INTRODUCTION TO BIOLOGY

- **BIOLOGY IS DERIVED FROM GREEK WORD**
  - **BIOS – LIFE**
  - **LOGOS – KNOLEDGE**

THEREFORE BIOLOGY IS THE STUDY OF LIFE

BRANCHES OF BIOLOGY

THREE MAIN BRANCHES;

- **BOTANY**
- **ZOOLOGY**
- **MICROBIOLOGY**

OTHER BRANCHES;

MORPHOLOGY – STUDY OF EXTERNAL STRUCTURE OF ORGANISM

ANATOMY – STUDY OF INTERNAL STRUCTURE

PHYSIOLOGY – STUDY OF THE FUNCTIONING OF THE BODY

BIOCHEM – STUDY OF CHEMISTRY OF MATERIALS IN ORGANISMS

CYTOLOGY – STUDY OF CELLS

GENETICS – STUDY OF INHERITACE

ECOLOGY – STUDY OF THE RELATIONSHIP OF ORGANISMS WITH THE ENVIRONMENT.

TAXONOMY – PLACING ORGANISMS IN GROUPS OF ORIGINAL ANCESTRY

HISTOLOGY – STUDY OF TISSUES

VIROLOGY

BACTERIOLOGY

ENTOMOLOGY

ICHTHYOLOGY

IMPORTANCE OF BIOLOGY

- LEARN DIFFERENT FUNCTIONING OF HUMAN BODY
- LEARN MORE ABOUT CELLS AND TISSUES
- LEARN MORE ABOUT GENETICS
- STUDY MORE ABOUT PLANTS
- CAREER SUBJECT
- STUDY ABOUT THE FUNCTIONING OF THE BRAIN AND HEART

CHARACTERISTICS OF LIVING

- NUTRITION
- RESPIRATION
- GASEOUS EXCHANGE
- EXCREATION
- GROWTH AND DEVELOPMENT
- REPRODUCTION
- IRRITABILITY
- MOVEMENT

DIFFERENCE PLANTS AND ANIMALS

PLANTS	ANIMALS
HAVE CHLOROPHYLL	LACK CHLOROPHYLL
THEIR CELLS HAVE CELLULOSE	CELLS LACK CELLULOSE

HAVE SIMPLE EXCRETORY ORGANS.	HAVE COMPLEX EXCRETORY ORGANS.
ONLY MOVE	MOVE AND LOCOMOTE

RESPOND SLOWLY TO CHANGES IN THE ENVIRONMENT.	**RESPOND QUICKLY.**
GROWTH OCCURS IN SHOOT AND	**GROWTH OCCURS IN ALL BODY**

RULES IN BIOLOGY DRAWING

- DO NOT SHADE
- USE A SHARP PENCIL
- DO NOT USE A PEN
- DO NOT USE A RULER OR A COMPASS TO DRAW
- GIVE TITLE TO THE DRAWING
- LABEL ALL PARTS TO THE RIGHT
- DRAW INSIDE A TABLE
- NO LINE SHOULD OVERL



CLASSIFICATION 1

CLASSIFICATION 1

THIS IS THE GROUPING OF ORGANISMS ACCORDING TO STRUCTURE OF SIMILARITY AND ANCESTRY.

HISTORY OF CLASSIFICATION

- LONG TIME AGO CLASSIFICATION WAS **ARTIFICIAL** WHERE LIVING THINGS WERE CLASSIFIED AS EITHER **PLANTS OR ANIMALS**.

- LATER ON PLANTS WERE CLASSIFIED AS **HERBS, SHRUBS** AND **TREES**.

- **ANIMALS ALSO WERE FURTHER DIVIDED INTO CARNIVORES, HERBIVORES AND OMNIVORES.**

- **HOWEVER MANY NEW LIFE FORMS HAVE BEEN DISCOVERED WHICH ARE NEITHER ANIMALS NOR PLANTS. THIS HAS LED TO A MORE ACCEPTED CLASSIFICATION SYSTEM THAT ADOPTS THE FIVE KINGDOMS**

- **TODAY MODERN CLASSIFICATION USES EVOLUTIONARY RELATIONSHIPS BETWEEN LIVING ORGANISMS.**

USING A MAGNIFYING LENS

A MAGNIFYING LENS MAGNIFIES SPECIMEN.

- **DIFFERENCE BETWEEN A MAGNIFYING LENS AND HAND LENS**

USING A HAND LENS

- PLACE SPECIMEN ON A BENCH
- HOLD THE HAND LENS ON TOP OF SPECIMEN
- FOCUS UNTIL THE IMAGE IS SHARP
- CALCULATE THE MAGNIFICATION

$$\text{MG} = \frac{\text{DRAWING LENGTH}}{\text{SPECIMEN LENGTH}}$$

IMPORTANCE OF CLASSIFICATION

- EASILY IDENTIFY ORGANISMS
- ARRANGE INFORMATION ABOUT LIVING ORGANISMS IN ORDERLY MANNER
- TO UNDERSTAND THE EVOLUTIONARY RELATIONSHIP
- EASIER STUDY OF ORGANISM FAMIL
- TO MONITOR DISSAPEARANCE AND APPEARANCE OF ORGANISMS

THE UNITS OF CLASSIFICATION

TAXONOMY – THIS IS THE SCIENCE OF CLASSIFICATION.

TAXON – THIS IS A SPECIFIC UNIT OF CLASSIFICATION

SO MANY TAXON MAKE UP A TAXA

UNITS INCLUDE;

- **KINGDOM**
- **PHYLUM/ DIVISION**
- **CLASS**
- **ORDER**
- **FAMILY**
- **GENUS**
- **SPECIE**

#######EXPLAIN THEM#######

THE KINGDOM

THERE ARE 5 KINGDOMS;

- **MONERA – BACTERIA**
- **PROTOCTISTA – ALGAE, PROTOZOA**
- **FUNGI – MUSHROOMS, YEAST, MOLD**
- **PLANTAE – ALL PLANTS**
- **ANIMALIA – ALL ANIMALS**

MONERA (PROKARYOTA)

- **THEY ARE SMALL UNICELLULAR ORGANISMS**
- **THEY LACK A NUCLEAR MEMBRANE HENCE PROKARYOTIC CELLS**
- **THEY ARE MAINLY BACTERIA**
- **EXAMPLE; *VIBRIO CHOLERAE***

PROTOCTISTA

- THEY ARE UNICELLULAR ORGANISMS
- THEY ARE EUKARYOTIC
- EXAMPLE; ALGAE, SLIME MOULD, PROTOZOA

FUNGI

- **SOME ARE UNICELLULAR AS OTHERS MULTICELLULAR**
- **THEY HAVE NO CHLOROPHYL**
- **MOST ARE SAPROPHYTES**

  E.G YEAST, MOULD AND MUSHROOMS
- **OTHERS ARE PARASITIC**

  E.G Puccinia graminae

PLANTAE

- ALL ARE MULTICELLULAR
- THEY CONTAIN CHLOROPHYLL
- THEY ARE AUTOTROPHIC
- THEY INCULDE;
  - BRYOPHYTES (MOSSPLANT)
  - PTERIDOPHYTES (FERNS)
  - SPERMATOPHYTES (SEED BEARING)

ANIMALIA

- ALL ARE MULTICELLULAR
- THEY ARE HETEROTROPHIC
- SEXUAL AND ASEXUAL REPRODUCTION
- EXAMPLES OF PHYLUM;
  - CHORDRATA (NOTOCHORD)
  - ARTHROPODA (INVERTEBRATES)

BINOMIAL NOMENCLATURE

THIS IS THE SCIENTIFIC DOUBLE NAMING SYSTEM OF LIVING ORGANISMS

ORGANISM IS GIVEN A FIRST NAME GENUS AND A SECOND NAME SPECIE NAME;

GENUS – GENERIC NAME

SPECIE – SPECIFIC NAME

- **GENUS NAME BEGINS WITH CAPITAL LETTER**
- **SPECIE BEGINS WITH A SMALL LETTER**

EXAMPLE A HUMAN;

HUMAN - Homo sapiens

DOG – Canis familiaris

BEAN – Phaseolus vulgaris

LION – Panthera leo

COCKROACH – Periplaneta americana

RULES IN BINOMIAL NOMENCLAT

- THE GENUS 1ST AND NAME CAPITAL
- THE SPECIE 2ND AND NAME SMALL
- UNDERLINED
- ITALLICISED
- GIVE NAME TO NEWLY DISCOVERED

SPECIMEN COLLECTION

SPECIMEN IS ANYTHING TAKEN IN THE LABORATORY AND USED TO CARRY OUT AN EXPERIMENT.

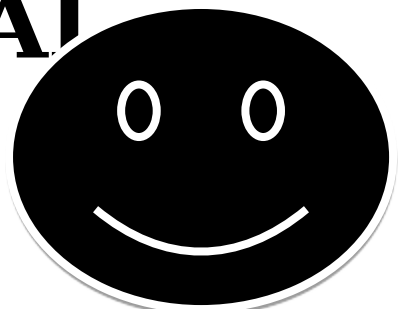
COLLECTING APPARATUS EXAMPLE;

POOTER	NETS
BAIT TRAPS	HAND GLOVES
COLLECTING JARS	FORCEPS
TRAPS	MAGNIFYING

PRECAUTION IN HANDLING SPECIMEN

- COLLECT NUMBER YOU NEED ONLY
- DO NOT HARM
- HANDLE STINGING SPECIMEN WITH CARE
- IMMOBILISE HIGHLY MOBILE SPECIMEN USING CHLOROFOAM
- DO NOT DESTROY NATURAL HABITAT OF SPECIMEN

#END#



THE CELL

THE CELL

THIS IS THE BASIC UNIT OF ANY LIVING ORGANISM.

THERE ARE TWO TYPES OF CELL ORG;

- **UNICELLULAR E.G MONERA AND PROTOCTISTA**
- **MULTICELLULAR E.G ANIMALIA, PLANTAE AND SOME FUNGI**

CELLS CAN BE SEEN BY MICROSCOPE

THE MICROSCOPE

THIS IS AN APPARATUS THAT IS USED TO MAGNIFY THE SPECIMEN.

THE TWO TYPES;

- **THE LIGHT X5,000**
- **THE ELECTRON X500,000**

DIFFERENCE

LIGHT	ELECTRON
USES LIGHT TO ILLUMINATE	BEAM OF ELECTRONS
LOW MAGNIFICATION	HIGH MAGNIFICATION

IMAGE OBSERVED DIRECTLY	OBSERVED ON A SCREEN
DEAD AND LIVING ORGANISM	DEAD ORGANISM
LENSES MADE OF GLASS	ELECTROMAG LENSES
SPECIMEN PLACED ON OPEN STAGE	SPECIMEN PLACED IN A VACUM

LIGHT MICROSCOPE PARTS

EYE PIECE – IT CONTRIBUTES TO THE MAGNIFICATION OF THE SPECIMEN

BODY TUBE – HOLDS EYE P AND OBJECTIVE LENS IN POSITION

COARSE KNOB -

FINE ADJUSTMENT –

REVOLVING NOSE PIECE –

OBJECTIVE LENS –

ARM/ LIMB –

STAGE –

CLIP –

CONDENSER –

DIAPHRAM –

MIRROR, HINGE SCREW AND BASE

HOW TO USE MICROSCOPE

TURN THE LOW POWER LENS UNTIL IT CLICKS IN POSITION.

LOOK THROUGH THE EYEPIECE TO ENSURE ENOUGH LIGHT IS PASSING THROUGH

PLACE SLIDE WITH SP ON THE STAGE

MAKE SURE THE SPECIMEN IS AT THE CENTER OF FIELD OF VIEW

USE THE COARSE KNOB

USE FINE KNOB

DRAW AND RECORD OBSERVATION

CARE OF MICROSCOPE

KEEP AWAY FROM THE EDGES

HOLD WITH BOTH HANDS

USE SPECIAL LENS CLEANERS

OBJECTIVE LENS CLICK IN POSITION

STORE IN DUST PROOF PLACE

CALCULATING MAGNIFICATION

$$MG = \frac{\text{DIAMETER OF FIELD OF VIEW}}{\text{TOTAL NUMBER OF CELLS}}$$

##########EXAMPLE ------->

- **IF DIAMETER OF FIELD OF VIEW IS 5MM AND THIR ARE 10 CELLS, CALCULATE THE SIZE OF ONE CELL IN MICROMETERS.**

1MM = 1000uM

$$\frac{5 \times 1000}{10} = 500uM$$

STRUCTURES UNDR LIGHT MICROS

THERE ARE TWO TYPES OF CELLS;

- **ANIMAL CELL**
- **PLANT CELL**

DIFFERENT ORGANELLES ARE SEEN INSIDE THIS CELLS.

#####DEFINE ORGANELLE

❖**IN ANIMAL CELL; ##DIAGRAM**

- **CYTOPLASM**
- **NUCLEUS**
- **CELL MEMBRANE**

❖**IN PLANT CELL; ##DIAGRAM**

- **CYTOPLASM AND VACUOLE**
- **NUCLEUS**
- **CELLWALL AND MEMBRANE**
- **CHLOROPLAST**

ELECTRON MICROSCOPE

- MAGNIFIES UPTO x500,000
- SPECIMEN MOUNTED IN VACUM CHAMBER
- HERE BEAM OF ELECTRONS IS DIRECTED TO IT
- ONLY OBSERVES DEAD SPECIMEN
- MAGNIFICATION IS VERY HIGH

STRUCTURES UNDR ELECTRO MICROS

#####SHOW DIAGRAM OF THE STRUCTURES

FUNCTION OF ORGANELLES

- **CELL MEMBRANE; SEEN AS DOUBLE LAYER IN ELECTRON MICROSCOPE.**

THIS IS THE PHOSPHOLIPID LAYER BETWEEN PROTEIN LAYERS.

SUBSTANCES ARE TRANSPORTED ACROSS BY ACTIVE TRANS AND DIFFUSION ####DIAGRAM

❖**ENDOPLASMIC RETICULUM; A TUBULAR NETWORK EXTENDING ONTO CYTOPLASM.**

ROUGH ENDOPLASMIC RETICULUM

SMOOTH ENDOPLASMIC RETICULUM

####DIAGRAM

- **RIBOSOMES;** **SMALL STRUCTURES ON ROUGH E. R**

THEY HAVE PROTEIN AND RIBO NUCLEIC ACIDS

THEY SYNTHESIZE PROTEINS

- **GOLGI BODIES; THIN PLATE LIKE STACKS FOUND IN CYTOPLASM.**

THEY PACKAGE AND TRANSPORT GLYCO-PROTEIN

THEY ALSO PRODUCE LYSOSOME

- **MITOCHONDRIA; ROD-SHAPED ORGANELLE.**

HAS INNER AND OUTER MEMBRANE.

INNER MEMBRANE FOLDINGS ARE CALLED CRISTAE.

INNER COMPARTMENT IS THE MATRIX.

PRODUCE ENERGY

- **LYSOSOME; THEY ARE ORGANELLES HAVING HYDROLYTIC ENZYME.**

THEY DESTROY HARMFUL MICROORGANISMS AND SUBSTANCES INSIDE CELLS.

- **CHLOROPLAST; FOUND IN PHOTOSYNTHETIC CELLS.**

IT HAS GRANA FOR LS AND STROMA FOR DS WHICH ARE THE SITES FOR PHOTOSYNTHESIS

####DIAGRAM

DIFFERENCE ANIMAL AND PLANT

PLANT CELL	ANIMAL CELL
• HAS CELL WALL AND MEMBRANE	HAS ONLY CELL MEMBRANE
• NUCLEUS AT SIDE	NUCLEUS CENTER
• CHLOROPLAST	NO CHLOROPLAST
• LARGE	SMALL

LARGE	**SMALL**
REGULAR SHAPE	**IRREGULAR SHAPE**
NO CENTRIOLE	**HAS CENTRIOLE**
STORES OILS, STARCH AND PROTEINS	**STORES FATS AND GLYCOGEN MOLECULES**

TEMPORARY SLIDE PREPARATION

A TEMPORARY SLIDE IS PREPARED FOR THE CURRENT USE ONLY.

THIS SLIDE MAY ALSO BE CALLED A WET SLIDE, SINCE THE SPECIMEN IS PLACED IN A LIQUID DROP.

IT HAS VARIOUS STEPS;

####----------→

1. SECTIONING;

MAKING THIN SLICES OF SPECIMEN USING A SCAPEL IN A PETRI DISH CONTAINING WATER.

- **FORCEP OR MICROTOME APPARATUS MAY BE USED TO REMOVE THE EPIDERMIS FROM THE LEAF**

######----------→

TYPES OF SECTIONS;

- **TRANSVERSE OR CROSS SECTION**

OBTAINED BY CUTTING ACROSS THE LENGTH OF THE SPECIMEN

######DIAGRAM

TYPES OF SECTIONS;

- **LONGITUDINAL SECTION**

OBTAINED BY CUTTING ALONG THE LENGTH OF SPECIMEN

####DIAGRAM

2. FIXATION;

INVOLVES TREATING THE SPECIMEN WITH 70% ETHANOL OR 99% EHANOL MIXED WITH 1% GLACIAL ETHANOIC ACID.

FIXATIVE IS THE CHEMICALS WHICH ARE USED HERE IN FIXATION PROCESS.

####----------→

IT IS MAINLY CARRIED OUT FOR TWO REASONS;

- **TO MAINTAIN SPECIMEN STRUCTURE**

- **TO MAKE SPECIMEN HARD ENOUGH FOR THIN SECTIONS TO BE CUT**

3. STAINING;

THIS MAKES IT EASIER TO IDENTIFY DIFFERENT PARTS OF THE SPECIMEN.

COMMON STAINS E.G

IODINE, METHYL BLUE, NEUTRAL RED, EOSIN ETC

LASTLY

4. MOUNTING;

THIS IS PLACING THE SPECIMEN ON THE SLIDE.

- **PLACE DROP OF WATER ON A SLIDE.**
- **LOWER THE SPECIMENT AND SPREAD**
- **LOWER COVERSLIP AT AN ANGLE**
- **LOWER GENTLY NOT TO TRAP AIR BUBBLES**

CELL SPECIALLIZATION

THIS IS THE STRUCTURAL MODIFICATION OF A CELL TO PERFORM A SPECIFIC FUNCTION.

ADVANTAGE; THE CELL BECOMES EFFICIENT IN CONDUCTING ITS ACTIVITIES

DISADVANTAGE; THE CELLS ARE UNABLE TO PERFORM CERTAIN TASKS HENCE ARE DEPENDENT ON OTHERS FOR SURVIVAL.

SPECIALIZED ANIMAL CELLS

RED BLOOD CELL

- TRANSPORTS OXYGEN

ADAPTATION

- BICONCAVE TO INCREASE THE SURFACE AREA FOR GASES DIFFUSION
- IT HAS HAEMOGLOBIN COMBINING WITH OXYGEN

- **IT LACKS NUCLEUS AS THIS PROVIDES A LARGE SURFACE AREA FOR PACKING AND TRANSPORTING OXYGEN.**

SPERM CELL

- THIS FERTILIZES THE OVUM.

- TRANSMITS HEREDITARY TRAITS TO THE OFFSPRING.

ADAPTATIONS

- FLAGELLUM
- MITOCHONDRIA
- LYTIC ENZYMES

WHITE BLOOD CELL

- **DESTROY** HARMFUL MICRO-ORGANISM

ADAPTATIONS

- HAS **LYMPHOCYTES** AND **PHAGOCYTES**

PLATELETS

- THEY FORM BLOOD CLOT

ADAPTATIONS

- VERY TINY
- VERY MANY
- ENZYMES FOR CLOTTING

SPECIALIZED PLANT CELLS

PALISIDE CELLS

- HAVE CHLOROPLAST

ADAPTATIONS

- VERY MANY
- CLOSELY PACKED
- BELOW EPIDERMIS
- ELONGATED AND LARGE

PARENCHYMA CELLS

- STORAGE OF FOOD

ADPTATIONS

- LARGE SAP VACUOLE
- NUMEROUS

ROOT HAIR

- ABSORBS NUTRIENTS
- ABSORBS WATER AND MINERAL

ADAPTATION

- THIN AND SMALL
- NUMEROUS
- THIN OUTER MEMBRANE

GUARD CELLS

- CONTROLS OPENING AND CLOSING OF TOMATA

ADAPTATIONS

- BEAN SHAPED

TISSUES

GROUP OF SIMILAR CELLS WORKING TOGETHER TO PERFORM A SPECIFIC FUNCTION.

ANIMAL TISSUES

CONNECTIVE TISSUES

- CONSIST OF NETWORK OF **STRONG FIBRES** AND **SPECIAL CELLS**.

- THEY **PROVIDE SUPPORT** AND BIND OTHER TISSUES TOGETHER.

NERVE TISSUE

- CONSIST OF NERVE CELLS
- THEY RECEIVE AND CONDUCT IMPULSE

EPITHELIAL TISSUE

- CONSIST OF THIN CELLS
- THEY PROTECT THE INNER TISSUES

SKELETAL TISSUE

- CONSIST OF BONES AND CARTILAGES. PROTECTS THE SOFT TISSUES.

BLOOD TISSUE

- RED, WHITE CELLS AND PLATELETS

PLANT TISSUES

EPIDERMAL TISSUE

- **THIN LAYER OF CELLS** COVERING OUTER SURFACE OF THE PLANT
- **PROTECTS** THE INNER TISSUES FROM INFECTIONS

PALISIDE TISSUE

CONDUCTING TISSUE

ORGANS

A GROUP OF SIMILAR TISSUES SPECIALLIZED TO CARRY OUT A SPECIFIC FUNCTION

1. ANIMALS; LIVER, HEART, SKIN, BRAIN, LUNGS, STOMACH, KIDNEYS, EYE, TONGUE

2. PLANTS; STEM, LEAVES, ROOTS, FLOWERS

ORGANS SYSTEM

THIS IS A GROUP OF ORGANS WORKING TOGETHER TO PERFORM A SPECIFIC FUNCTION.

RESPIRATORY SYSTEM,
DIGESTIVE SYSTEM,
EXCREATORY SYSTEM,
REPRODUCTIVE SYSTEM,
CIRCULATORY SYSTEM,
NERVOUS SYSTEM

####END



CELL PHYSIOLOGY

CELL PHYSIOLOGGY

THIS IS THE STUDY OF THE CELL FUNCTIONS.

MATERIALS MOVE IN AND OUT OF THE CELL MEMBRANE WHICH IS ALSO CALLED PLASMA MEMBRANE.

THE CELL MEMBRANE

ITS MADE OF 3 LAYERS

- **TWO OUTER PROTEIN LAYERS**
- **MIDDLE PHOSPHOLIPID LAYER**

###DIAGRAM

PROPERTIES CELL MEMBRANE

- SEMI PERMIABLE
- SENSITIVE TO TEMPERATURE
- HAS ELECTRIC CHARGES; THIS ALLOW ONLY SOME SUBSTANCES TO ENTER THE CELL NOT OTHERS
- SENSITIVE TO pH

PHYSIOLOGICAL PROCESSES

MOVEMENT OF MATERIALS IN AND OUT OF THE CELL OCCURES THROUGH THREE MAIN PROCESSES

- **DIFFUSION**
- **OSMOSIS**
- **ACTIVE TRANSPORT**

####DIFFUSION---------->

DIFFUSION

THIS IS THE MOVEMENT OF PARTICLES FROM A REGION OF HIGH CONCENTRATION TO A REGION OF LOW CONCENTRATION

IT OCCURES WITHIN GASES AND LIQUIDS ONLY

#DIFFUSION OR CONCENTRATION GRADIENT

FACTORS AFFECTING

- CONCENTRATION GRADIENT
- SIZE OF PARTICLES
- THICKNESS OF MEMBRANE
- TEMPERATURE
- SURFACE AREA TO VOLUME RATIO

ROLES OF DIFFUSION

IN PLANTS

- ABSORPTION OF WATER AND MINERAL SALTS FROM SOIL TO ROOTS.
- TRANSPORT OF MANUFACTURED FOOD SUBSTANCES IN PHLOEM.

- **REMOVAL OF EXCESS WATER THROUGH TRANSPIRATION.**

- **GASEOUS EXCHANGE WHICH INVOLVES ABSORPTION OF OXYGEN FOR RESPIRATION AND CARBON (IV) OXIDE FOR PHOTOSYNTHESIS.**

####IN ANIMALS ----------

→

IN ANIMALS

- **ABSORPTION OF FOOD FROM THE ILLEUM**

- **REABSORPTION OF MINERAL IONS FROM THE KIDNEY E.G CHLORIDES AND SODIUM IONS**

- **EXCREATION OF NITROGENOUS WASTES**

- **GASEOUS EXCHANGE WHEREBY OXYGEN DIFFUSES ACROSS RESPIRATORY SURFACE INTO THE BLOOD STREAM AS CARBON (IV) OXIDE DIFFUSES OUT OF THE BODY.**

DIFFUSION EXPERIMENTS

- DEMONSTRATED USING **POTASSIUM PERMANGANATE** CRYSTAL.

- **PERFUME** IN ONE CORNER OF THE ROOM

OSMOSIS

##DEFINE

IT IS A SPECIAL TYPE OF DIFFUSION AS IT INVOLVES MOVEMENT OF WATER FROM A REGION WHERE THEY ARE HIGHLY CONCENTRATED TO WHERE THEY ARE OF LOW CONCENTRATION

TYPES OF SOLUTIONS IN OSMOSIS

- **HYPERTONIC SOLUTION**

HAS HIGH OSMOTIC PRESSURE

- **HYPOTONIC SOLUTION**

HAS LOW OSMOTIC PRESSURE

- **ISOTONIC SOLUTION**

FORCES INVOLVED IN OSMOSIS

1. OSMOTIC PRESSURE

THIS IS THE FORCE WHICH DRAWS WATER FROM A DILLUTE TO A CONCENTRATED SOLUTION THROUGH A SEMI PERMIABLE MEMBRANE.

OTHER DEFINITION####----------→

THIS IS ALSO THE PRESSURE REQUIRED TO STOP WATER MOLECULES FROM MOVING INTO THE CONCENTRATED SOLUTION.

THEREFORE OSMOTIC PRESSURE DEPENDS ON THE SOLUTE CONCENTRATION.

THE HIGHER THE SOLUTE CONCENTRATION, THE HIGHER THE OSMOTIC PRESSURE.

IF TWO SOLUTIONS ARE SEPARATED BY A SEMIPERMIABLE MEMBRANE, THE SOLUTION WITH HIGHER SOLUTE CONCENTRATION IS CALLED HYPERTONIC SOLUTION

THEREFORE, A HYPERTONIC SOLUTION HAS A HIGHER SOLUTE CONCENTRATION THAN A HYPOTONIC SOLUTION.

IF THE TWO SOLUTIONS HAVE THE SAME SOLUTE CONCENTRATION, THE SOLUTION IS SAID TO BE AN ISOTONIC SOLUTION.

WATER MOLECULES WILL MOVE FROM A HYPOTONIC SOLUTION TO A HYPERTONIC SOLUTION, UNTIL THE TWO SOLUTIONS BECOME ISOTONIC.

2. OSMOTIC POTENTIAL

THIS IS THE ABILITY OF A SOLUTION TO DEVELOP OSMOTIC PRESSURE WHEN SEPARATED FROM A HYPOTONIC SOLUTION BY A SEMI PERMIABLE MEMBRANE.

WHEN A SOLUTION IS NOT SEPARATED BY SEMIPERMIABLE MEMBRANE, NO OSMOSIS WILL TAKE PLACE.

HOWEVER, IT HAS THE POTENTIAL TO DEVELOP OSMOTIC PRESSURE

FACTORS AFFECTING OSMOSIS

- THICKNESS OF THE MEMBRANE.
- TEMPERATURE
- THE CONCENTRATION GRADIENT

ROLES OF OSMOSIS

IN PLANTS

- UPTAKE OF WATER INTO THE ROOT HAIR CELLS
- TRANSPORT OF WATER THROUGH THE XYLEM
- SUPPORT IN THE PLANT
- OPENING AND CLOSING OF STOMATA

- **FEEDING OF INSECTIVOROUS PLANTS**
- **HELPS THE CELLS TO MAINTAIN TURGIDITY**
- **REHYDRATES THE PLANT**

IN ANIMALS

- **ABSORPTION OF WATER FROM THE COLON INTO THE BLOOD STREAM**
- **REABSORPTION OF WATER IN THE KIDNEY NEPHRON**
- **MOVEMENT OF WATER FROM BLOOD TO THE TISSUES**
- **CELL TO CELL WATER MOVEMENT**

WATER RELATION IN ANIMAL CELL

THE INSIDE OF THE ANIMAL CELL IS **HYPERTONIC AS THE OUTSIDE IS HYPOTONIC**.

WHEN THE **RED BLOOD CELL IS PLACED IN HYPOTONIC SOLUTION**, IT GAINS WATER **SWELLS** AND BURST.

- IT **WILL BURST SINCE** THE CELL MEMBRANE IS NOT STRONG ENOUGH TO WITH HOLD THE PRESSURE CREATED BY THE ABSORPTION OF EXCESS WATER MOLECULES.
- THIS BURSTING OF THE REDCELL IS **CALLED HAEMOLYSIS.**

- **WHEN THIS REDBLOOD CELL IS PLACED IN A HYPERTONIC SOLUTION, WATER MOLECULES WILL BE DRAWN OUT OF THE CELL BY OSMOSIS.**
- **THIS WILL MAKE THE CELL TO SHRINK IN A PROCESS KNOWN AS CRENATION.**

WATER RELATION IN PLANT CELL

THE PLANT CELL HAS A **CELL WALL** WHICH IS PERMIABLE TO SUBSTANCES.

INSIDE THE SAP VACUOLE ARE DISSOLVED SUGARS AND SALTS **CREATING HIGH OSMOTIC** PRESSURE FOR THE CELL.

- **WHEN THE PLANT CELL IS PLACED IN HYPOTONIC SOLUTION OR DISTILLED WATER, WATER MOLECULES ENTER THE CELL BY OSMOSIS THROUGH THE CELL MEMBRANE AND INTO THE VACUOLE.**

- **THIS MAKES THE VOLUME OF VACUOLE AND CYTOPLASM TO INCREASE LEADING TO DEVELOPMENT OF AN OUTWARD PRESSURE AGAINST THE CELL WALL CALLED TUGOR PRESSURE.**

- **THE CELL WALL ON THE OUTER SIDE OF THE CELL PREVENTS THE CELL FROM BURSTING AS IT EXCERTS AN EQUAL PRESSURE TO TUGOR PRESSURE CALLED THE WALL PRESSURE.**

- **WHEN THE PLANT CELL IS PLACED IN HYPERTONIC SOLUTION, IT WILL LOSE WATER AND BECOME FLACCID.**

- **AS MORE WATER IS LOST, THE CELL MEMBRANE PULLS AWAY FROM THE CELL WALL. THIS PROCESS THEN IS CALLED PLASMOLYSIS.**

- **THE LOSS OF WATER IN THE PLANT LEADS TO WILTING PROCESS.**

THIS IS CHARACTERISED BY FOLDING OF LEAVES AND FLOWERS TO MINIMISE FURTHER WATER LOSS.

- **THE OPPOSITE IS DEPLASMOLYSIS WHICH IS ADDING WATER.**

OSMOSIS EXPERIMENTS

LIVE TISSUES USED

- POTATO
- TOMATO
- PAWPAW
- EGG SHELL
- GOAT BLADDER

MAY USE VISKING TUBING

ACTIVE TRANSPORT

THIS IS THE PROCESS BY WHICH SUBSTANCES MOVE ACROSS THE CELL MEMBRANE BY THE USE OF ENERGY AND PROTEIN CARRIERS AGAINST CONCENTRATION GRADIENT.

FACTORS AFFECTING A. TRANSPORT

- **OXYGEN CONCENTRATION**
- **GLUCOSE CONCENTRATION**
- **TEMPERATURE**
- **pH**
- **ENZYME INHIBITORS**

ROLES OF ACTIVE TRANSPORT

IN PLANTS

- ABSORPTION OF SOME MINERAL SALTS BY THE ROOT
- MOVEMENT OF PHOTOSYNTHETIC PRODUCTS FROM LEAF TO PHLOEM

IN ANIMALS

- **ABSORPTION OF DIGESTED FOOD** INTO THE BLOOD STREAM.
- **REABSORPTION OF NUTRIENTS** SUCH AS GLUCOSE AMINO ACIDS IN THE NEPHRON INTO THE BLOOD.

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- **ACCUMULATION** OF SUBSTANCES WITHIN THE CELL **INORDER TO MAKE THE OSMOTIC PRESSURE** OF THE BODY ISOTONIC TO THE SURROUNDING **HYPERTONIC SOLUTION**.

THIS **PREVENTS WATER LOSS** TO THE ENVIRONMENT.

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- **EXCREATION OF WASTE FROM THE BODY.**

- **FUNCTIONING OF THE SODIUM ION PUMP IN THE NERVE CELLS.**

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DIFFERENCE ACTIVE AND PASSIVE

ACTIVE TRANSPORT	PASSIVE TRANSPORT
1. AGAINST CONC GRADIENT	ALONG CONC GRADIENT
2. OXYGEN MUST BE PRESENT	NO OXYGEN NEEDED
3. ENERGY REQUIRED	NO ENERGY REQUIRED

TRANSPORTS IONS, PROTEINS AND COMPLEX SUGARS	TRANSPORTS ANYTHING SOLUBLE I.E GLUCOSE, WATER, GASES ETC
DISRUPTS EQUILIBRIUM ESTABLISHED BY DIFFUSION	NO DIFFUSION OR OSMOSIS AFTER EQUILIBRIU

