Name: ________________________________________________________

Class: ______________________ Date: ____________________________

School: _____________________ Teacher: _________________________

<table>
<thead>
<tr>
<th>FAT</th>
<th>Activity/Form</th>
<th>Learner's mark</th>
<th>Learner's %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Practical</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TOTAL 30
Practical Task: No 01  
Knowledge Strand/s: Life and Living and Processing

Topic: Testing Foods for Starch

Name of Learner: ________________________________  
Class _____

Instructions

1. You will complete the practical activity in class under supervision.
2. Complete all instructions in your NST exercise book.
3. Label all sections the same as on this instruction sheet.
4. Use a pen for writing.
5. All sketches must be done in pencil.

Major Process and Design Skills:
*Access information *Recall information *Observe *Compare *Measure *Sort *Classify *Identify problems  
*Raise questions *Predict *Hypothesising *Plan investigation *Do investigation *Record information *Interpret information *Communication (Plot a bar graph, Draw a table, observations)* Evaluate (Suggest ONE way in which you could improve the investigation to get more accurate results)

Background information

- Starch is a powdery, white substance found in the living cells of green plants.
- Starch is a carbohydrate, and carbohydrates are very important because they are the body’s most important and readily available sources of energy for us.
- When plants make food during photosynthesis, the plant uses sunlight to change carbon dioxide and water into glucose and oxygen. The glucose can then be converted into starch. Starch is stored in different organs in plants such as seeds, leaves, stems and roots. The seeds of maize, wheat, rice, and the stems, roots, and tubers of the potato all contain starch.
- Currently, the top five carbohydrate sources for South Africans are bread, soft drinks, cookies and cakes (including doughnuts), sugars / syrups / jams, and potatoes.
- To test the presence of starch in food, scientists use iodine solution. Iodine solution is orange or brown in colour. When starch is present, the iodine solution will turn a blue-black colour.
- The more starch there is in a sample, the darker blue-black colour it will turn.
- In the following investigation, you will be testing samples of some foods – bread, cereal and milk, etc – to see whether they contain starch.
- Cooked food samples turn a darker blue-black colour than uncooked samples, because cooking helps to break down cell walls to release starch.
NOTE: SAFETY:
- Iodine solution is toxic. Do not swallow it. (It will also stain your skin and clothes, although this is not harmful.)
- You must wear correct protective clothing and eyewear.
- Do not eat the food samples to be tested or other chemicals and do not lick your fingers.
- The starch test is sensitive, so if you use a container, e.g. test tube, for more than one investigation, make sure that you thoroughly clean it out with soap and water each time or else traces of starch from one food sample may remain on the sides and give a positive result for a sample which, in fact, contains no starch.
- The mortar and pestle must also be washed between each test.
- Do not cough or sneeze on food.
- Always wipe up spills immediately.

Investigation
- Testing food for the presence of starch.

1. Aim

TO DO: (individual)
Write down a response to each of the following:
- What is the aim of this investigation? (1)
- For what reasons do you think a scientist would want to test food for starch? (1)
- Suggest ONE way a scientist could use the information obtained from testing food for the presence of starch. (1)
- Suggest ONE other fact about food that a scientist would likely need to know? (1)

2. Prediction

TO DO: (in groups)

- Look at the labelled samples of food, provided by your teacher and predict which will contain starch?
- Predict what you think will happen when iodine solution is dropped into the flour?

3. Hypothesis – (guess answer)

- Discuss and decide in pairs on a suitable hypothesis.

TO DO: (individual)
- Formulate a suitable hypothesis for this investigation.
- Write your hypothesis like this:

  If ................[I do this],................,...then,...................[this]...........will happen  (3)
4. **Plan an investigation**

**List of Material / Equipment**

- Twelve (12) small samples of unknown food labelled; A, B, C, D, E, F, G, H, I, J, K & L.
- **NOTE**: Food sample A is water.
- Water
- Iodine solution OR Tincture of iodine (available from your local pharmacy)
- Clean pipette / medicine dropper / syringe
- Clean containers, e.g.: Test tubes with test tube racks, small white dishes / test trays (ice cube trays recommended), saucers, small jars, etc.
- Clean forceps
- Glass rod OR one box of toothpicks
- Clean mortar and pestle
- Clean spatulas or spoons for each sample of unknown food
- Pens for labelling
- Brush for cleaning test tubes
- Small knife
- Soap

**Method**

**Instructions for the teacher**

- Prepare a place/ stations in the classroom where the learners will work in groups.
- Divide the learners into groups with two to four learners in a group.
- Set out all food samples and equipment in different stations according to the number of groups.
- Remind learners about safety measures they should follow during the investigation.

**NOTE**: Some foods need preparation before testing. Touching the test food with your fingers may contaminate the foods. Use forceps to place a piece of food and small portions of dried food into their matching numbered containers.

Then, also with forceps, do the following:

- Tear the food into small pieces.
- Pull apart the piece of food.
- Flatten the piece of food.

**TO DO: (individual)**

- Redraw the table shown below in your exercise book.
- Complete the table by writing the names of the food samples to be tested in the first column, starting with water.
- Indicate whether a sample of food tested contains starch, by using the headings suggested in the sample table below:
| Food sample | Prediction:  
• Starch present  
• Starch not present  
• Don’t know | Description of food sample before adding iodine solution / tincture of iodine | Description of food sample after adding iodine solution / tincture of iodine | First test results | Second test results |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A - water</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
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<tr>
<td>C</td>
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<td>D</td>
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<td>E</td>
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<td>F</td>
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<td>G</td>
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<td>H</td>
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<td>I</td>
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<td>J</td>
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<tr>
<td>K</td>
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</tr>
<tr>
<td>L</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. **Conduct an investigation**  
Conducting an investigation and recording observations:

**TO DO: (in a group)**
- Work at a station and a group allocated by your teacher.
- Follow the instructions below.

**FOR FOOD SAMPLES THAT NEED TO BE CRUSHED**
- Use clean mortar and pestle to crush a small amount of each of the food samples, keeping each food sample separate from the others.
- **Remember to wash the mortar and pestle with soap and water before crushing the next food sample.**

[Diagram of a mortar and pestle]
• Place the crushed foods individually into clean containers using clean forceps.
• Label each container.

• Place one spoonful of each of the other foods into your containers.
• NOTE: Food sample A is pure water.

To keep foods from mixing together, make sure the number of each spoon matches the number of the food and the container.
• Label each container.
• Add two drops of water to each food sample.
• Use a toothpick / glass rod to stir and mix the food sample well with water.
• Test each food sample that is mixed with water by adding two to three drops of iodine solution / tincture of iodine to each food sample by using a clean pipette / medicine dropper / syringe.

• Wait a few more minutes to observe and note any changes.

TO DO: (individual)
• As you complete each test, record your results on the table you have drawn.

TO DO: (in a group)
• Empty all containers in the bin and clean them including and any other equipment that will be re-used.
• Clean the station you last worked at.
6. **Communicate**

**Record Observation**

**TO DO: (individual)**
- Complete a record of all the observations.

7. **Evaluation**

**TO DO: (individual)**

**Interpret Observation**
- Describe your observations in the investigation. (2)
- Interpret and discuss your observations. (2)
- Suggest reasons why your predictions may have been different from your findings.
- If your predictions were correct explain on what basis you made your prediction.
- Accept or reject the chosen hypothesis by stating an overall conclusion that you can draw from the investigation. (2)

8. **Conclusion and Improvement**

**TO DO: (individual)**

(a) Suggest ONE way in which you could improve the investigation to get more accurate results. (2)
(b) How can you tell by using this test that a substance contains starch? (1)
(c) What is the main purpose of starch in plants? (1)
(d) Why do you think that water was included as a substance to test for starch? (1)
(e) Give two examples of carbohydrates we eat? (2)
(f) What difference, if any, did you notice between the raw and cooked potato? (1)
(g) Do the amount of the food samples used in the test for starch need to be measured very accurately? Explain your answer. (2)
(h) Complete the self-assessment checklist.

**Self-Assessment Checklist**

<table>
<thead>
<tr>
<th>Features specified</th>
<th>Achieved?</th>
<th>Improvements which I could make</th>
</tr>
</thead>
<tbody>
<tr>
<td>• All instructions were carefully followed</td>
<td>Yes/No</td>
<td></td>
</tr>
<tr>
<td>• All questions have been completed in my exercise book.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Tables have been drawn, labelled correctly and completed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• I worked neatly and the work station was clean when I left</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• The work in my exercise book is neat and up to date</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• I answered all the questions</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Formal Assessment Rubric

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aim of this investigation correctly stated</td>
<td>1/1</td>
</tr>
<tr>
<td>Reasons a scientist would want to test food for starch?</td>
<td>1/1</td>
</tr>
<tr>
<td>ONE way a scientist could use the information obtained from testing food for the presence of starch.</td>
<td>1/1</td>
</tr>
<tr>
<td>ONE other fact about food samples that a scientist would likely need to know?</td>
<td>1/1</td>
</tr>
<tr>
<td>Predictions accurately made</td>
<td>2/2</td>
</tr>
<tr>
<td>A suitable hypothesis formulated / stated</td>
<td>3/3</td>
</tr>
<tr>
<td>Observations / data accurately recorded on a table</td>
<td>4/4</td>
</tr>
<tr>
<td>Observations in the investigation accurately described.</td>
<td>2/2</td>
</tr>
<tr>
<td>Basis on what predictions were made explained</td>
<td>1/1</td>
</tr>
<tr>
<td>The chosen hypothesis accepted or rejected by stating an overall conclusion that can be drawn from the investigation.</td>
<td>1/1</td>
</tr>
<tr>
<td>How one can tell by using this test that a substance contains starch</td>
<td>1/1</td>
</tr>
<tr>
<td>The main purpose of starch in plants</td>
<td>1/1</td>
</tr>
<tr>
<td>Why water was included as a substance to test for starch?</td>
<td>1/1</td>
</tr>
<tr>
<td>Two types of carbohydrates we eat?</td>
<td>2/2</td>
</tr>
<tr>
<td>Difference between the raw and cooked potato?</td>
<td>2/2</td>
</tr>
<tr>
<td>ONE way in which the investigation could be improved to get more accurate results.</td>
<td>2/2</td>
</tr>
<tr>
<td>Do the amount of the food samples used in the test for starch need to be measured very accurately? Explain your answer.</td>
<td>2/2</td>
</tr>
<tr>
<td>All test tray / small white dishes / lids of containers / saucers / test tubes emptied in the bin. Station and all equipment that could be re-used left clean.</td>
<td>2/2</td>
</tr>
</tbody>
</table>

Comment:

Signature: Teacher_________________                                      Date: _________________________________

Mark:       /30
STARCH TEST
TEACHER’S NOTES:

Introduction
This is a simple test which shows whether food contains starch. Iodine solution is used to
test for the presence of starch in various foods. It has a yellowish-orange to brown colour.
When iodine solution is mixed with starch it turns from a yellow-orange colour to a blue-black colour. Iodine solution is a sensitive test. It uses very small amounts of starch.
Schools can also use Tincture of iodine which is available from chemists at a cheap price
in the place of iodine solution.

Starch forms as grains inside the living cells of plants. Iodine solution penetrates into the
starch most easily when the cell walls have been destroyed and it reacts most readily
when the starch grains are swollen. Both these things happen when plant foods are
cooked.

We talk about a positive test result to indicate the presence starch (i.e. yellowish-orange
of brown iodine solution turns blue black) and a negative test result to indicate the
absence of starch (i.e. yellowish-orange of brown iodine solution show no colour change).

Safety Tips
The Practical Work Task should be done with learners under the direct supervision of a
teacher or an adult. Iodine solution will stain skin and clothing. It is also advisable for
learners to wear:
• Eye protection (e.g. goggles) to protect eyes
• Apron to protect clothing

Wash off any iodine that comes into contact with skin immediately. Girls should also be
advised to tie their long hair. All materials should be carefully used with instructions
carefully read and followed.

The teacher should also make sure that all learners:
• DO NOT eat any tested foods as iodine can be poisonous,
• Wash their hands well after every activity,
• Never eat or drink while conducting an experiment,
• Be careful to keep all of the materials used away from their mouth, nose, and eyes,
• Never experiment on their own,
• Clean up and dispose of materials properly when they are finished with every activity.

The starch test is sensitive, so if learners use a container, e.g. test tube for more than
one investigation, make sure that they thoroughly clean it out each time or else traces of
starch from one food sample may remain on the sides and give a positive result for a
sample which, in fact, contains no starch. The mortar and pestle must also be washed
between each test.
Method for STARCH test
You will need

### EQUIPMENT AND MATERIALS

<table>
<thead>
<tr>
<th>Test tubes</th>
<th>About thirteen (13) small samples of the following foods (or other foods of your choice)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test tube racks</td>
<td>- Potato (raw and cooked)</td>
</tr>
<tr>
<td>Alternative equipment in the place of test tubes:</td>
<td>- Banana</td>
</tr>
<tr>
<td>- test trays (ice cube trays recommended)</td>
<td>- Maize meal (raw and cooked)</td>
</tr>
<tr>
<td>- small white dishes</td>
<td>- Butter</td>
</tr>
<tr>
<td>- containers</td>
<td>- Crackers</td>
</tr>
<tr>
<td>- saucers</td>
<td>- Cheese</td>
</tr>
<tr>
<td>Glass rod</td>
<td>- Bread</td>
</tr>
<tr>
<td>Spatulas or spoons</td>
<td>- Oil</td>
</tr>
<tr>
<td>Beaker or dish</td>
<td>- Water</td>
</tr>
<tr>
<td>Brush</td>
<td>- Rice (cooked)</td>
</tr>
<tr>
<td>Labels or pen markers</td>
<td>- Flour (bread or cake)</td>
</tr>
<tr>
<td>Small knife for cutting and or chopping</td>
<td>- Sugar</td>
</tr>
<tr>
<td>Forceps</td>
<td>- Pasta</td>
</tr>
<tr>
<td>One box of toothpicks</td>
<td>- Maizena</td>
</tr>
<tr>
<td>Mechanical grinder or Mortar and pestle</td>
<td>- Apple</td>
</tr>
<tr>
<td>Pipette / medicine dropper / syringe</td>
<td>- Lettuce</td>
</tr>
<tr>
<td>Iodine solution / Tincture of iodine (available from your local pharmacy)</td>
<td>- Papers</td>
</tr>
<tr>
<td>- Minced beef</td>
<td>- Tea</td>
</tr>
<tr>
<td>- Bread</td>
<td>- Milk (1 teaspoon)</td>
</tr>
<tr>
<td>- Tea</td>
<td>- Chocolate</td>
</tr>
<tr>
<td>- Onion</td>
<td>- Orange juice</td>
</tr>
<tr>
<td>- Egg albumen</td>
<td>- Honey</td>
</tr>
<tr>
<td>- Honey</td>
<td>- 1 teaspoon of breakfast cereal</td>
</tr>
<tr>
<td>- A piece of doughnut</td>
<td>- Unknown food sample</td>
</tr>
</tbody>
</table>

### Method

Collect all the necessary equipment, materials and select food samples for the investigation. Decide on the number of stations you will use depending on the size of the class, number of learners, available equipment and materials.

- Prepare a place / station in the classroom where the learners will work in groups.
- Divide the learners into groups with two to four learners in a group.
- Set out all food samples and equipment in different stations according to the number of groups.
- Ensure that all the equipment is clean
- Give learners an opportunity to draw up a table where they will keep a record of the food samples to be tested and the results.
NOTE: Some foods need preparation before testing. Touching the test food with your fingers may contaminate the foods. Use forceps to tear the food sample into small pieces, pull apart the piece of food sample or to flatten a piece of food. Then, also with forceps put a piece of food into the labelled test tube or test tray. Some food may need to be broken up using a mortar and pestle. If the food tested is solid, grind, crush or chop a small amount and put into a container.

For foods that do not need preparation, place one spoonful of each of the foods into your container. To keep foods from mixing together, make sure the number of each spoon matches the number of the food and the container.

NOTE: Your first food sample should be pure water.

Give learners time to:
- Draw a table
- Write the names of all food samples in the first column of the table they have drawn.
- Make a prediction of food samples which will contain starch and to complete the table.

FOR FOOD SAMPLES THAT NEED TO BE CRUSHED: Use clean mortar and pestle to crush a small amount of each of the food samples, keeping each food sample separate from the others.

Add about two drops of water to the food in the tray or test tube to make it into a solution before carrying out the test. Stir the food and water well with a glass rod or a toothpick. Use a pipette to add about three drops of iodine solution to the food sample to be tested. Observe any colour changes apart from the yellow colour of iodine solution itself and record the results in the table in your notebook. Repeat the procedure with the next food sample.

CLEAN UP!!!!!
1. Compulsory for all learners.
2. Wash ALL containers THOROUGHLY with soap, water, and a test tube brush. Turn them upside down with the test tubes on the test tube rack to dry.
3. Dispose of the food samples in the bin.
4. Clean the work station and wipe it dry.

Results:
The water should be yellow. The water stays yellow because there is no starch in it. This is what scientists call a negative control because you know that it should give a negative test for starch. Scientists use controls in experiments so they know what to expect when testing unknowns. Food samples that contain starch will show you what a positive test looks like. Because we know what the result should be positive for this test, we call this a positive control.
Possible / suggested answers to some questions:

- What is the aim of this investigation?
  To investigate the food that contain starch ✓
- Reasons a scientist would want to test food for starch?
  To have knowledge about the relative contents of different food groups. ✓
- Any other relevant answer
- ONE way a scientist could use the information obtained from testing food for the presence of starch.
  To make recommendations about diets suitable for people in different circumstance, e.g. people suffering from malnutrition diseases such as kwashiorkor. A scientist can point out food rich in starch but lacking in protein and are thus quite unsuitable as a staple diet for young children. ✓
- ONE other fact about food samples that a scientist would likely need to know?
  He will need to know:
  o the relative quantities of each food class as well as whether it is present or absent,
  o the vitamin content,
  o the energy value,
  o the mineral salts present,
  o the proportion of roughage,
  o any other relevant answer.

It is important to eat a variety of foods to nourish your cells, to repair cells, for growth, to boost the immune system, etc. (Any one)
- Prediction accurately made and recorded ✓ ✓
- A suitable hypothesis correctly formulated / stated ✓ ✓ ✓
- Observations / data accurately recorded on a table ✓ ✓ ✓ ✓

- Observations in the investigation accurately described. ✓ ✓
- Basis on what predictions were made explained ✓
- The chosen hypothesis accepted or rejected by stating an overall conclusion that can be drawn from the investigation. ✓
- Suggest ONE way in which the investigation could be improved to get more accurate results.
- By repeating ✓ the investigation several times using the same type and quantity of food samples and iodine solution / tincture of iodine. ✓
- What is the main purpose of starch in plants?
- Stored food for the plant ✓
- How can you tell by using this test that a substance contains starch
- If orange or brown iodine solution used to test for starch changes to a blue/black colour ✓
- Why do you think that water was included as a substance to test for starch?
- It was used as a control in the investigation to know what to expect when testing an unknown. ✓
- Give two types of carbohydrates we eat?
  Sugars ✓ and starches ✓
- What difference, if any, did you notice between the raw and cooked potato?
  Cooked food samples turn darker blue black than uncooked samples, ✓ because cooking helps to break down cell walls and releases starch. ✓
- Do the amount of the food samples used in the test for starch need to be measured very accurately? Explain your answer.
  No. ✓ This is because the food samples for showing the presence or absence of starch do not show how much starch is present. ✓
- All equipment cleaned and the station you worked from ✓ ✓ ✓