Pakistan School
Kingdom of Bahrain

Pakistan School, Kingdom of Bahrain.

Welcome to new class

Grade 11

RULES OF THE CLASS

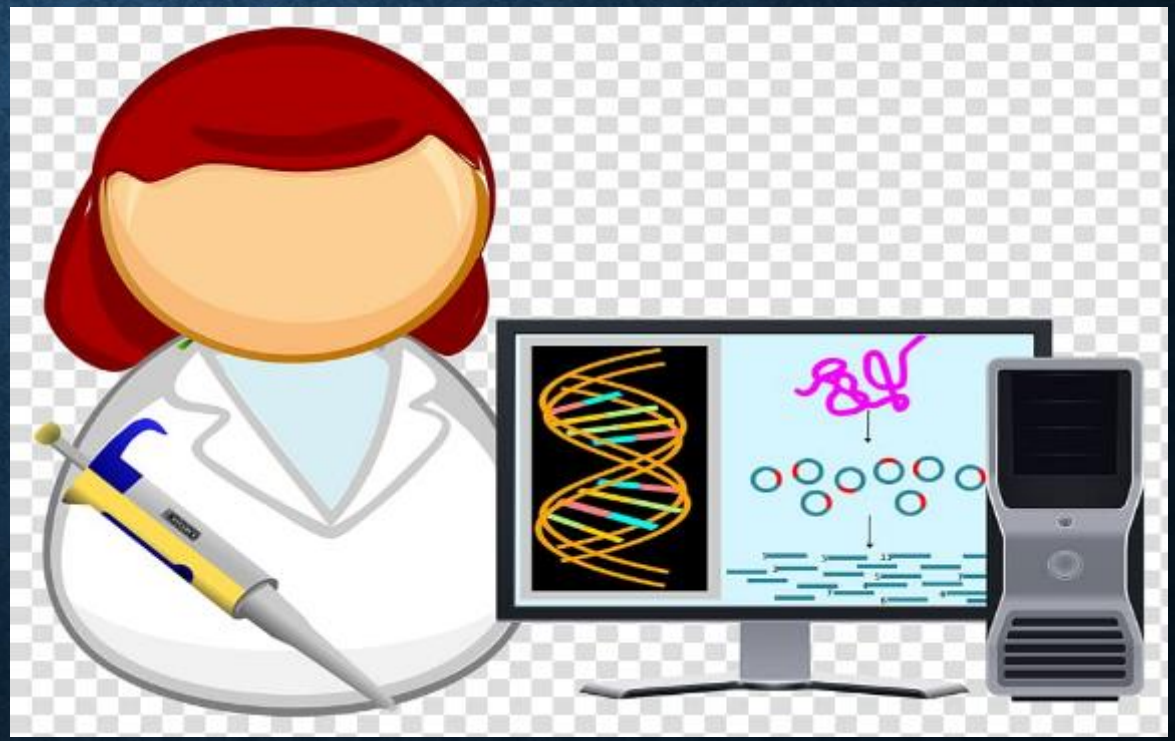
1) Be on time for all your classes.
2) Respect all the participants of the class.
3) Do not create any disturbance.
4) Pay attention to your teacher.
5) Raise hand if you have a question.
6) Enter into the class with your actual name and CPR number.

CHAPTER 1

Cell Structure and Function

ENGAGING STARTER

WHAT DO YOU SEE IN THIS PICTURE



Objectives:

At the end of this lesson students will be able to:

- Identify and analyze some techniques used in cell biology

CELL THEORY

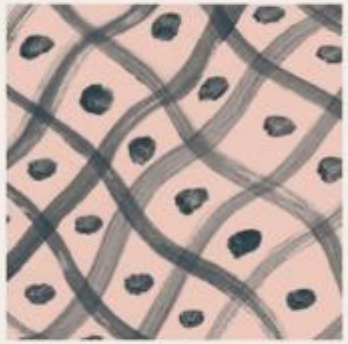
It is the fundamental concept of biology.

- Cell is the basic unit of life. (structure + function)
- All organisms are made up of one or more cells.
- Cells arise from other cells through cell division.
- Cells carry genetic material.
- All cells have approximately same chemical composition.

1. All living organisms are made of cells

3. Cells arise from pre-existing cells

5. All cells have the basic chemical composition



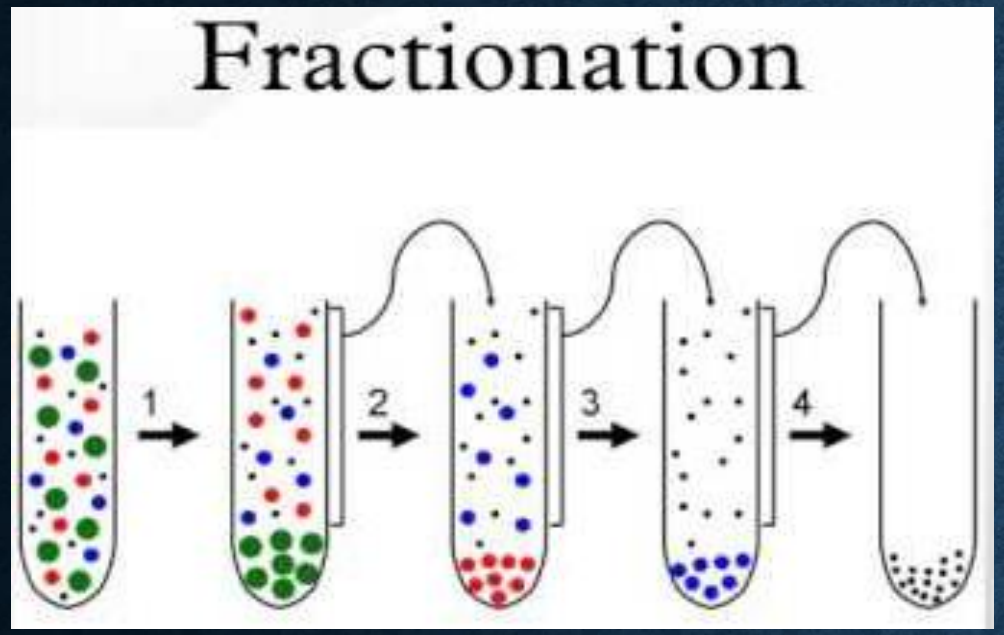
2. Cells are the basic unit of life

4. Hereditary information is passed from cell

6. Energy flow occurs within cells

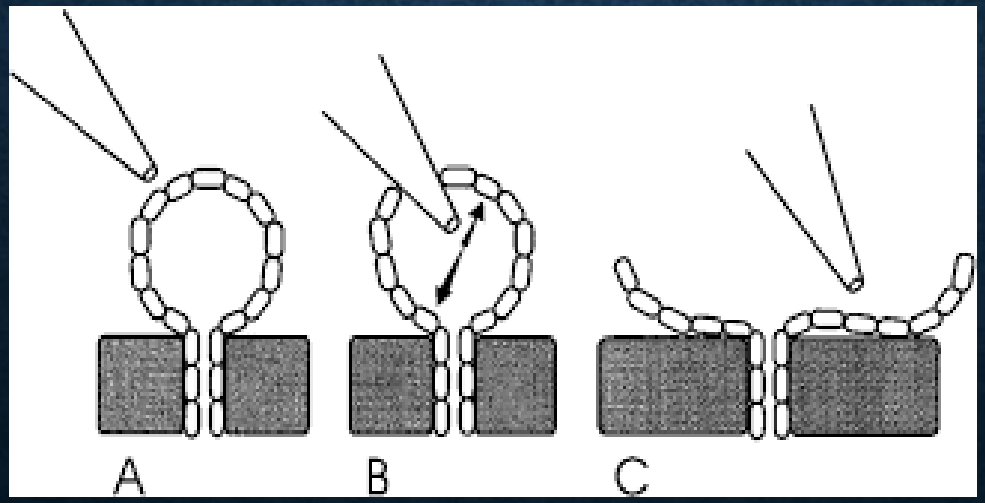
TECHNIQUES USED IN CELL BIOLOGY:

1. Cell Fractionation

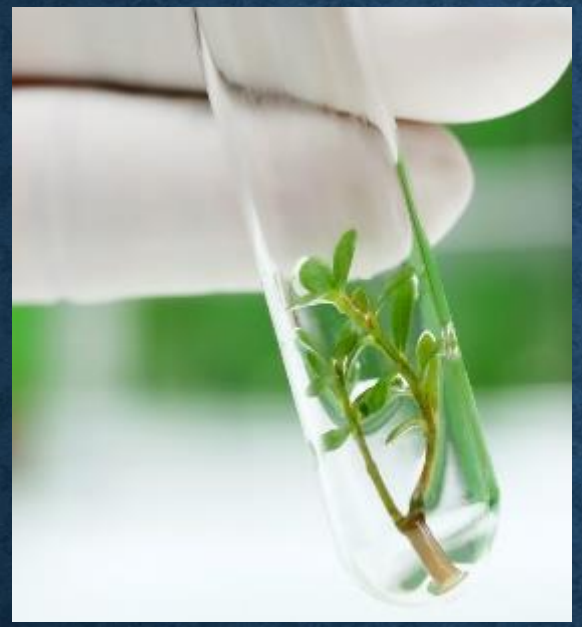


2. Differential Staining

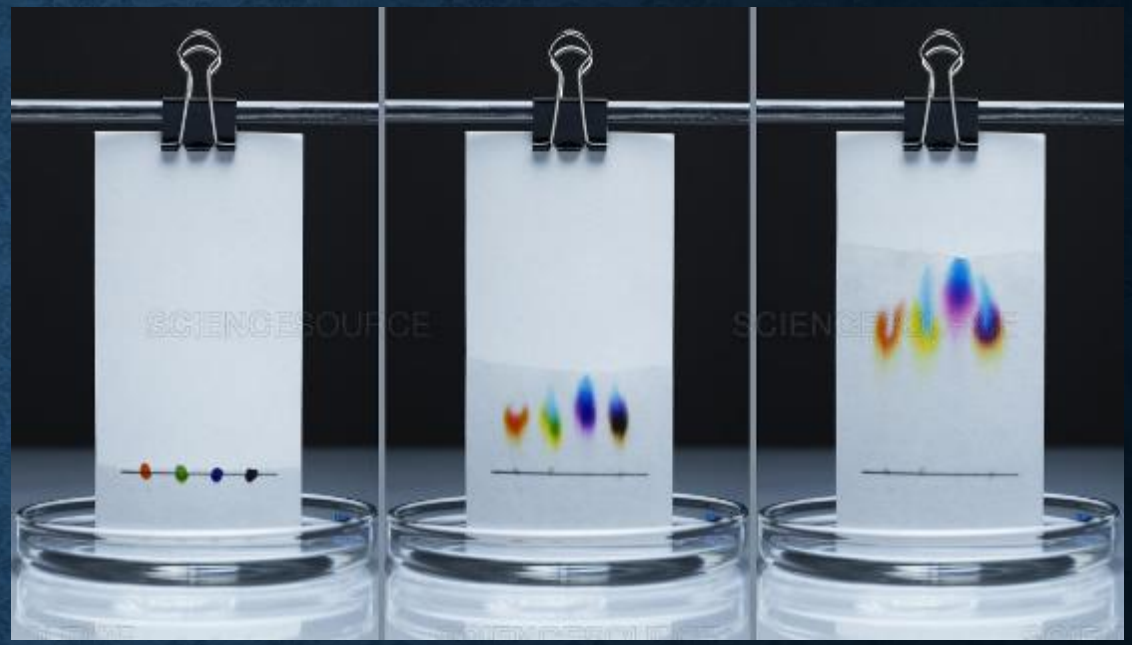
3. Microdissection



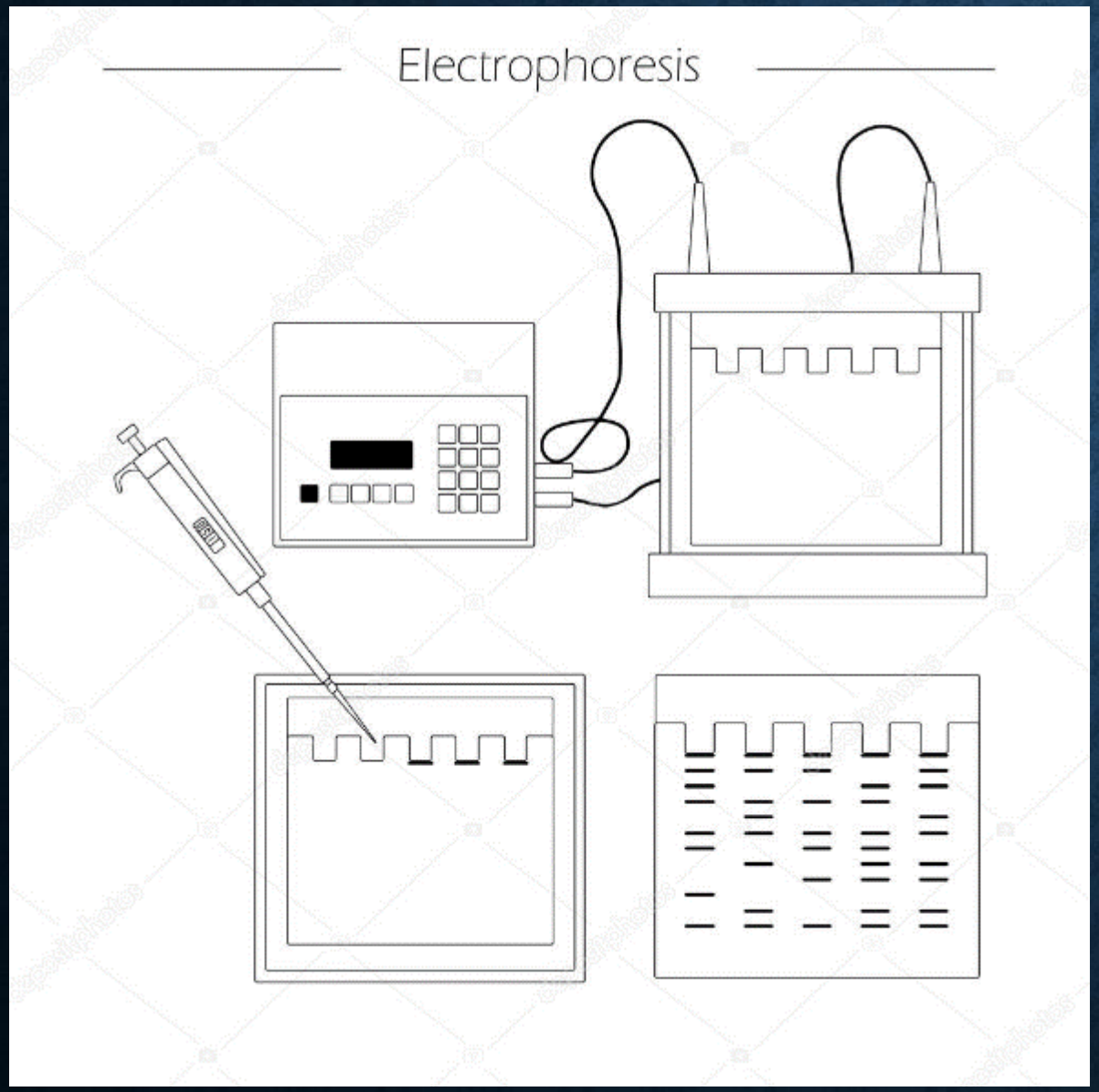
4. Tissue Culture



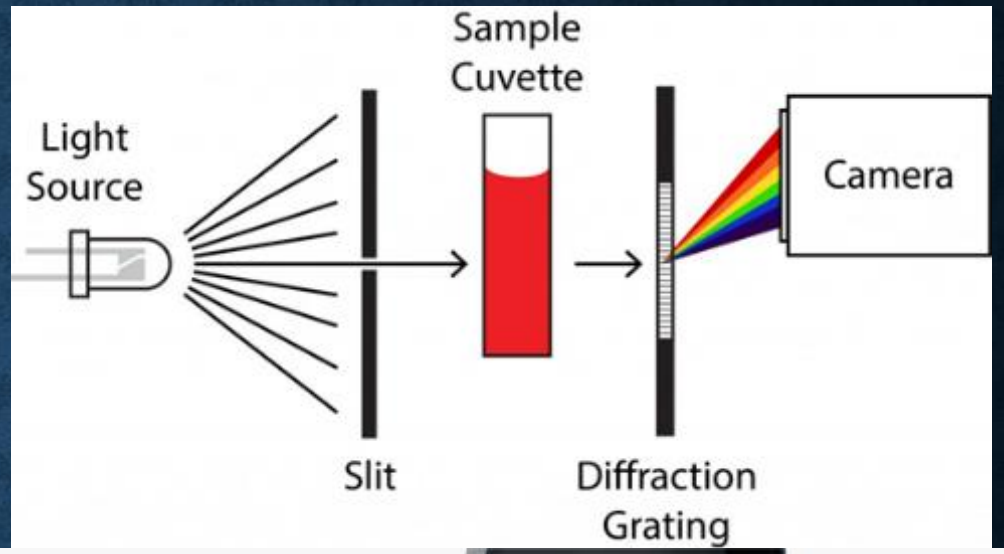
5. Chromatography



6. Electrophoresis



7. Spectrophotometry



8. Resolution and Magnification in Microscopy

9. Micrometry

1.CELL FRACTIONATION:

Cell fractionation is the process used to separate **cellular** components while preserving individual functions of each component.It is based upon **size and density**. It is useful for electron microscopy of cell components.

The basic cell fractionation consists of 2 steps.

a) Homogenization.

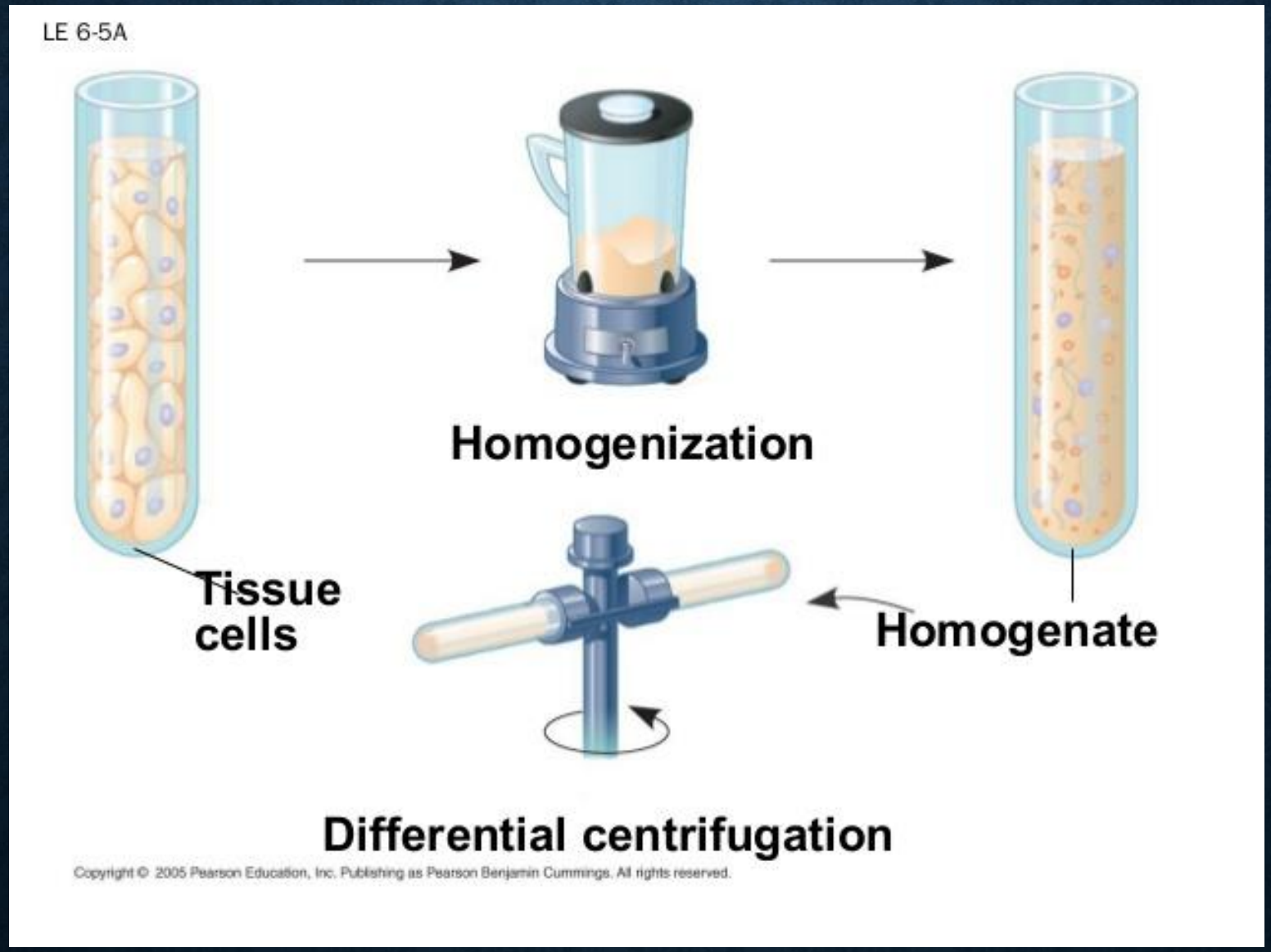
b) Centrifugation.

A) HOMOGENIZATION:

- Formation of homogenous mass which is uniform mixture of cells = Cell homogenate / Cell Suspension
- Grinding of cell in suitable medium

- Correct pH - ionic composition - Temperature
- Presence of certain enzymes (e.g. pectinase → middle lamella)

- Instrument → cell homogenizer (food mixer/ blender)
- Next - Resulted mixture is centrifuged

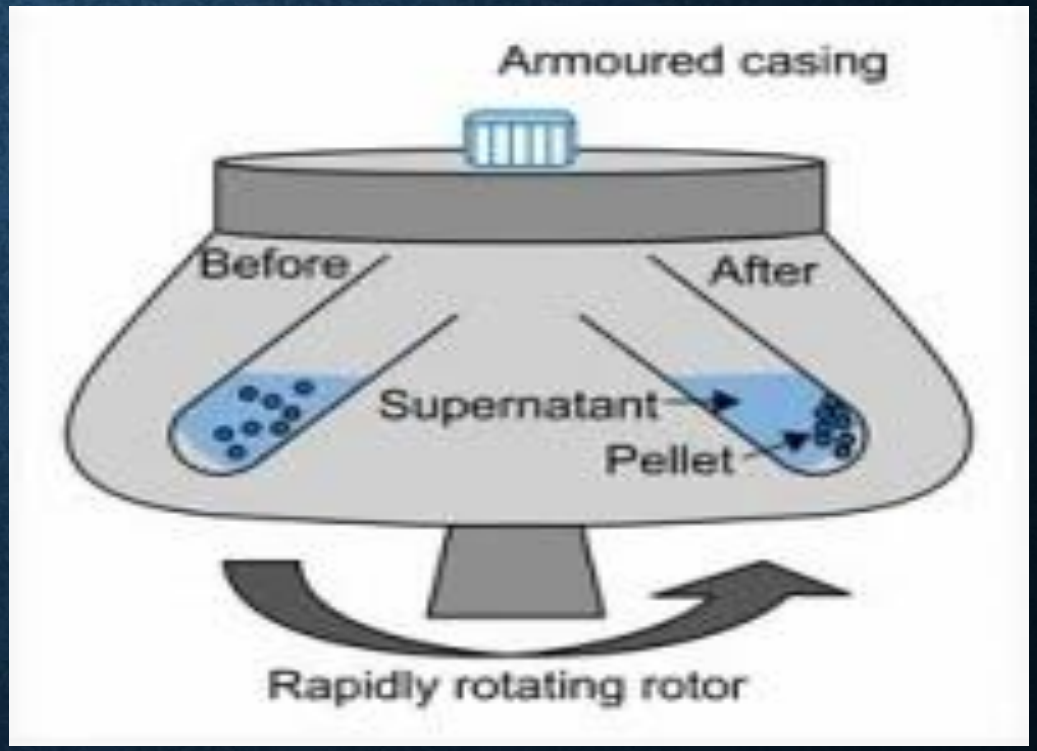


B) CENTRIFUGATION:

- Process which separates substances on the basis of their size and densities under the influence of centrifugal force
- Instrument → **Centrifuge** (spins the test-tubes)
- Spinning exerts the centrifugal force
- Sediment at bottom = **Pellet**
- Liquid content suspended above sediment = **Supernatant**
- Series of pellets can be obtained
- Increasing speeds can be used

THE PARTICLES IN SUSPENSION EXPERIENCE A RADIAL **CENTRIFUGAL**

FORCE MOVING THEM AWAY FROM THE AXIS OF ROTATION.



Types

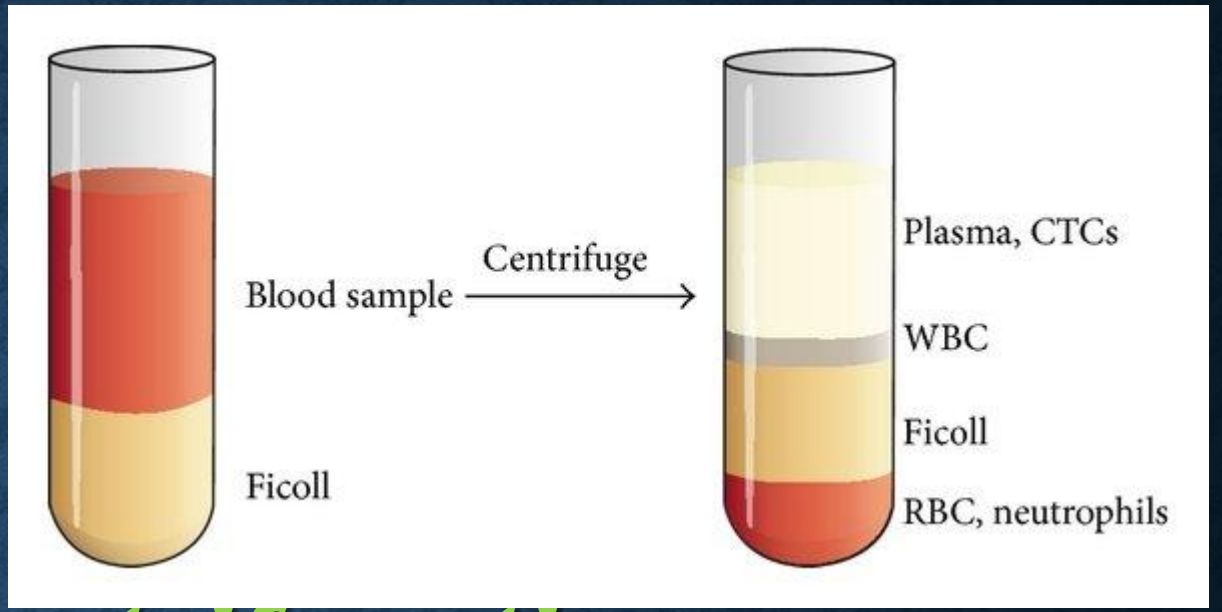
1. Density Gradient Centrifugation

- Cell components separate in different sediments based on size and densities.
- Upper sediments – less dense + smaller components
- Lower sediments – more dense + larger components

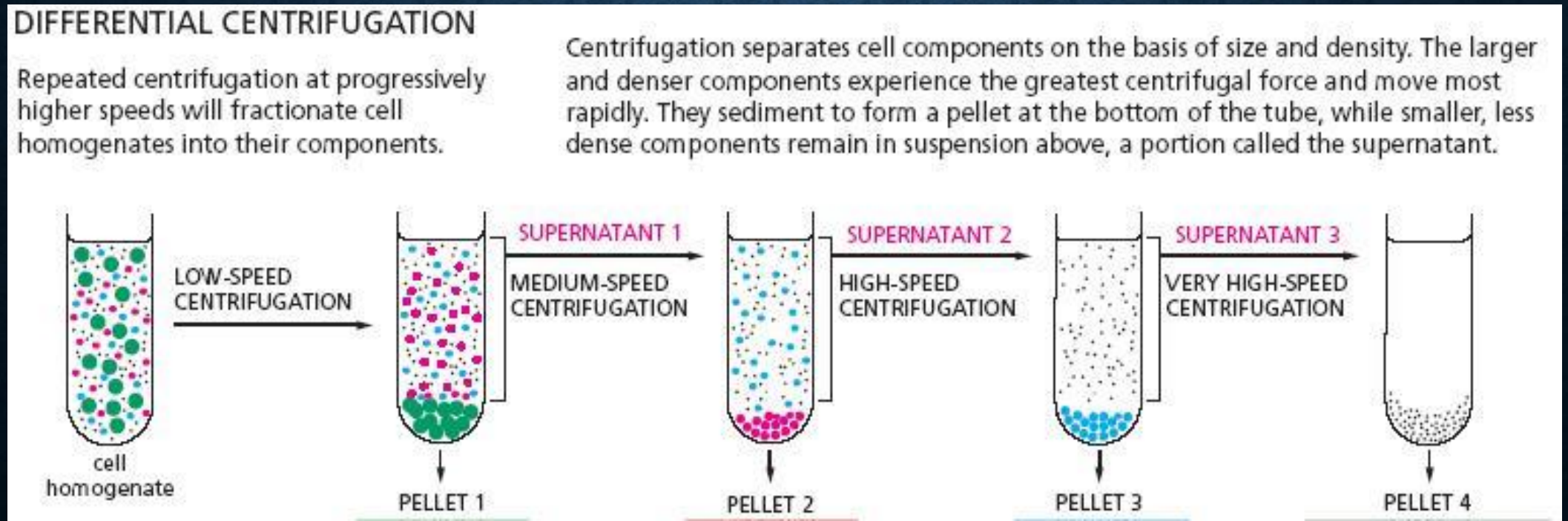
2. Differential Centrifugation

- The sedimentation rate determines how fast it sediments
- The faster the rotation of centrifuge the smaller the particles that will sediment

Density Gradient Centrifugation



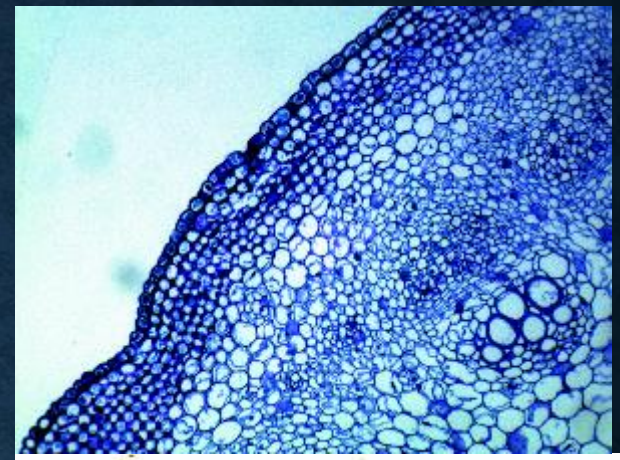
Differential Centrifugation

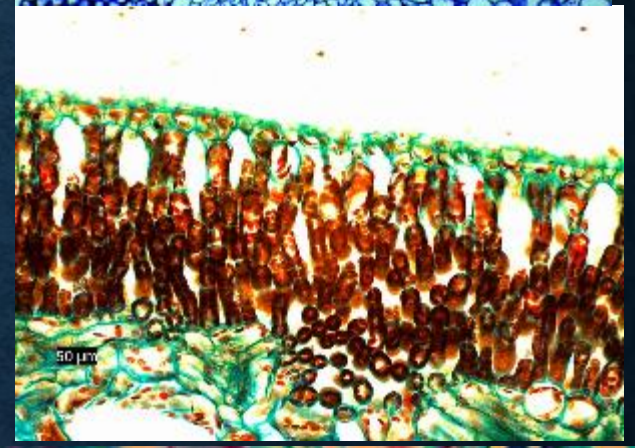


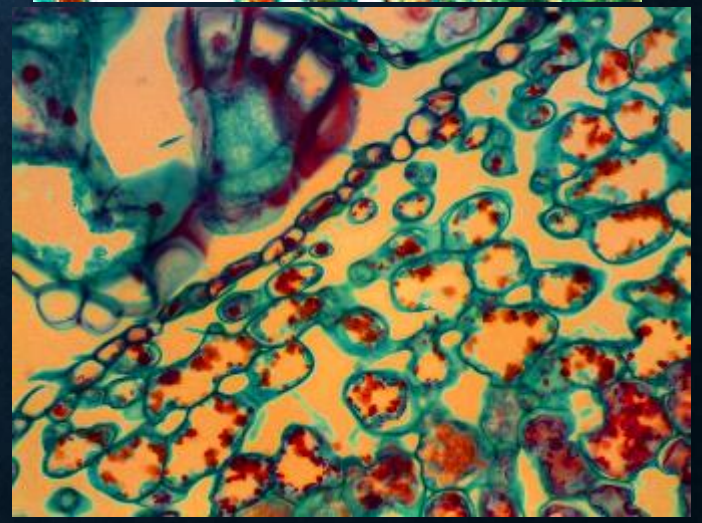
2.DIFFERENTIAL STAINING:

Most biological structures are transparent. In order to differentiate between these structures various colour dyes are applied. Such techniques are called **STAINING TECHNIQUES**.

- When one stain is used it is called single staining.
- When two stains are used it is called double staining or differential staining.
- Examples of stains: borax carmine (nucleus) , eosin (cytoplasm) , haematoxylin (nucleus) .

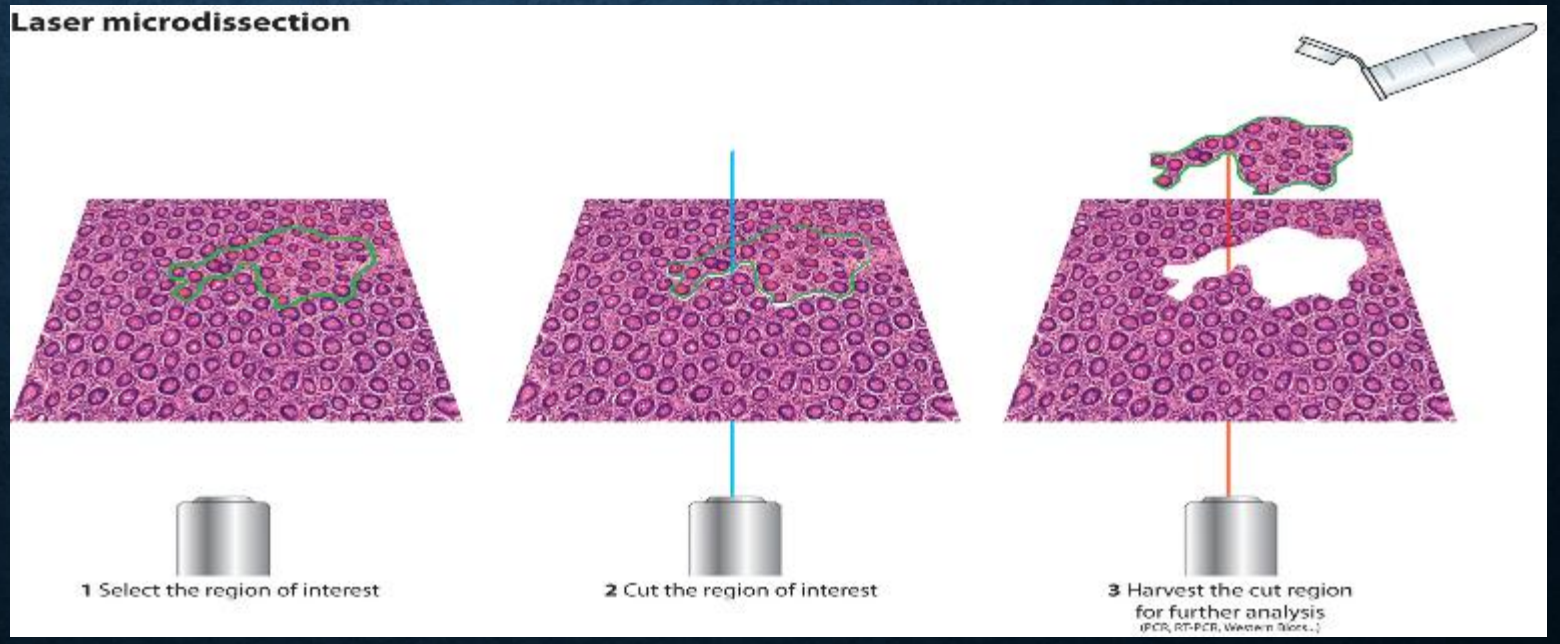






3.MICRODISSECTION:

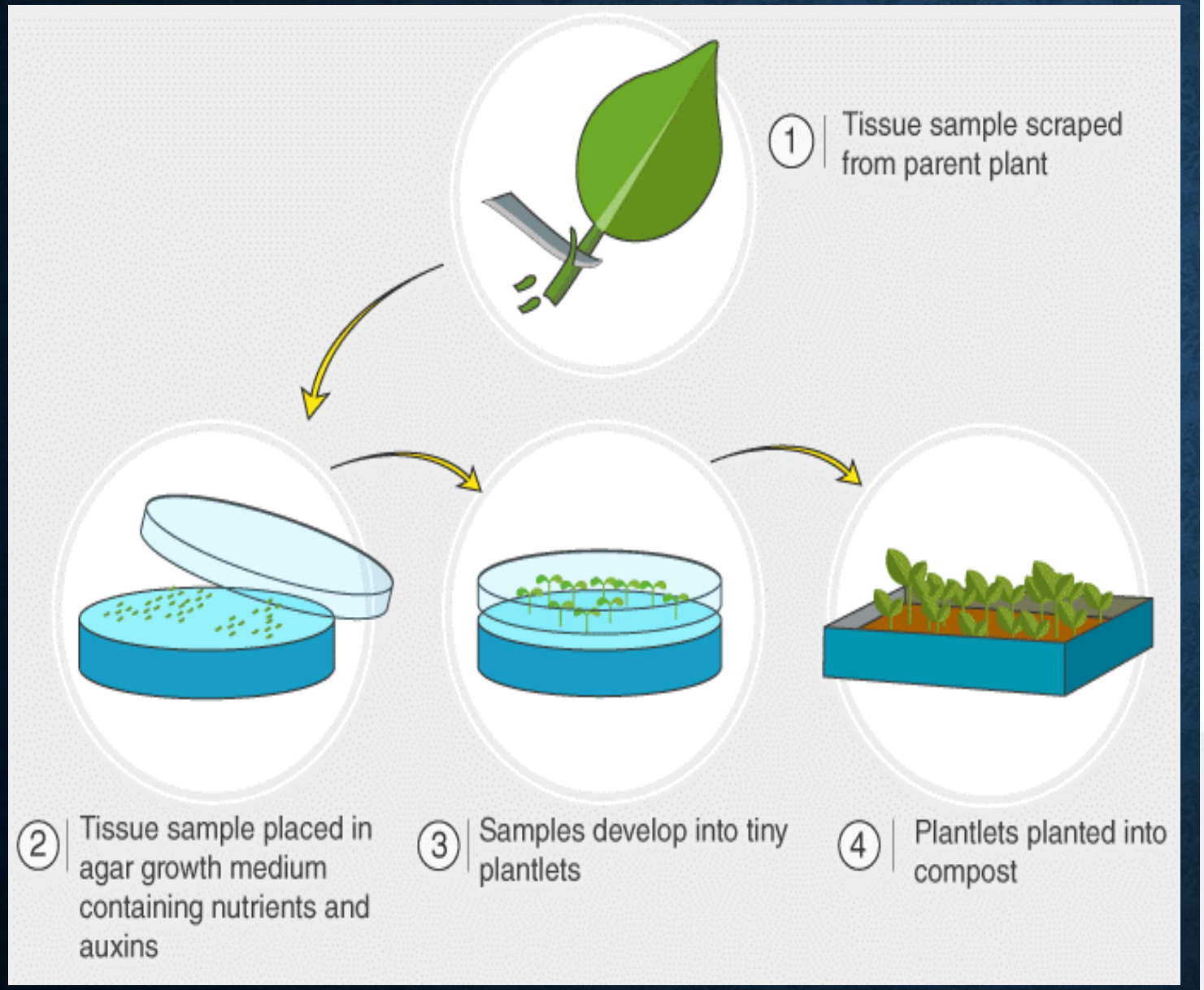
- Microdissection refers to the variety of techniques where a microscope is used to assist in dissection.
- It is done to remove tumor or granules from delicate tissue or cells like, brain, heart, and nerve cells.
- In this technique, the image is seen on large TV screen or monitor while dissecting.

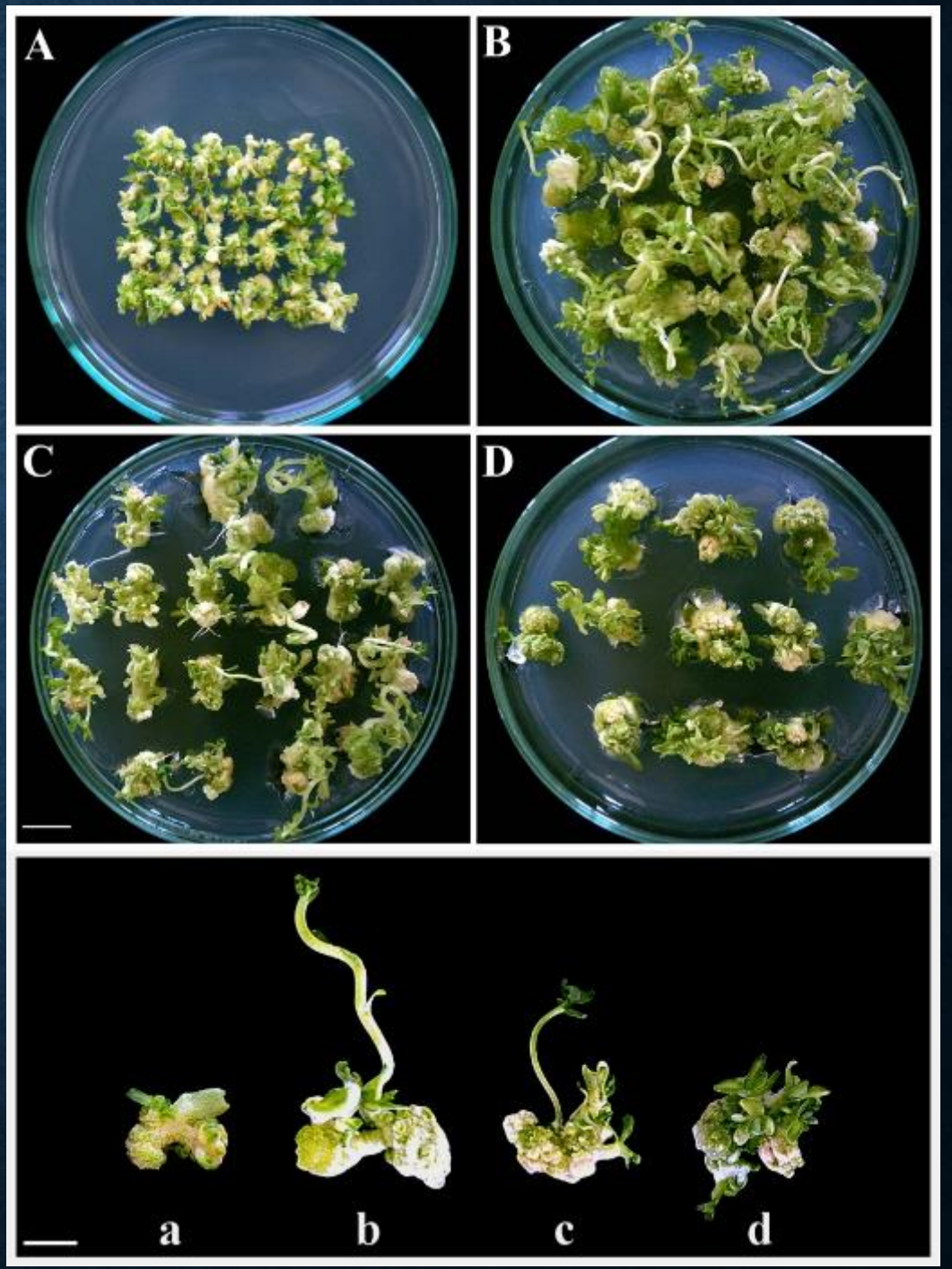


3.TISSUE CULTURE:

- Growth of cell or tissue on chemically defined nutrient medium under sterile conditions.
- For plants → plant cloning
- For animals → Identify any cell abnormality like cancer or chromosomal disorder.

Done by → growing individual cells to form a layer


1 Tissue sample scraped from parent plant
2 Tissue sample placed in agar growth medium containing nutrients and auxins
3 Samples develop into tiny plantlets
4 Plantlets planted into compost


A
B
C
D
a
b
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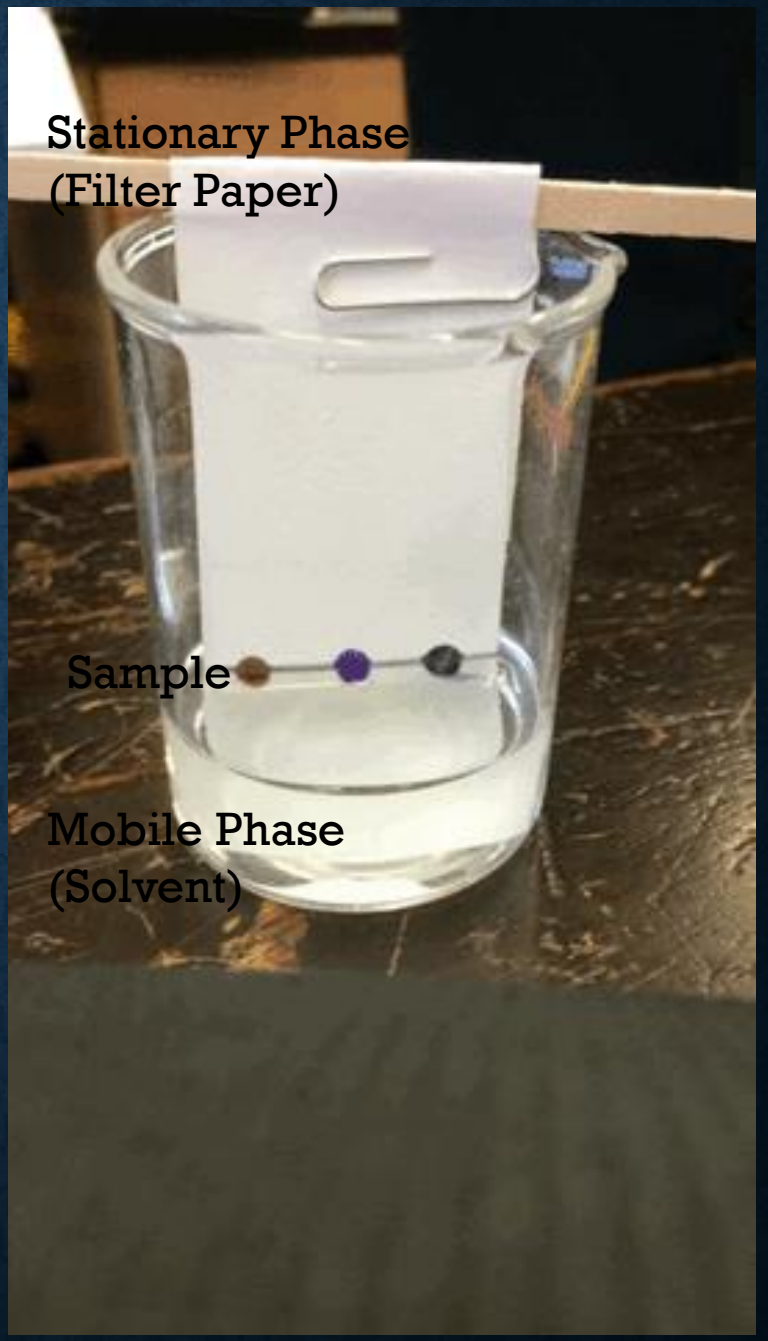
d

5.CHROMATOGRAPHY:

- A technique that separates different chemical compounds from a mixture
- a technique for the separation of a mixture by passing it in solution or suspension through a medium in which the components move at different rates.
- Usually mixtures of proteins, amino acids or photosynthetic pigments.



PAPER CHROMATOGRAPHY

- Two phases

1) Stationary Phase – consists of **filter paper**

2) Mobile Phase – consists of **solvent** containing mixture sample

- Process – The mobile phase passes through the stationary phase, molecule of mixture sample present in mobile phase separate on stationary phase as invisible dots according to individual affinity. Then filter paper is sprayed with staining dye to make the dots visible.
- Filter Paper → Chromatogram
- Apparatus → Chromatography chamber

PLENARY:

1. List few cell biology techniques.
2. Which technique will be used in separation of blood sample?
3. Which technique can help us to grow food for the growing population?
4. What is the principle of differential centrifugation?


STAY
HOME
STAY SAFE

Allah Hafiz