

NUTRITION

**THIS IS THE PROCESS
WHEREBY LIVING
ORGANISMS OBTAIN AND
UTILIZE NUTRIENTS**

TWO MODES OF NUTRITION;

- **AUTOTROPHIC NUTRITION**
- **HETEROTROPHIC
NUTRITION**

AUTOTROPHIC NUTRITION

**ORGANISM MAKE OWN FOOD
FROM SIMPLE SUBSTANCES
USING ENERGY.**

**THE ORGANISMS ARE CALLED
AUTOTROPHS.**

HAS TWO MAIN TYPES;

- **CHEMOSYNTHESIS**
- **PHOTOSYNTHESIS**

HETEROTROPHIC NUTRITION

**THIS IS A MODE OF
NUTRITION WHERE AN
ORGANISM TAKES IN READY
MADE COMPLEX FOOD
SUBSTANCE FROM THE BODY
OF ANOTHER ORGANISM.**

**SUCH ORGANISM ARE
CALLED HETEROTROPHS.**

IMPORTANCE NUTRITION

- **IT PROVIDE SUBSTANCES THAT ARE BROKEN DOWN BY RESPIRATION TO RELEASE ENERGY. THIS ENERGY IS USED FOR VARIOUS BIOLOGICAL PROCESSES**
- **IT PROVIDES THE RAW MATERIALS FOR GROWTH AND DEVELOPMENT**
- **PROVIDES THE RAW MATERIALS FOR REPRODUCTION ETC**

PHOTOSYNTHESIS

- THIS IS THE PROCESS WHEREBY GREEN PLANTS **MAKE THEIR OWN FOOD** BY USING SIMPLE SUBSTANCES LIKE **WATER, SUNLIGHT, CARBON (IV) OXIDE AND CHLOROPHYL.**
- **OXYGEN IS ALWAYS GIVEN OUT AS A BYPRODUCT.**

IMPORTANCE PHOTOSYNTHESIS

- **SERVES AS A SOURCE OF FOOD TO THE PLANT**
- **REMOVES CO₂ FROM ATMOSPHERE**
- **IT REPLENISHES OXYGEN IN THE ATMOSPHERE**
- **IT CONTRIBUTES TO SYMBIOTIC RELATIONSHIP BETWEEN PLANTS AND ANIMALS.**

EXTERNAL LEAF STRUCTURE

####DIAGRAM

- PETIOLE
- MIDRIB
- VEINS
- LAMINA
- APEX

INTERNAL LEAF STRUCTURE

####DIAGRAM

1. CUTICLE;

- **TRANSPARENT, WAXY AND WATERPROOF LAYER ON THE EPIDERMIS.**

- **IT ALLOWS PENETRATION OF LIGHT TO THE PHOTOSYNTHETIC TISSUE.**

- **IT REDUCES EXCESS WATER LOSS BY EVAPORATION. IT PROTECTS FROM MECHANICAL DAMAGE.**

2. THE EPIDERMIS

- THIS IS THE OUTERMOST LAYER AND ITS ONE CELL THICK.**
- THESE CELLS LACK CHLOROPLAST**
- THEY ARE ALSO TRANSPARENT TO ALLOW LIGHT TO PASS THROUGH.**
- IN SOME REGIONS, THIS CELLS ARE MODIFIED INTO GUARD CELLS WHICH OPEN AND CLOSE THE STOMATA**

3. MESOPHYL LAYER

**THIS IS THE MIDDLE LAYER
CONSISTING OF TWO TISSUES.**

- THE PALISIDE MESOPHYL**
- THE SPONGY MESOPHYL**

**####-→PALISIDE
MESOPHYL**

4. THE PALISIDE MESOPHYL

- IT CONSIST OF CELLS
PACKED WITH NUMEROUS
CHLOROPLAST.**
- THE CHLOROPLAST
CONTAIN CHLOROPHYL FOR
PHOTOSYNTHESIS.**

**THE CELLS ARE LOCATED
BENEATH THE UPPER
EPIDERMIS TO RECEIVE
MAXIMUM SUNLIGHT**

**THEY ARE TIGHTLY PACKED
TO TRAP MOST OF THE
INCOMING SUNLIGHT.**

5. SPONGY MESOPHYL LAYER
IT CONSISTS OF CELLS
LOCATED BETWEEN THE
PALISIDE MESOPHYL AND THE
LOWER EPIDERMIS.

THE CELLS ARE IRREGULARLY
SHAPED AND LOOSLY
ARRANGED CREATING LARGE
INTERCELLULAR SPACES

**THIS AIR SPACE PROMOTE
DIFFUSION OF GASES
THROUGH THE LEAF.**

**THIS CELLS ALSO HAVE
CHLOROPLAST BUT NOT AS
MUCH AS THE PALISIDE
MESOPHYL.**

6. VASCULAR BUNDLES

CONSISTS OF XYLEM AND THE PHLOEM.

- XYLEM CONDUCTS WATER**
- PHLOEM TRANSLOCATED FOOD**

7. STOMATA

8. GUARD CELL

ADAPTIONS OF TO LEAF

PHOTOS

- **GREEN IN COLOR DUE TO CHLOROPHYL TO TRAP LIGHT ENERGY**
- **THIN TO FACILLITATE FASTER DIFFUSION AND LIGHT PENETRATION**
- **IT IS BROAD TO INCREASE THE SURFACE AREA FOR ABSORPTION OF LIGHT AND CARBON (IV) OXIDE FROM THE ATMOSPHERE.**

- IT HAS **VEINS PROVIDING ADDITIONAL SUPPORT** AND VACULAR BUNDLES TO CONDUCT WATER AND TRANSLOCATION IN THE LEAF.
- IT HAS A **PETIOLE PROVIDING SUPPORT** BY ATTACHING IT TO THE STEM AND EXPOSE IT TO SUNLIGHT.

ADAPTATIONS OF LEAF TO ABSORB SUNLIGHT

- **LEAVES ARE ARRANGED IN MOSAIC PATTERN AS THIS PREVENTS OVERLAPPING**
- **THE SHOOTS TEND TO GROW TOWARDS THE SUNLIGHT FOR MAXIMUM LIGHT ABSORPTION**

THE CHLOROPLAST

**ORGANELLE WHERE
PHOTOSYNTHESIS TAKES
PLACE**

**MAINLY FOUND IN THE
MESOPHYL AND GUARD CELLS**

**IT IS SURROUNDED BY TWO
MEMBRANES, OUTER AND
INNER**

**INSIDE THE MEMBRANES
ARE THE GRANA WHERE
LIGHT STAGE OCCURES.**

**ONE GRANA IS CONNECTED
TO THE OTHER VIA THE
INTERGRANNA OR THE
LAMELLAE**

**THE GRANA CONTAIN
CHLOROPHYL**

**STROMA IS AN AQUEOUS
MATRIX CONTAINS ENZYMES
THAT SPEED UP
PHOTOSYNTHETIC REACTION.**

ADAPTATIONS OF CHLOROPLAST

- **IT CONTAINS CHLOROPHYL TO TRAP LIGHT ENERGY**
- **IT HAS GRANA FOR ACCOMMODATING LARGE CHLOROPHYL PIGMENTS**
- **IT HAS STROMA CONTAINING ENZYMES FOR PHOTOSYNTHETIC RXNS**

- THE **STROMA IS COLORLESS** ALLOWING LIGHT TO REACH THE GRANA AND CHLOROPHYLL

- THE **STROMA HAS ENZYMES** THAT CATALASE CARBON (IV) **OXIDE** FIXATION PROCESS

REQUIREMENTS FOR PHOTOSYNTHESIS

- **WATER OR MOISTURE**
- **LIGHT**
- **CARBON (IV) OXIDE**
- **CHLOROPHYLL**

THE PHOTOSYNTHESIS

**PHOTOSYNTHESIS IS THE
PROCESS WHEREBY GREEN
PLANTS MAKE THEIR OWN
FOOD BY USING SIMPLE
SUBSTANCES LIKE WATER,
SUNLIGHT, AIR AND
CHLOROPHYL MOLECULES.**

**TWO STAGES
LIGHT AND DARK STAGE**

THE LIGHT STAGE

**STAGE ALSO CALLED LIGHT
DEPENDENT STAGE SINCE IT
MUST USE LIGHT.**

**IT OCCURES IN THE GRANA
WHICH HAS CHLOROPHYLL
MOLECULES THAT ABSORBS
THE SUNLIGHT.**

**PHOTOLYSIS IS THE MAIN
PROCESS HERE;**

**PHOTO MEANS LIGHT
LYSIS MEANS SPLITTING**

**THEREFORE PHOTOLYSIS IS
THE SPLITTING OF WATER
MOLECULES TO HYDROGEN
AND OXYGEN MOLECULES**

OXYGEN; RELEASED VIA STOMATA
SOME IS USED BY THE PLANT

HYDROGEN;

SUNLIGHT; SOME STORED AND
USED IN DARK STAGE

SOME USED TO FORM THE
ENERGY RICH ATP ENERGY.

THIS INVOLVES CONVERSION OF
LIGHT ENERGY TO CHEMICAL
ENERGY

THE DARK STAGE

**ALSO CALLED THE LIGHT
INDEPENDENTS STAGE.**

IN THE STROMA

**CARBON (IV) OXIDE FIXATION
IS THE MAIN PROCESS
WHERE CO₂ COMBINES WITH
HYDROGEN**

THEIR COMBINATION YIELDS

- **A CARBOHYDRATE** IN FORM OF **GLUCOSE**

- **WATER MOLECULES.** SOME IS STORED AS EXCESS REMOVED

- **ENERGY**

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END PRODUCTS OF PHOTOSYNTH

- **SOME GLUCOSE IS USED IN RESPIRATION**
- **SOME GLUCOSE IS CONVERTED TO STARCH FOR STORAGE**
- **SOME GLUCOSE IS CONVERTED TO SUCROSE WHICH IS TRANSLOCATED IN THE PLANT**

• **SOME GLUCOSE IS USED IN
MAKING CELLULOSE CELLWALL**

• **FATTY ACIDS AND GLYCEROL
ARE COMBINED TO FORM OILS
N FATS**

• **AMINO ACIDS ARE CONVERTED
TO PROTEINS**

ETC ETC



FACTORS AFFECTING PHOTOSYNTHESIS

- **LIGHT VARIATIONS**
- **TEMPERATURE VARIATIONS**
- **CARBON (IV) OXIDE
CONCENTRATION**
- **WATER**

**CHEMICAL
COMPONENTS
CONSTITUTING
LIVING
ORGANISMS**

CARBOHYDRATES

**THEY ARE LARGE GROUPS OF
ORGANIC COMPOUNDS
CONTAINING THE ELEMENT
CARBON, HYDROGEN AND OXYGEN
IN THE RATIO 1:2:1**

**THEY HAVE A GENERAL FORMULA
OF $(CH_2O)_n$**

**n IS THE NUMBER OF CARBON
ATOMS**

**CARBOHYDRATES ARE
DIVIDED INTO THREE GROUPS;**

- **MONOSACCHARIDES (SIMPLE
SUGAR)**

- **DISACCHARIDES (DOUBLE
SUGARS)**

- **POLYSACCHARIDES
(COMPLEX SUGARS)**

THE MONOSACCHARIDES

THEY ARE THE **SIMPLEST**
CARBOHYDRATES HAVING A
GENERAL FORMULA OF $(CH_2O)_n$
 $n=6$

THEREFORE, FORMULA IS
 $C_6H_{12}O_6$

GLUCOSE, FRUCTOSE,
GALACTOSE, RIBOSE AND
DEOXYRIBOSE

**GLUCOSE IS FOUND IN CELL
CYTOPLASM BLOOD OF
VERTEBRATES**

**FRUCTOSE IS FOUND IN RIPE
FRUITS**

**RIBOSE AND DEOXYRIBOSE
IS FOUND IN THE NUCLEUS**

PROPERTIES MONOSACCHARIDES

- **THEY ARE SWEET TASTE**
- **THEY ARE CRYSTALLISABLE**
- **THEY ARE SOLUBLE IN WATER**

- **THEY ARE REDUCING SUGARS;
THEY REDUCE BLUE
COPPER (II) SULPHATE TO
RED COPPER (I) OXIDE.**

FUNCTIONS OF MONOSACCHARIDES

- **THEY ARE OXIDISED IN RESPIRATION TO RELEASE ENERGY.**
- **THEY ARE THE BUILDING BLOCKS OF DISACCHARIDE AND POLYSACCHARIDE.**

THE DISACCHARIDES

THIS IS FORMED WHEN **TWO MONOSACCHARIDES COMBINE.**

MONO + MONO -> DISACH + WATER

THIS PROCESS INVOLVES THE LOSS OF A SINGLE WATER MOLECULE AND THEREFORE **CALLED CONDENSATION.**

THE BOND LINKING TWO MONOSACCHARIDE IS CALLED **GLYCOSIDIC BOND.**

EXAMPLES OF DISACCHARIDE;

- **SUCROSE**
- **MALTOSE**
- **LACTOSE**

**EACH IS FORMED BY
COMBINATION OF DIFFERENT
MONOSACCHARIDES.**

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CONDENSATION REACTION

**GLUCOSE + GLUCOSE →
MALTOSE + WATER**

**GLUCOSE + FRUCTOSE --→
SUCROSE + WATER**

**GLUCOSE + GALACTOSE →
LACTOSE + WATER**

PROPERTIES DISACCHARIDES

- **THEY ARE SWEET TASTE**
 - **THEY ARE CRYSTALLISABLE**
 - **THEY ARE SOLUBLE IN WATER**
-
- **MALTOSE AND LACTOSE ARE REDUCING SUGARS WHILE SUCROSE IS NON REDUCING SUGAR.**

- **SUCROSE IS FOUND IN GREEN PLANTS, SUGAR CANE AND SUGAR BEETS**

- **MALTOSE IS FOUND IN GREMINATING BARLEY**

- **LACTOSE IS FOUND IN MAMMALIAN MILK**

**THE DISSACHARIDE CAN BE
BROKEN INTO DIFFERENT
MONOSACCHARIDES IN A
PROCESS **CALLED HYDROLYSIS.****

**THIS PROCESS INVOLVES
SPLITTING OF LARGE MOLECULES
INTO SMALLER CONSTITUENTS BY
USING WATER.**

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**IT MAY BE ACHIEVED BY
HEATING THE DISACHARIDE
WITH DILLUTE HCL.**

**IN THE BODY OF ORGANISM
HYDROLYSIS IS CATALYSED BY
HYDROLYTIC ENZYMES**

**DISACH + WATER →
2MONOSACCHA**

HYDROLYSIS REACTION

**SUCROSE + WATER →
GLUCOSE + FRUCTOSE**

**LACTOSE + WATER →
GLUCOSE + GALACTOSE**

**MALTOSE + WATER →
GLUCOSE + GLUCOSE**

FUNCTIONS OF DISSACHARIDES

- **THEY ARE HYDROLISED TO MONOSACCHARIDES WHICH ARE USED TO RELEASE ENERGY**
- **SUCROSE IS MAIN FORM OF TRANSLOCATION**
- **SUCROSE IS A FORM FOOD IS STORED IN PLANTS.**

THE POLYSACCHARIDES

- THEY HAVE A GENERAL FORMULA OF $(C_6H_{10}O_5)_n$
- THE VALUE OF n IS VERY LARGE.
- THEY ARE MADE UP OF VERY MANY MONOSACCHARIDE MOLECULES.
- EXAMPLES; STARCH, CELLULOSE AND GLYCOGEN

THE STARCH

- IT IS PRESENT **AS STORED FOOD** IN THE PLANT TISSUES.

- IT **FORMED BY THE CONDENSATION** (300 TO 1000 GLUCOSE UNITS)

THE CELLULOSE

- IT EXISTS AS **COMPONENT OF CELL WALL** IN THE PLANTS
- IT IS FORMED BY **CONDENSATION OF (14,000 GLUCOSE UNITS)**
- IT IS **TOUGH, FIBROUS AND INSOLUBLE IN WATER**. DUE TO THIS, IT IS USED TO **MAKE COTTON GOODS AND PAPER**.

THE GLYCOGEN

- IT IS PRESENT AS **STORED CARBOHYDRATES** IN ANIMAL TISSUE.
- IT IS **SYNTHESIZED FROM EXCESS GLUCOSE**.
- IT HAS **(30,000 GLUCOSE UNITS CONDENSED)**

PROPERTIES OF POLYSACCHARID

- **ALL ARE INSOLUBLE IN WATER**
- **DO NOT HAVE A SWEET TASTE**
- **THEY ARE ALL NON REDUCING SUGARS**

FUNCTIONS OF POLYSACCHARIDE

- **THEY ARE ALL STRUCTURAL COMPOUNDS. E.G**
CELLULOSE IS A COMPONENT OF THE PLANT CELL WALL
- **THEY ARE OXIDISED TO RELEASE ENERGY.**

FUNCTIONS OF CARBOHYDRATES

- **THEY ARE A SOURCE OF ENERGY**
- **AS A STRUCTURE OF THE PLANT CELL. EXAMPLE THE CELLULOSE.**
- **AS ROUGHAGE SINCE CELLULOSE PROVIDES BULK AND RESISTANCE TO MUSCLES IN THE ALIMENTARY CANAL. THIS PREVENTS CONSTIPATION.**

**THE
PROTEINS→**

PROTEINS

**THEY ARE COMPOUNDS OF
CARBON HYDROGEN AND
OXYGEN.**

**SOMETIMES THEY MAY
CONTAIN NITROGEN, SULPHUR
OR PHOSPHOROUS.**

**SOME LIKE THE HAEMOGLOBIN
ALSO MAY CONTAIN IRON.**

**THEY ARE MADE UP OF SMALL
UNITS CALLED AMINO ACIDS.**

**THERE ARE ABOUT 20
DIFFERENT TYPES OF AMINO
ACIDS OCCURRING NATURALLY.**

**THE AMINO ACIDS HAVE AN
AMINO GROUP (NH₂)
CONSISTING OF NITROGEN AND
HYDROGEN.**

**THE PROTEINS ARE REFERRED
TO AS **NITROGENOUS
COMPOUNDS** BECAUSE THEY
HAVE NITROGEN IN THEIR
STRUCTURE.**

####DIAGRAM

**THEY ARE FORMED BY THE
CONDENSATION OF TWO
AMINO ACID GROUPS **TO FORM
DIPEPTIDE MOLECULE.****

**AMINO + AMINO → PROTEIN +
WATER**

**DURING THIS PROCESS,
WATER MOLECULE IS FORMED.**

**THE TWO AMINO ACIDS ARE
JOINED BY A FORCE CALLED
PEPTIDE BOND.**

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####----DIAGRAM---→

**FURTHER CONDENSATION LEADS TO
ADDITION OF MORE AMINO ACIDS
TO A PROTEIN CHAIN. THIS LEADS
TO EVEN LONGER PROTEIN CHAIN
WHICH IS CALLED A POLYPEPTIDE
CHAIN.**

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**THE UNIQUENESS OF A
PARTICULAR PROTEIN IS
DETERMINED BY THE TYPE
AND THE SEQUENCE OF AMINO
ACID THAT IT CONTAINS.**

PROPERTIES OF PROTEINS

- **MOST ARE SOLUBLE IN WATER BUT DO NOT FORM TRUE SOLUTIONS THEY FORM COLLOIDAL SUSPENSION.**

- **MOST ARE DENATURED IN TEMPERATURES ABOVE 40**

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- **MOST ARE ALSO DENATURED BY EXTREME pH**

- **THEY ARE AMPHOTERIC IN NATURE. THIS PROPERTY ENABLES PROTEINS TO COMBINE WITH NON PROTEIN COMPOUNDS TO FORM CONJUGATED PROTEINS.**

IN MUCUS, NON PROTEIN COMPOUND IS CARBOHYDRATE WHILE IN HAEMOGLOBIN IT IS IRON

FUNCTION OF PROTEINS

1. AS STRUCTURAL MATERIAL;
THEY FORM PART OF THE CELL
MEMBRANE. FIBROUS PROTEINS
WHERE THE POLYPEPTIDE
CHAIN IS VERY LONG HAVE A
GREAT PHYSICAL STRENGTH.

THEY FORM CONNECTIVE
TISSUES, MUSCLE FIBRES,
NAILS, HOOVES IN MAMMALS
ETC.

**2. REGULATION OF
METABOLIC REACTIONS IN
THE BODY. ENZYMES AND
HORMONES ARE PROTEINS
IN NATURE.**

**ENZYMES ARE METABOLIC
CATALYSTS WHILE
HORMONES REGULATE THE
METABOLIC PROCESSES.**

3. SOURCE OF ENERGY WHERE PROTEINS ARE USED TO RELEASE ENERGY IN THE ABSENCE OF CARBOHYDRATES AND LIPIDS. THIS IS MAINLY DURING STARVATION

4. DEFENCE AGAINST INFECTIONS WHEREBY THE ANTIBODIES ARE MAINLY MADE UP OF PROTEINS. THEY DESTROY PATHOGENS IN THE BODY.

**5. GROWTH AND REPAIR OF
WORN OUT TISSUES
WHEREBY THE ENZYME
FIBRINOGEN IS
PROTEINOUS AND IT
FACILLITATES THE BLOOD
CLOTTING PROCESS.**

PROTEIN AS STORAGE PRODUCTS

- **PLANTS STORE EXCESS PROTEINS IN SEEDS USED DURING GERMINATION**
- **MAMMALS STORE SOME PROTEINS IN THE FORM OF CASEIN IN MILK**

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SOURCE OF PROTEIN

ESSENTIAL AMINO ACIDS ARE THE ONES THAT CANNOT BE SYNTHESIZED BY HUMAN BODY AND MUST BE OBTAINED FROM THE DIET.

SOME PROTEINS THAT WE EAT CONTAIN ALL ESSENTIAL AMINO ACIDS HENCE CALLED 1ST CLASS AMINO ACIDS.

**ALL ANIMAL PROTEIN AND
SOYA BEANS MAKE UP THE
1ST CLASS AMINO ACIDS.**

**2ND CLASS PROTEINS LACK
ONE OR MORE ESSENTIAL
AMINO ACIDS. MOST
HOWEVER ARE PLANT
PROTEINS AND FEW ANIMAL
PROTEINS.**

THE LIPIDS →

LIPIDS

- MAINLY CONSIST OF **FATS AND OILS**.
- THEY ARE MADE OF ELEMENTS; **CARBON, HYDROGEN AND OXYGEN**
- AT ROOM TEMPERATURES, **FATS ARE SOLID AS OILS ARE LIQUIDS**.
- THEIR BUILDING BLOCKS ARE MAINLY **FATTY ACIDS AND GLYCEROLS**

**•THE NATURE OF LIPIDS
DEPENDS ON THE FATTY ACID IT
CONTAINS EVEN THOUGH THE
GLYCEROL IS THE SAME IN ALL
LIPIDS.**

**•COMPLEX LIPIDS ARE FORMED
BY THE CONDENSATION
PROCESS.**

**EXAMPLE, PHOSPHOLIPIDS,
WAXES, STEROIDS AND
CHOLESTROL.**

PROPERTIES OF LIPIDS

- **INSOLUBLE IN WATER BUT SOLUBLE IN ORGANIC SOLVENTS LIKE ALCOHOL AND ETHER FORMING SUSPENSIONS.**
- **THEY ARE INERT HENCE STORED UNDER THE TISSUES OF THE ORGANISMS.**
- **FATS MELT AND LIQUEFY AT HIGH TEMPS AND SOLIDIFY AT LOW**

FUNCTIONS OF LIPIDS

- **RAW MATERIAL FOR THE CELL MEMBRANE**
- **INSULATION AGAINST HEAT LOSS**
- **SHOCK ABSORBERS FOR THE ORGANS**
- **SOURCE OF ENERGY WHEN OXIDISED**
- **SOURCE OF METABOLIC WATER WHEN OXIDISED**

**FOOD
TESTS###→**

FOOD TEST

**THE BENEDICT SOLUTION
CONTAINS;**

**SODIUM CARBONATE, SODIUM
CITRATE AND COPPER(II)
SULFATE PENTAHYDRATE**

• REDUCING SUGARS→

**ADD FOOD TO TEST TUBE
ADD BENEDICT SOLUTION
OBSERVE COLOR CHANGE**

• NON REDUCING SUGAR →

USE DILLUTE HCL

THEN NaHCO_3

ADD BENEDICT SOLUTION

• PROTEINS OR BIURET TEST →

ADD NaOH

THEN CuSO_4 AND SHAKE

PURPLE COLOR

• LIPIDS →

1. EMULSION TEST

ADD **ALCOHOL AND SHAKE**

ADD **WATER** AND SHAKE

WHITE SUSPENSION

2. GREASE SPOT TEST

RUB OIL ON FILTER PAPER

HOLD PAPER ABOVE A FLAME

- **VITAMIN C →**

BLUE DCPIP TO COLORLESS

- **STARCH**

PUT FOOD IN A TEST TUBE

ADD IODINE

**BROWN COLOR TO BLUE
BLACK**

TESTING STARCH FROM A GREEN LEAF;

- TAKE A LEAF EXPOSED TO
SUN FOR SEVERAL HOURS**
- BOIL IN A WATERBATH FOR 2
TO 3 MINUTES.**

**#THIS TREATMENT KILLS
THE LIVING TISSUES IN THE
LEAF PREVENTING FURTHER
CHEMICAL REACTIONS**

**#ALSO RUPTURES STARCH
GRANULES**

•TAKE A TESTTUBE HAVING
WARM METHYLATED SPIRIT
AND DIP THE LEAF INSIDE. THIS
WILL **DISCOLORISE THE LEAF**
REMOVING ALL CHLOROPHYL.
FROM HERE THE LEAF WILL BE
STIFF AND BRITTLE.

•**REMOVE IT AND DIP IN A**
BEAKER CONTAINING WATER
TO REHYDRATE AND SOFTEN IT

•PLACE THE LEAF IN A WHITE TILE AND ADD THREE DROPS OF IODINE SOLUTION TO IT.

•THE PARTS HAVING STARCH ARE STAINED BLUE BLACK.

•METHYLATED SPIRIT TURNS FROM PURPLE COLOR TO GREEN INDICATING PRESENCE OF CHLOROPHYLL IN THE LEAF