is not available. It can easily be made up using water. In this process, firstly the milk is homogenised and then evaporated to 60% of its' volume. The milk is then either roller or sprayed dried and the remaining water is evaporated off. All of the vitamins and some of the amino acids are lost. The flavour is also altered.
Condensed Milk	This milk is also use din makin desserts such as Banoffi pie. Most of the B vitamins are lost in the process where pasteurised milk is evaporated to 1/3 of its' volume, then homogenised and 40% sugar is added. It is then sealed in cans and heated to 115ºC for 15 minutes. The extra 40% sugar that is added makes it very sweet and very high in calories.

Does the nutrient value change for different types of milk e.g. low fat, skimmed, powdered, condensed , UHT etc. Can you explain why ?

Do the different types of milk have different shelf life? Why?

Where and how should milk be stored in transport, in shops and at home? Give details e.g. what temperature? Is it safe to freeze milk?

Scenario:

The machine for printing labels for the Full-fat, Skimmed and Buttermlk cartons has ran out of ink.

The Creamery is now left with three pallats of unlabelled and unidentified cartons of milk.

One carton from each batch has been dropped into the Home Economics room. From your experience, can you organise a taste test to identify each of the three types of milk.

Lesson 2

What can we make from milk?

Double Lesson

In this lesson, we will take a closer look at milk as a natural food and discover the many possible ways in which it can be processed into different dairy products. Where are dairy products manufactured? Could some of these techniques be repeated in school or at home?

Ok, how about we begin with one of the most fundamental and simplest dairy product found in almost every home?
….. BUTTER!

Image sourced:
http://www.clipartof.com/images/thumbnail/6855.jpg

Examining the butter packages available to you, can you identify the common ingredients in butter?

Image sourced:
http://upload.wikimedia.org/wikipedia/commons/b/b5/Butter_with_a_butter_knife.jpg

Why is there a need for so many different types of butter? Why can some butter be spread straight from the fridge and others can't?

_____

_____

_____

_____

_____

Because milk and cream do not freeze very well, long ago people used to make their own butter at home as a method of preservation.

Do you think you would be able to make butter 'from scratch' as was done in the past?

Materials needed per group of pupils:

100ml of cream

Salt

A food Processor or a bowl and electric whisk

Lid for the bowl or a plate

Smaller bowl

The cream should be allowed to reach room temperature before class begins, around 20ºC (68ºF) is ideal – this is critical.

Don't heat it but leave the cartons out of the fridge for a good few hours to warm up.

Method

1. Pour the cream into the bowl
2. Begin to beat the cream with the electric whisk
3. It will go through the usual stage of starting to form firm peaks and then it becomes quite stiff.
4. At this point you might like to reduce the speed of your whisk because when it begins to get stiff, it happens very fast.
5. The cream will turn a bit yellow in colour and then little bits of butter appear and a thin liquid.
6. What is this thin liquid?
7. Seconds later, the butter seems to clump and is separated from the liquid.
8. Drain the liquid off into the smaller bowl using the lid or a plate to keep the butter in the larger bowl.
9. Add clean cold water to the butter in the bowl and operate the whisk on low speed for a minute. You need the water to be cold or you melt the butter, which will then run off with the water. Drain off the water in the same as Step 8.
10. Repeat the washing process until the water is clear.
11. You now need to get the water out of the butter. In the old days they had special wooden paddles to press and shape the butter but you can use your hands and the back of a spoon to do this.

Homemade butter can be stored for at least three months in a freezer. Commercial butter stores for much longer can you identify any ingredient (apart from salt) in the listed ingredients that may help the butter to last longer?

_____

_____

_____

_____

To salt do not add more than a half teaspoon for each 250 grams of butter. You can also add crushed garlic or dried herbs to make flavoured butter when you get home if you wish.

Name the by-product formed in the production of butter?

_____

What can it be used for?

Can you recall with what raising agent would you use this liquid? Why?

_____

_____

_____

Why is it so important that all of the liquid has to be ‘washed’ from the butter before pressing?

_____

_____

_____

Making Ice-cream in a bag:

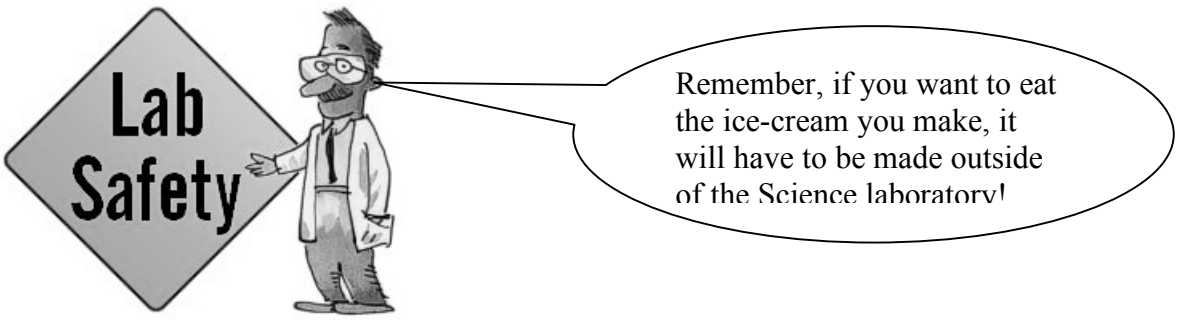


Image sourced: http://nobel.scas.bcit.ca/debeck_pt/science/images/labsafety.jpg

Materials needed per group:

- 1/2 cup milk
- 1/2 cup whipping cream
- 1/4 cup sugar
- 1/4 teaspoon vanilla or vanilla flavoring
- 1/2 to 3/4 cup sodium chloride (NaCl) as table salt or rock salt
- 2 cups ice
- Small sealable bag
- Large sealable bag
- Thermometer
- Measuring cups and spoons

Method:

1. Add 1/4 cup sugar, 1/2 cup milk, 1/2 cup whipping cream, and 1/4 teaspoon vanilla to the small bag. Seal the bag securely.
2. Put 2 cups of ice into the large bag.
3. Use a thermometer to measure and record the temperature of the ice in the gallon bag.
4. Add 1/2 to 3/4 cup salt (sodium chloride) to the bag of ice.
5. Place the sealed small bag inside the large bag of ice and salt. Seal the large bag securely.
6. Gently rock the large bag from side to side. It's best to hold it by the top seal or to have gloves or a cloth between the bag and your hands because the bag will be cold enough to damage your skin.
7. Continue to rock the bag for 10-15 minutes or until the contents of the large bag have solidified into ice cream.

8. Open the large bag and use the thermometer to measure and record the temperature of the ice/salt mixture.
9. Remove the small bag, open it, serve the contents into cups with spoons and ENJOY!

Observations:

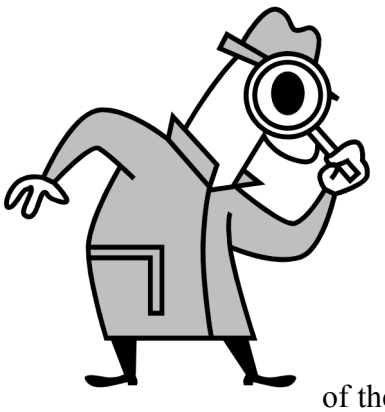
Temperature at the beginning of the experiment: _____

Temperature at the end of the experiment: _____

Can you explain this change in temperature?

Why was it important to add the salt?

Would sugar have had the same effect? Why?



What is in milk that causes some people to have an allergic reaction to it?

Do you know anyone who is allergic to Dairy Products?

What impact would this have on their diet?

What alternatives are available to ensure they gain the R.D.A. of the many vitamins and minerals found in milk and other dairy products e.g. calcium?

Lesson 3

Careers in The Food Science Industry

Single Lesson

In the previous lesson, we have prepared butter ourselves, but now it's time to investigate and take a look at how the experts process, preserve and package our foods!

In this lesson, you will work together to organise a class trip to a local factory or creamery.
The aim of this visit will be to observe the production line and understand the different stages of manufacturing cheese.
We will also look at the Creamery as an industrial structure and its' influence on the locality.

Image sourced:
http://www.brickschools.org/veteranses/lib/veteranses/SchoolBus.gif

Organisation:

1. The class must firstly be divided into different committees;
    - Contact committee – this committee must decide on a date that suits everybody, write a letter, perhaps followed by a phonecall to the creamery or factory you intend to visit. The proposed date may need to be altered…
    - Research committee – Before you visit the creamery, you should know the background of the creamery; when was it set up? By whom? What does it produce? Etc.
    - Industrial Structure Research committee – this committee will investigate how the factory has helped to contribute to the local area. Does it provide employment? How many people are employed? What career opportunities are created?

- Cheese Manufacturing Committee – this committee researches and becomes very familiar with the different stages of cheese manufacturing. These stages should be presented as a poster to the rest of the class.
- Transport committee - This committee will be responsible with the teacher to organise how the class will travel to the Creamery. Is it walking distance form the school? Will a bus have to be booked and paid for?
- Questions committee – this committee is responsible for compiling questions to ask the staff a the Creamery on the day of the visit. They may also take questions from other members of the class to add to the list. These pupils will then be responsible for recording the answers to these questions during the visit.

2. Each committee must fulfill its' own responsibility before the trip can go ahead successfully.

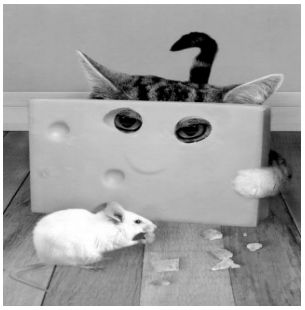


Image sourced: http://imagecache2.allposters.com/images/pic/GDFCARD/ABC08~ABC-Cat-peering-through-cheese-Posters.jpg

Reflection

After the visit, write your own report on what you learned. Use these questions to prompt your thinking:

- Factory Structure – no. of people employed, areas of employment (lab / office) et.c
- Did the production line vary from what you had anticipated as researched by your classmates?
- Was there any other ingredients added to the cheese?
- How many different products were produced in the Creamery?
- What storage and preservation techniques and facilities did you see? Can you explain how these work?
- How is the cheese promoted? Where is it sold?

Careers in the Food Science Industry:

During your visit to the local Food Industry, how many different roles and responsibilities did you see that the different employees held?

From your study of Food Science, Food Processing, Cooking, Food Safety and Hygiene etc. throughout this module, and from what you have observed in your visit to the Food Industry of your choice, you should now be more aware of different employment opportunities relating to Food:

Chef…
Farmer….
Health and Safety Manager…
Dietician…
Nutritionalist…
Product Manager….
Sales & Marketing…
Packaging…
Food Preservation….
Quality Assurance …
……

These are just a few of the employment opportunities.
Investigate a career of your choice within the Food Science industry. Research the role this person plays, their responsibilities, typical aspects of their work etc. If possible could you interview someone in this job?

Record your findings and present them on a poster to the rest of your class.