

CHRISTIAN SOCIAL SERVICES COMMISSION (CSSC)
NORTH JOINT EXAMINATION SYNDICATES
FORM SIX PRE-NATIONAL EXAMINATION 2025
FOOD AND HUMAN NUTRITION 3
MARKING SCHEME

1. a) i) The difference between the two sets of banana slices is that, the slices not placed in boiling water changed colour (discolored/turned brownish) while those placed in boiling water remained white. **$1\frac{1}{2}$ marks**

Explanation

- The slices not placed in boiling water have to change colour and become brown due to the reactions of enzymes (enzymatic reaction) i.e those enzymes in an apple reacted with oxygen.
- The slices put in boiling water have to remain unchanged, this is because the enzymes have been inactivated or killed by heat (temperature).
- Enzymes, which catalyse browning reaction such as phenolase or peroxidase, are active in the slices not placed in boiling water, forming brown complexes known as melanin. Inactivation of such enzyme by a mild heat treatment is known as blanching.

@ Point $1\frac{1}{2}$ marks, total $4\frac{1}{2}$ marks

- ii) Name of the reaction is ***Enzymic Browning***. **1 mark**

Ways of preventing Enzymic Browning

- Thermal inactivation of polyphenol oxidase
- Elimination/Exclusion of oxygen from the system
- Change of pH to prevent enzyme action
- Use of antioxidant like ascorbic acid, Sulphur dioxide.

@ Point 1 mark, total 4 marks

b)

i. Observations

- The fresh vegetables have a natural green colour, firm texture and raw flavor
- After blanching for two minutes, the colour become deep green and the texture become soft with pleasant flavor.
- After five minutes of blanching, the colour is still deep green but some how pale or dull compared to the one blanched for two minutes, the texture become more soft with a pleasant flavor of cooked vegetables.

@ Point 1 mark, total 3 marks

- ii. The aim of the experiment is to show the effect of blanching (blanching) moist heat on the colour, texture and flavor of green vegetables. **1**

mark

- iii. Vegetables are washed before blanching to remove impurities (dirty) and microorganisms. **1 mark**

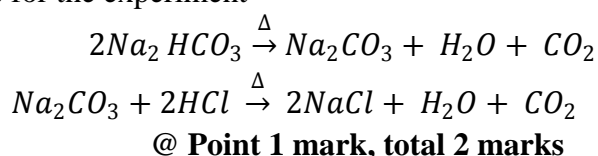
- iv. Vegetables are blanched before freezing to:

- Inactivate naturally occurring enzymes that cause deteriorative reactions during frozen storage. These reactions include colour and texture changes, off-flavours and decrease in nutritive value.
- Drive out the air bubbles from the vegetables, which are otherwise retained in their structure. For this reason enzymes and other microorganisms will not be able to survive and deteriorate the vegetables. Also removing air bubbles reduce the volume (bulkiness) of the vegetables.
- Kill harmful microorganisms.
- Remove raw flavor and soften the vegetables.
- Improve colour of the vegetables e.g green peas and carrots.

Any four points @ Point 1 mark, total 4 mark

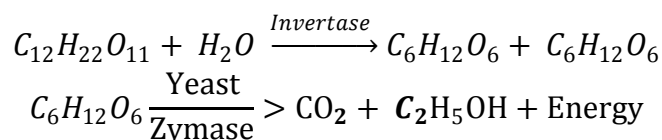
2. (i) Observations and answers

- The limewater turned milky due to the gas evolved which is CO₂. **1 mark**
- A further evolution of CO₂ due to the reaction between the sodium carbonate residue and diluted hydrochloric acid. **1 mark**
- The experiment determines the action of heat and acid on bicarbonate of soda as a raising agent. **1 mark**
- Chemical equations for the experiment



(ii) Observations

- Limewater in the flask left in a warm place turned limewater milky/cloudy after some time.
Explanation
Yeast at 30⁰C in the presence of water utilizes glucose to produce carbon dioxide gas, which turned limewater milky.
- Limewater in the flask left in a hot water (60⁰C) did not turn milky.
Explanation
This shows that CO₂ was not produced because yeast (yeast enzymes) were denatured/destroyed by heat.
Chemical equations



@ Point 1 mark, total 6 marks

(iii) Role played by yeast and cane sugar

- Cane sugar has been used as a source of energy for the maximum activities of yeast.
- Yeast ferment sugars to form two important products, which are carbon dioxide gas and alcohol. Carbon dioxide gas produced is the one used as raising agent.

@ Point 1 mark, total 2 marks

(iv) The observed properties of yeast

- Yeast is a biological (living) raising agent that utilizes sugar as a source of energy.
- Yeasts are active at room temperature and are destroyed by high temperatures.

@ Point 1 mark, total 2 marks

3. Experiment I

Observed changes in a series of colours which were from blue, green, yellow, orange and finally brick red precipitate. **1 mark**

Inference; non- reducing sugar was present. **0.5 mark**

Bases on the observed changes;

Hcl hydrolyses non- reducing sugar (complex sugar) to reducing sugar (simple sugar). Benedict's soln contains copper sulphate.

The reducing sugars reduce soluble blue copper sulphate which has copper (II) ions (cu^{2+}) to copper (I) ion which appears as insoluble red brown copper oxide (brick red). $cu^{2+} \rightarrow cu^+ + e^-$

marks

Experiment II

Observed purple or violet colour.

When sample B was mixed with dilute copper sulphate, nitrogen atoms in the peptide bonds formed purple colour with copper II ions. **1 mark**

This proved that protein was present in sample B. **0.5mark**

Basis of the observed changes;

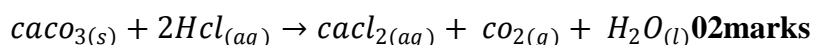
When protein mixed with dilute alkaline copper (II) sulphate soln, nitrogen atoms in the peptide bonds form a purple complex with copper (II) ions from copper (II) sulphate. **02 marks**

Experiment III

Observed white precipitates **01mark**

Show that calcium was present **0.5 mark**

Hcl was added in sample C in order to dissolve calcium carbonate present in the plant sources. **01 mark**



Experiment IV

Observed the formation of bright yellow precipitate **01 mark**

Shows that phosphate is present. **0.5 mark**

Food sources may be spinach, cassava leaves, green leafy vegetables, legume leaves, beans, nuts, soybeans, whole cereals, amaranths. **any three @0.5=1.5mrks**

Warming or temperature speeds up the rate of reaction. **01mark**