

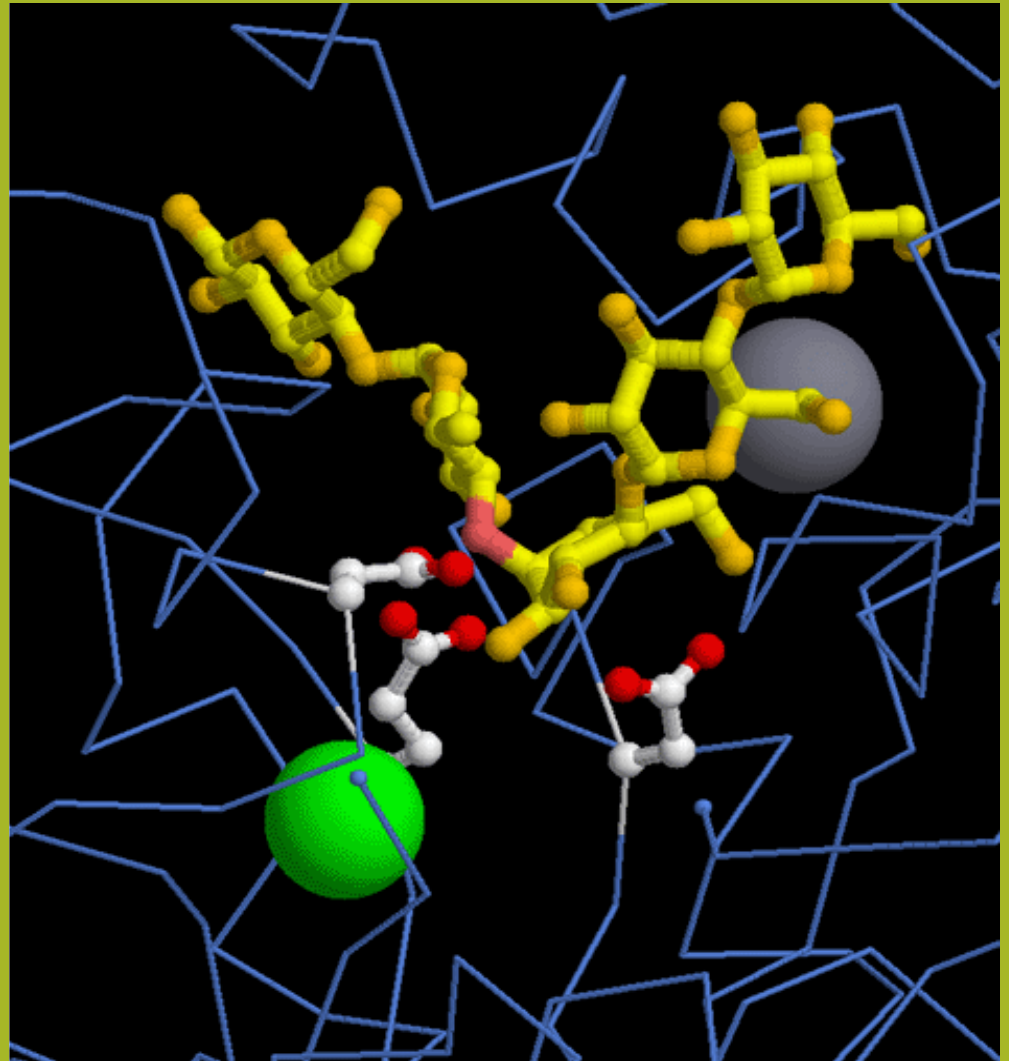
# Human Digestion

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## Enzymes

Junior Certificate

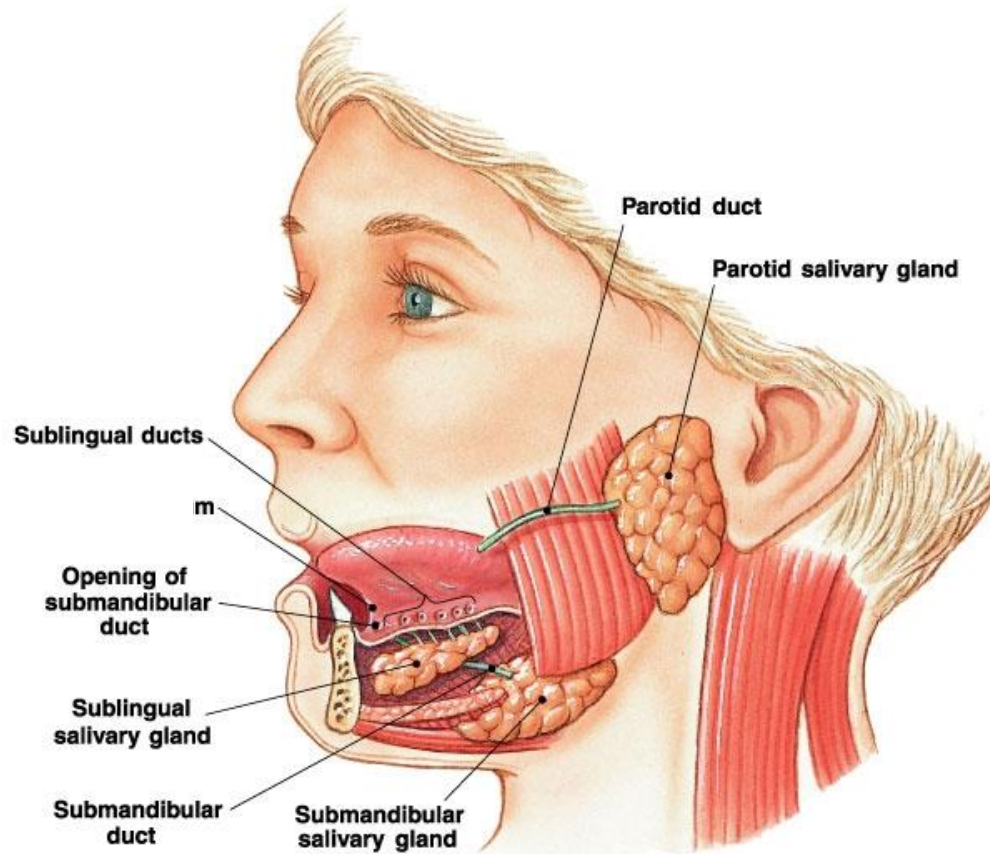
# Investigating the act of the Enzyme Amylase



# Enzymes

- Enzymes are chemicals produced in living cells, which speed up and control chemical reactions.
- An enzyme works as **Catalyst** by combining with a **Substrate**.
- It breaks the substrate down into a **Product**.
- **Amylase** is an enzyme produced in the salivary glands and breaks down starch (substrate) into a simpler sugar called **Maltose** (product).

# Salivary Glands



# What is the function of Saliva?

- Saliva is thick colourless liquid containing water, mucin, salts and the enzyme salivary amylase (ptyalin)

## Water and Mucin

- moisten and lubricate the food.

## Salts

- sodium chloride and sodium bicarbonate provide a slightly alkaline or near neutral medium in which amylase works best.

## Amylase

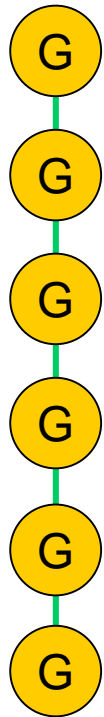
- begins the digestion of starch

Enzyme + Substrate = Product + Enzyme

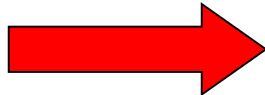


# An Enzyme in Action

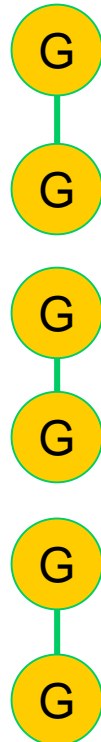
Starch  
molecule



Amylase



Maltose  
molecules



Glucose  
molecules



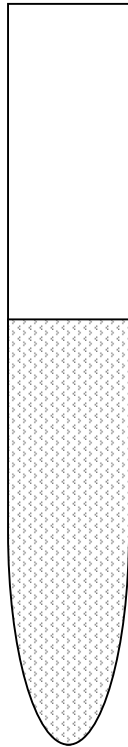
# Planning and Preparation

- Three test tubes and test tube rack,
- Starch solution, Amylase, Iodine,
- Benedicts solution
- Biurets Reagent
- Hotplate, dropper,
- Thermometer, beaker, water.



# Preparing the Solutions

A



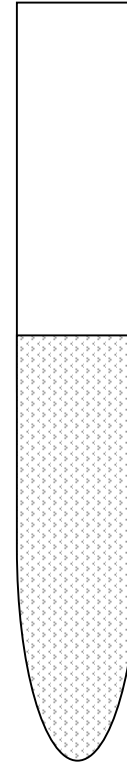
**Amylase and  
Starch**

B



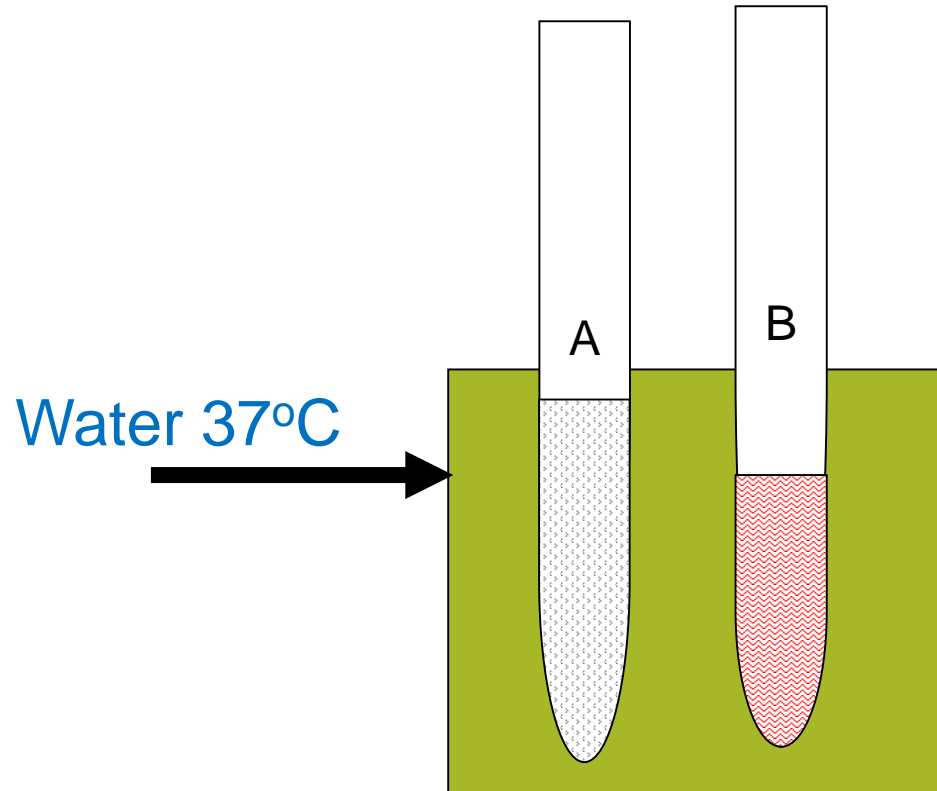
**Starch only**

C

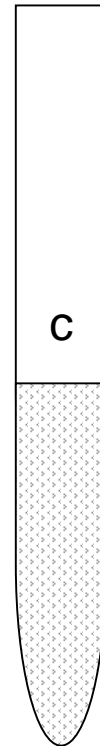


**Amylase and  
Starch**

# Preparing the Solutions



Add Benedict's  
Solution

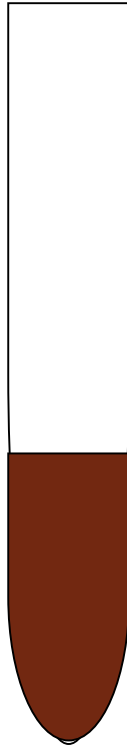


# Procedure

1. Set up the apparatus as shown in diagram.
2. Add 3 ml of starch solution to A and B
3. Place 2 ml of amylase in test tube B
4. Place A and B in a water bath at 37° for 5 minutes.
5. Remove and place in the test tube rack.
6. Test both with Iodine
7. Add amylase and starch to test tube C.
8. Add 3-4 drops of Benedicts solution and place in the water bath at 37° for 3-5 minutes.
9. Observe the results.

# Results

A



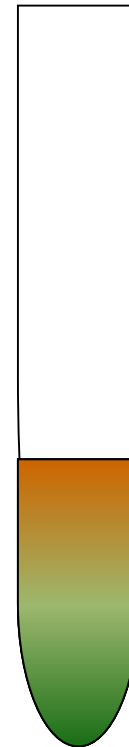
Tested with Iodine  
Starch only

B



Tested with Iodine  
Starch and Amylase

C



Tested with Benedicts  
Amylase and Starch

# Results

A Starch Only

## Iodine added

Turns blue/black Starch Only  
Showing starch is present

B Amylase and Starch

## Iodine added

No colour change  
No starch present (starch has been  
broken down)

C Amylase and Starch

## Benedicts added

Turns **Green**  
Showing presence of reduced sugar  
Maltose

# Conclusion

- **Amylase** found in Saliva begins the digestion of starch in the mouth.
- The amylase, breaks the chemical bonds in the starch molecule, breaking it into **simpler sugar (Maltose)**.
- The negative result for starch in test tube A proved that amylase breaks starch.

# Extension

- Enzymes are highly specific. They will not interact with just any substance. Amylase will only act on carbohydrates, Protease will act only on protein and nothing else.
- Enzymes must work in the mild conditions of a cell in the body, at approximately 40°C and at a pH between 6.5 and 7.5. All enzymes are sensitive in some degree to temperature.
- Temperatures 55°C or above for over 30 minutes will generally cause rapid degradation of many enzymes with a concurrent loss of activity. Optimal temperatures for most hydrolytic enzymes is 40°C to 50°C
- 10°C below the optimal temperature reduces the effective activity by about 30%.