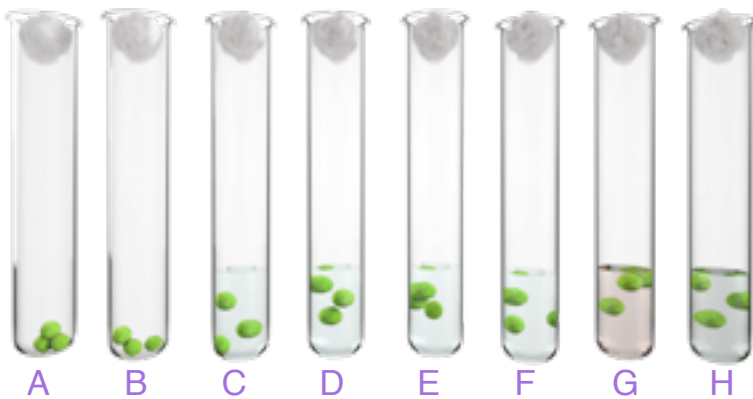


Name:

Class:

Date:



SAFETY NOTE: Wash your hands thoroughly after handling the vinegar and sodium nitrite solutions. Let your teacher know if you get any in your eyes.

DO NOT open the tubes of peas next lesson - leave the cotton wool plugs in place.

Procedure

1. Collect eight test tubes and label them A to H.
2. Put three fresh peas in each test tube. Put test tube A in the fridge.
3. Add 5cm³ of liquid to tubes C to H as follows - distilled water, dilute sodium chloride solution, concentrated sodium chloride solution, concentrated sugar solution, vinegar, sodium nitrite solution.
4. Plug each tube with cotton wool and leave for at least 48 hours at room temperature (except tube A)
5. Predict what will happen to the peas after 48 hours and add your suggestions to the table below.
6. After 48 hours examine the tubes and record the appearance of the peas and solutions

My predictions

Tube	What I think will happen and why...
A	
B	
C	
D	
E	
F	
G	
H	

Name:

Class:

Date:

Questions

1. What is the investigation trying to find out?

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2. Why use three peas in each test tube rather than one?

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3. Why was no liquid added to tubes A and B?

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.....

4. Why was tube A put in the fridge?

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.....

5. Why plug the tubes with cotton wool?

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Food preservation

My food cupboard

Name:

Class:

Date:

Look at different food items in your cupboards, fridge and freezer at home and use any information you find on the packaging to complete the table below. Find 10 different food items and at least 4 different preservation techniques.

Food item	Country of origin	How has it been preserved?	Best before date	Use by date

Microbes cause a lot of food spoilage. But we can control microbial growth by changing each of these factors:

- temperature
- oxygen availability
- moisture levels
- pH of the food

Your teacher will split you into groups of four - these will be your home groups.

Step 1: In your Home Groups

In your Home Group, agree who will research each factor. They will become your **experts**. Hand out the relevant expert card to your chosen expert. Make sure everyone in your group knows what they need to find out.

When your teacher tells you, each expert joins with experts from other Home Groups who are researching the same factor. These will form the Expert Groups.

Step 2: In the Expert Groups

Each Expert Group should now find out as much as they can about each factor. The speech bubbles on your cards will give you some clues but you can go further and find out more.

When your teacher tells you to all the expert go back to their Home Groups.

Step 3: In the Home Group

Each expert should now share what they have found. Make sure everyone in the Home Group gets a chance to share.



Food preservation

Food preservation techniques

Temperature



How do the microbes damage the food?

Why does the food last longer in the fridge?

Does freezing keep food safe forever? Does it damage the food in some way?

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Oxygen availability



Why doesn't food go off in cans?

Crisps are packed in nitrogen gas not air - why?

Why do we keep bread in an airtight container?

Why do containers to keep food in often have screw top lids?

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Food preservation

Food preservation techniques

Moisture levels



Campers often take dried food away with them. They just add water and heat it up at the campsite and they have a nice meal. How do these foods last so long?

How long can dried rice last before it goes off?

Why do some people call jam preserves? How do jams preserve fruit?

What is the difference between dried and fresh fish?

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pH of the food



How come pickled onions last so long but fresh onions spoil after a few weeks?

Why does the acid in vinegar seem to preserve food?

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Food preservation

What works?

There are many ways to preserve food. But which is best for each of these people? Think about the issues faced by each of the people below and suggest how they might preserve their food.

I serve foods to people visiting Kuala Lumpur, Malaysia. I get up at 4:00 am and visit the food market to buy the ingredients for one day's trade. I provide breakfast of fried meat and rice or hot soup for the office workers and tourists. I sleep in the afternoon because in the evening I'm cooking pork and fish for the late-night customers.



I work for an investment bank and my flat looks out over the river Thames near Canary Wharf in London. I eat out more often than at home but I always need some food at home in case friends come back after a later night at the office.



I live in Leicester with my family. There are five of us in the home now and my older sister makes six when she comes home from uni. My youngest brother has to take medicine every day and we need to keep his medicine cool.

I live in a small village in Kenya called Kathamba. My husband and I are farmers. My parents are farmers so we produce lots of our own food - mainly fresh vegetables. The soil here is very fertile and we can grow plenty to eat and some to sell. Next year we hope to get a bicycle to take our produce to the town 8 miles away to sell - that will give us more profits as the prices there are higher.



Making a zeer pot

Below is a set of images and statements. They are similar to the video you have just watched. Cut out the images and statements and match them up to explain how a zeer pot is made. Stick them in your book.



Bowl-shaped moulds are created from mud and water and left to dry in the sun. Clay is pressed onto the moulds to form the pots. Clay rims and bases are added and the moulds are removed.



Once the pots have been fired in a pit of sticks, the zeer pot is ready to assemble. A smaller pot is placed inside a larger one and the space in between filled with sand.



The whole structure is placed on a large iron stand. This allows the air to flow underneath and aid the cooling process.



Twice a day, water is added to the sand between the pots so that it remains moist. The entire assembly is left in a dry, ventilated place.



Food preservation

Making a zeer pot

Name:

Class:

Date:



Fruit, vegetables and sorghum (a type of cereal prone to fungal infestation) are then placed in the smaller pot, which is covered with a damp cloth.



In the heat, the water contained in the sand evaporates through the skin of the outer, larger pot. This evaporation brings about a drop in temperature of several degrees, cooling the inner pot and extending the shelf life of the perishable food inside.



Why does water need to be added to the sand between the pots every day?

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The outer pot is never glazed. Why?

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Why is the pot made of clay not metal?

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Food preservation

Name:

Class:

Date:

Researching zeer pots

Produce	Shelf life outside zeer pot / days	Shelf life inside zeer pot / days
Tomatoes	2	20
Guavas	2	20
Rocket	1	5
Okra	4	17
Carrots	4	20

Data from Practical Action and Sudan Woman's Association for Earthenware Manufacturing



Temperature (°C) in pots standing in shade or sunlight

External temperature	Shaded pot	Pot in sunlight
34.5	36.0	40.5
45.0	36.0	38.5
45.5	36.0	40.5
45.5	36.0	38.5



Temperature (°C) in pots confined by wooden baffles or exposed to air currents

External temperature	Unconfined pot	Confined pot
39.0	33.0	32.5
44.0	38.0	35.0
45.5	36.0	35.0
45.5	36.0	35.0

Data from Practical Action technical brief.



Name:

Class:

Date:

1. Which crops spoil most rapidly if kept outside the zeer pot?

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.....

2. What is the average drop in temperature for a zeer pot standing exposed in the sunlight?

.....

3. What causes the drop in temperature of the zeer pot?

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We have found that keeping the zeer pot on a stand above the ground so that air can circulate around it helps to keep it cool.



4. Describe an investigation you could do to test the idea that raising the zeer pot above the ground might help with cooling.

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Name:

Class:

Date:

1. Why do the people wash their hands?

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2. Why are the vegetables chopped?

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3. Why are the chopped vegetables put in salt water?

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.....

4. What are the advantages of dried food?

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5. What dried food do you eat?

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.....



Many traditional ways to reduce water content of foods to preserve them use sun drying - tomatoes, dates, figs, chillis, peppers and sultanas are dried in this way. This uses heat and some wind to dry out the food before spoilage happens.

Designing a solar dryer

In your group, design a solar dryer that will work well for the people in the video clip you have just seen. Use your scientific understanding to produce a dryer that will:

- be cheap and easy to manufacture and maintain
- protect the drying materials from dust and dirt
- maximise absorption of heat from the sun

Produce your design as a poster with full annotations to show the science behind your ideas.



Food preservation

It's a good business

Name:

Class:

Date:

The Viharagata women's group in Sri Lanka has been in existence since 1999 and has seven members. Approximately 200 independent suppliers provide the group with fruit. The producers explain that in this part of Sri Lanka there are two seasons for both jack and bread fruit: the seasons for bread fruit are December to February and August to September, and the seasons for jack fruit seasons are November to January and June to August. Based on the seasons for jack and bread fruit, it is clear that the group has substantially less work in the months of February to June. One alternative may be to dry other fruits such as mango.



1. How are the women preserving the food?

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2. Why have they chosen that method?

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.....
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3. What other methods might they use?

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4. What could the group do between February and June?

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.....

Name:

Class:

Date:

5. Look at the table below. It shows a variety of foods with their water content and their water activity. Water activity means the amount of moisture that is available in the food to enable microbes to grow. The lower the value the more difficult it is for microbes to grow and spoil the food.

Draw a bar chart to show the water content and water activity of each of the foods in the table.

Using information from your bar graph answer the following questions.

Which two foods are the most difficult for microbes to grow in ?

.....

Which two food are the easiest for microbes to grow in?

.....

Does anything surprise you?

.....

Table 1: Water in food

Food	Water content (%)	Water activity
Macaroni	10	0.45
Fresh meat	70	0.985
Dried vegetables	5	0.2
Rice	16	0.8
Breakfast cereal	5	0.2
Bread	40	0.86
Biscuits	5	0.2
Milk	3.5	0.11
Marmalade	35	0.86
Toffee	8	0.6
Nuts	18	0.65
Potato crisps	1.5	0.08
Wheat flour	14.5	0.72
Marzipan	16	0.75
Boiled sweets	3	0.3
Oats	10	0.65

Investigating osmosis

Aim: to find out what happens to the weight of a potato when it is placed in solutions of sodium chloride of different concentrations.

Osmosis is

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Prediction:

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Method

Prepare six boiling tubes with solutions as given below.

Tube	Volume of deionised water (ml)	Volume of 1 mol/l sodium chloride solution (ml)
A	10	0
B	8	2
C	6	4
D	4	6
E	2	8
F	0	10

1. Cut cores from a fresh potato with a cork borer and slice them into discs about 3mm thick. Pat each disc dry and weigh a stack of five of them. Note the results down.
2. Quickly transfer the five disks to boiling tube A and give it a shake.
3. Repeat the process for all other tubes - blotting and weighing five disks for each.
4. After about 20 minutes take the disks out of tube A, blot dry and re-weigh them.

Food preservation

Name:

Class:

Date:

Investigating osmosis

Draw a table to record your results here.

Explain your results in terms of the movement of water into or out of the potato in each of the solutions.

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.....

Write down three things you did to make sure your experiment was a fair test.

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Using your findings from this investigation describe the scientific basis for the best conditions in which to keep:

Freshly picked potatoes

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.....

Freshly peeled potatoes

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.....

Food preservation

Drying and salting

Ready salted?

Dried meat and fish are widely popular in many developing countries where the process of salting and drying meat in the open air is suited to hot climates. Selling dried meat has become a popular income-generating activity and provides a useful nutritious food all year around.



Salting is also used to preserve meat and fish so that they can be used at times when food is scarce. The exact recipe for the preserving salt needs to be followed carefully - too little salt means the meat is not preserved effectively. The salt for preservation also often includes a range of other flavours as well. Biltong, shown in the picture below, is a popular snack in southern Africa which uses salt to preserve meat but adds other flavours to make the product more appealing.

Seasoning for spiced biltong

Salt	3.74 kg	Dried onion powder	30 g
Sugar	1.87 kg	Garlic powder	30g
Potassium nitrate	20g	Ginger powder	30g
Mixed spice	210 g	Mustard powder	30 g
Black pepper	100g		



Food preservation

Name:

Class:

Date:

Drying and salting

1. Give two advantages of preserving food by drying.

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2. Why would it be difficult to draw a simple bar chart to show the ingredients of biltong seasoning?

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3. Fatty meats are not very suitable for salting and drying. Plan an investigation into how the percentage of fat in a meat sample affects how well salting can preserve it. Make sure you:

- a identify the key variables you need to manipulate
- b show how you will measure these variables
- c explain how the data you collect will allow you to answer the original question.

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