A What do these things have in common?

Paper	Food sweeteners
Ice cream	Cardboard boxes
Stamps	Baby foods
Envelopes	Medicine tablets

Give up?
They all have something to do with starch.
Find out how starch is used for each of the above products.

A Introducing the NEW electric car of tomorrow!

The car developed by Chrysler Corporation, United States, runs on corn-based ethanol.

This is how it works. A reformer converts the ethanol to hydrogen and oxygen using a platinum catalyst. The chemical reaction in the fuel cell produces electricity to power the car's motor. By the year 2006 you could have one of these cars.

But just think how difficult it will be to get corn-based ethanol in New Zealand!

Could a wheat-based ethanol-electric car be designed in New Zealand?

Research this possibility. How well will this type of car be accepted by New Zealanders?

A car that runs on ethanol is 50% more fuel efficient than conventional internal-combustion engines and it virtually eliminates tail pipe pollution. Wow! At last a clean and environmentally friendly fuel for all to use.

Here are some key words to help you on your research... Starch, Ethanol, Fermentation, Distillation, Dehydration, Enzymatic saccharification, Fermentable sugars, Glucoamylases, Elevation temperatures.

A Visit a brewery that makes wheat beer

Describe the stages needed to turn wheat into malt and eventually into beer

Your description of each stage should include words from the following list...

Starch	Glucose molecules	amylose and amylopectin starches
Enzymes	Diastase (alpha amylase)	amylase (beta amylase)
Fermentable sugar	Maltose	Glucose
Maltobiose	Alcohol	Polysaccharides (dextrins)
Body and sweetness	Saccharomyces yeast	Aerated wort
Oxygen	Anaerobic fermentation	Enzymatic action
Simple sugar molecules	Primary by-products	Ethanol (ethyl alcohol)
Carbon dioxide	Aroma and taste	pH of wort drops
Bacteria	Flocculation	Conditioning tanks
Aging process		

NEW ZEALAND BREAD & FLOUR INFORMATION CENTRE

activities

Starch

Q Why are complex carbohydrates important?

A List the differences between simple and complex carbohydrates.

A In a group of 3 or 4, list foods which contain complex carbohydrates. To find information to help you, read 'Nutritional aspects of bread - I and II' and 'Nutritional aspects of bread and wheat- III'.

A Compare the ingredient lists and nutritional labels to evaluate a variety of breads and grain products to determine if they are high in simple or complex carbohydrates. Display your information on a table like this...

Product	Simple Carbohydrates	Complex Carbohydrates	Notes
Donuts	✓	✓	The simple carbohydrates are the jam and sugar added
Cornflakes		✓	I would tick the simple carbohydrate box if sugar was sprinkled over the cornflakes

A Take a dessertspoon of flour and mix it with five dessertspoons of water in a saucepan. Bring it slowly to the boil while you stir it. After it has boiled for 3 or 4 minutes, allow it to cool. Note any changes while you were cooking the mixture. How does the final product compare with what you started with?

A If you have access to a microscope, examine raw and cooked starch. Can you spot the differences and similarities?

A Look at some flour under a microscope and draw what you see. Do the same with some potato juice. Compare your drawings. What similarities and differences did you see?

NEW ZEALAND BREAD & FLOUR INFORMATION CENTRE 1997. PO BOX 30, LINCOLN, CANTERBURY

Have a sticky competition.

Try making 3 or 4 of the paste recipes below. Compare how well they stick paper, plastic, material and wood to cardboard. Use the same amount of paste for each pasting and leave them to dry for the same amount of time. Think of some innovative testing procedures to check the adhesiveness of each medium. One test could be to tie each medium with a piece of string to the ceiling of the classroom. This test will tell you how long the paste will work in a variety of weather conditions such as wind and heat.

Homemade Paste

1 cup Flour

2 cups Water

Put the flour in a saucepan. Slowly stir in the water. Bring to a boil over low heat. Keep stirring until thick and shiny. Cool before using. Store in a sealed jar.

Paper Paste

1/3 cup Flour, plain

2 tablespoons Sugar

1 cup Water

1/4 teaspoon Oil of cinnamon or cloves

Mix flour and sugar in a saucepan. Gradually add water, stirring vigorously to break up lumps. Cook over low heat until clear, stirring constantly. Remove from the stove and add oil of cinnamon. Stir until well blended. Makes about 1 cup. Store in a sealed jar.

Wheat Paste

1 cup Flour, plain

1/2 cup Rice flour

3 teaspoons Cornflour

2 cups Water

Combine both flours and water in a pot. Cook on a low heat. The mixture should be very watery. Stir the mixture constantly for 10 minutes or until the paste begins to thicken. Take the pot off the heat when the mixture starts to thicken. In a container with a lid combine cornflour with half a cup of water. Tighten the lid and shake the mixture until there are no lumps of cornflour. Combine the cornflour mixture with the flour mixture and stir over heat for at least another two minutes. Store in a sealed jar. Use for permanent pasting - so beware!

Paperhanger's Paste

1 cup Flour, plain

1 tablespoon Alum, powdered

1 tablespoon Rosin, powdered

1 1/2 cups Water, warm

4 1/2 cups Water, hot

1 1/2 cups Water, cold

8 drops Oil of cloves or cinnamon

Mix flour, alum and rosin in a large pot. Make a paste by adding the warm water. Stir until smooth. Pour in hot water, stirring vigorously to break up lumps. Place over low heat and boil until thick and clear. Thin with the cold water. Add the oil of cloves or cinnamon as a preservative if paste will not be used the same day it is made. Store in a sealed jar. Makes 1 1/2 litres. Use also for Papier Mâché projects to obtain a hard finish.

Resin Papier Mâché Paste

1/2 cup Flour, plain

1/4 cup Powdered resin glue

1/2 cup Water, warm

1 1/2 cups Water, hot

4 drops Oil of cinnamon or cloves

Mix flour and resin glue in a saucepan. Make a paste by adding warm water. Add hot water, stirring vigorously to prevent lumps. Cook over low heat, stirring constantly, until mixture is thick, clear and smooth. Add oil of cinnamon or cloves.
Makes 1 litre. Store in a sealed glass jar. Use within a few days of preparation.

Papier Mâché Paste

1 cup Water

1/4 cup Flour, plain

5 cups Water, hot not boiled

Mix flour into one cup water until mixture is thin and runny, stir into hot water. Gently boil and stir for 3 minutes. Cool before using. Store in a sealed jar. Use with newspaper/newsprint strips for Papier Mâché.

Thin Paste

1/4 cup Sugar

1/4 cup Flour, plain

1/2 teaspoon Powdered alum

1 3/4 cups Water

1/4 teaspoon Oil of cinnamon or cloves

In a medium-sized pan, mix together sugar, flour and alum. Gradually add 1 cup of water, stirring vigorously to break up lumps. Boil until clear and smooth, stirring constantly. Add remaining water and oil of cinnamon or cloves. Stir until thoroughly mixed. Makes 1 litre. Store in a sealed jar.

Wallpaper Paste

4 cups Flour, plain

1 cup Sugar

4 litres Water, warm

1 litre Water, cold

1/2 teaspoon Oil of cinnamon or cloves

Mix flour and sugar in a large pot. Add enough warm water, a little at a time, to make a smooth paste. Add the rest of the warm water slowly, stirring vigorously to break up lumps. Bring the mixture to a boil, stirring constantly. Cook until thick and clear. Thin with cold water to desired consistency. Add oil of cinnamon if paste will not be used the same day. Makes 6 litres. Best to use when still warm. Store for a few days. Use for papier mâché and other projects that require a large amount of paste. You can use it for covering lamp shades and wastebaskets with cloth or wallpaper if durability is not necessary.