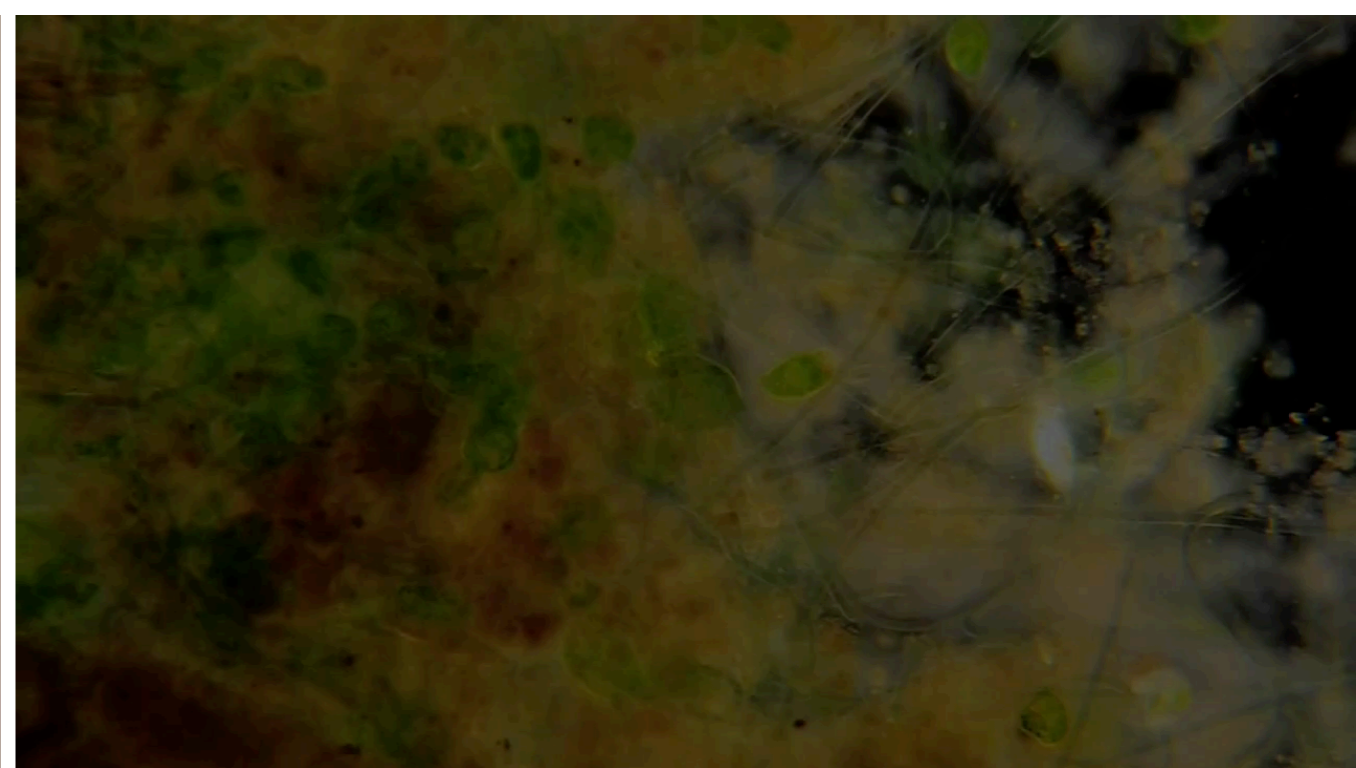
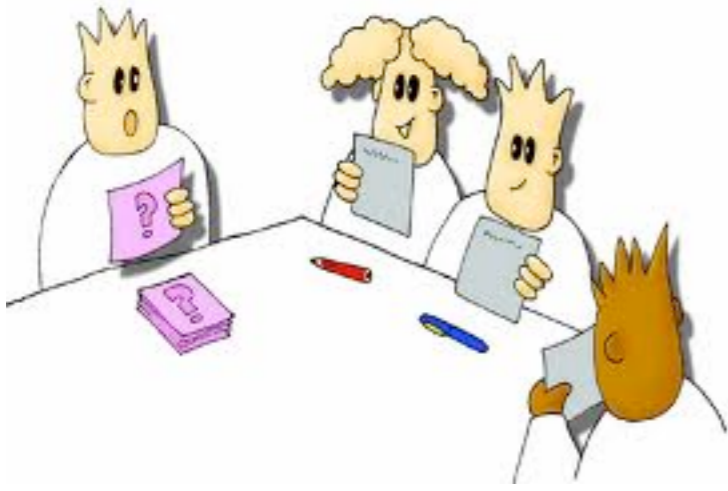
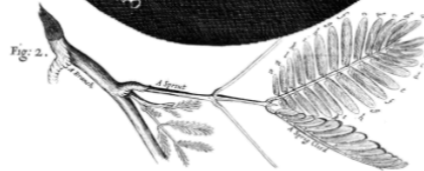
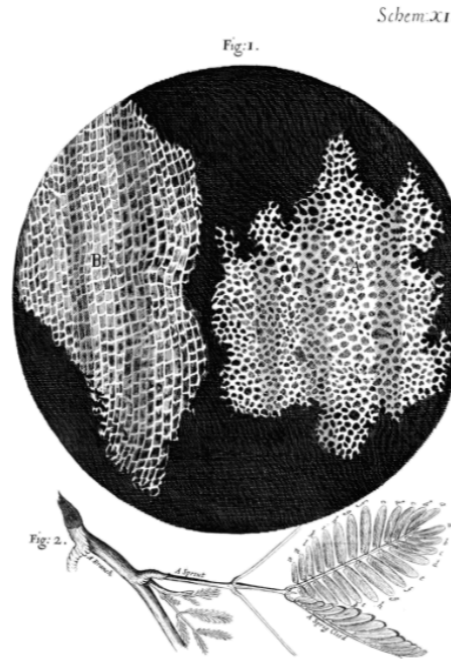
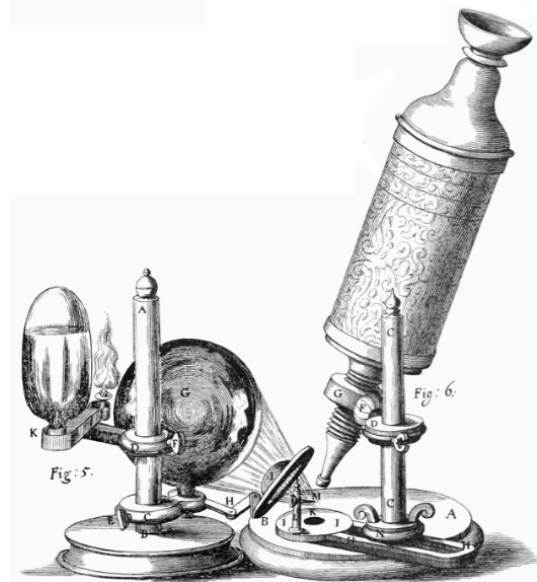


**Compare and contrast the following two organisms
on a white board**



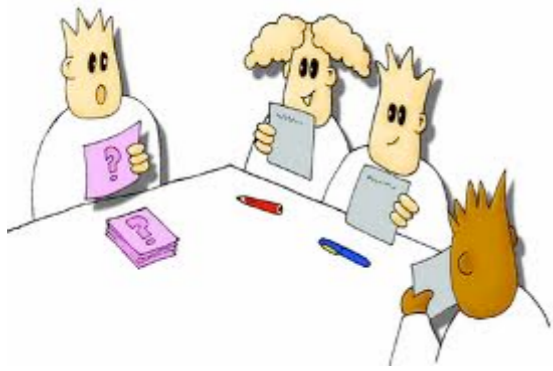
Cells and Cell Theory



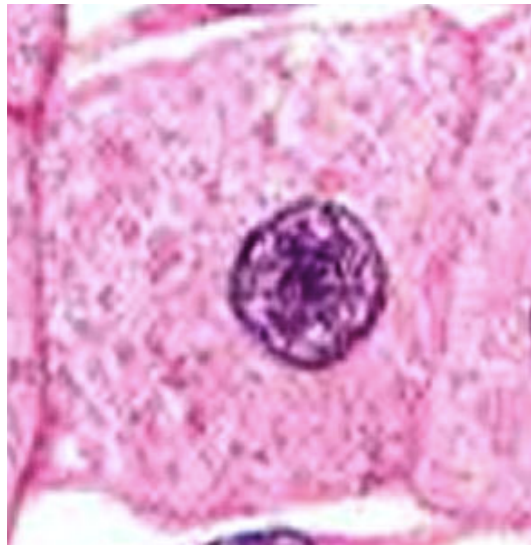
Matthias Schleiden



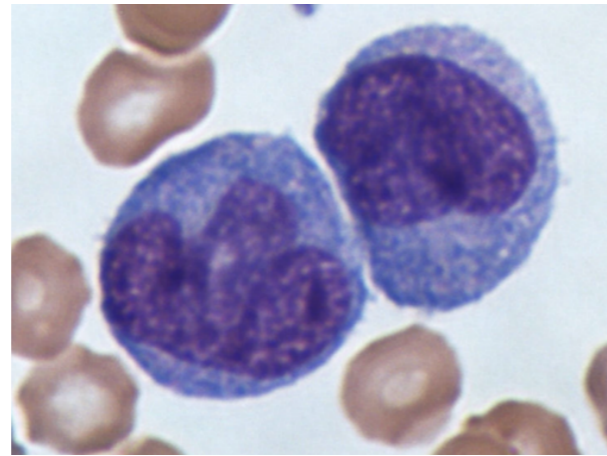
Theodor Schwann



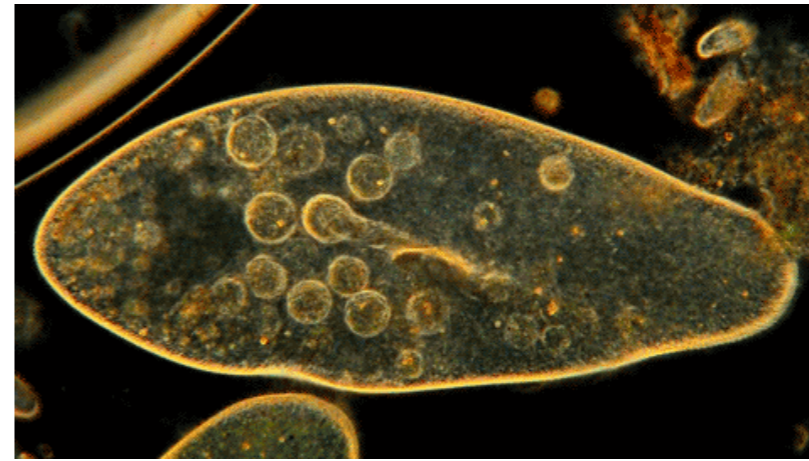
**Examine the following images.
Then state some commonalities to all.**



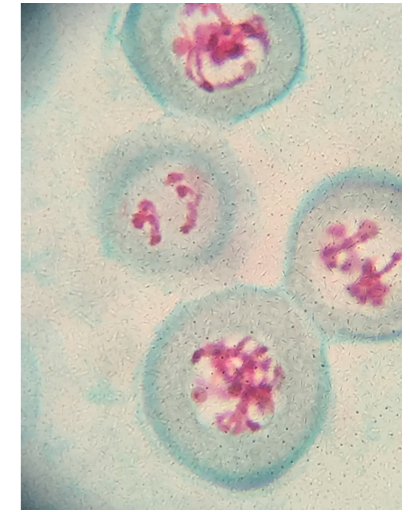
Stained liver cell



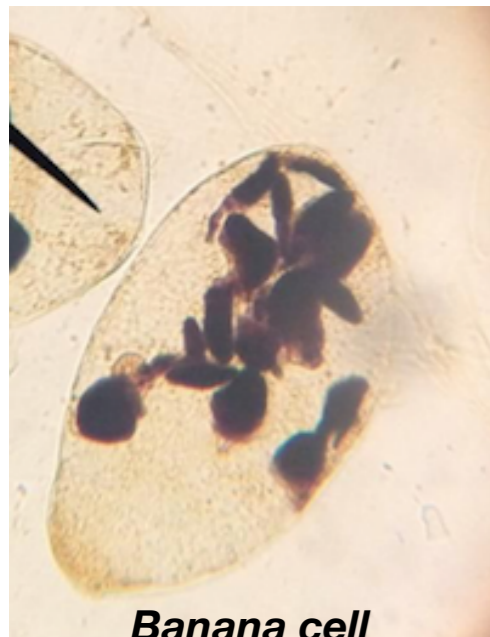
Stained White blood cell



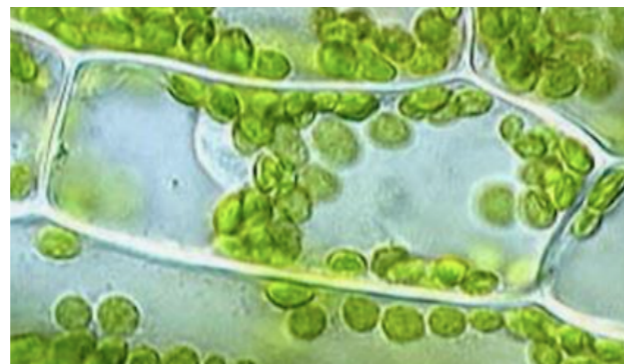
Paramecium



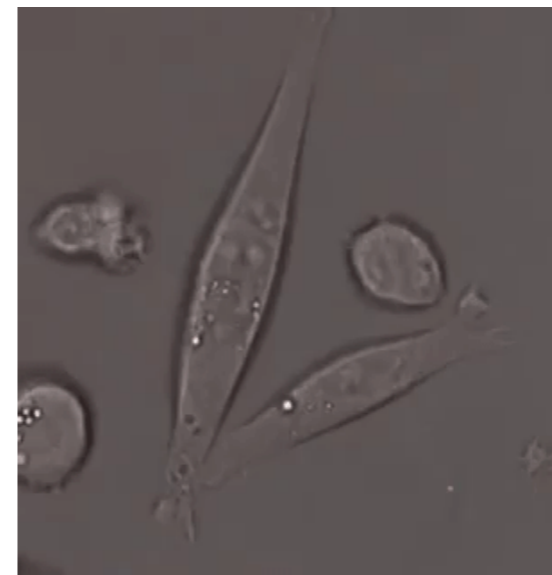
Lily pollen



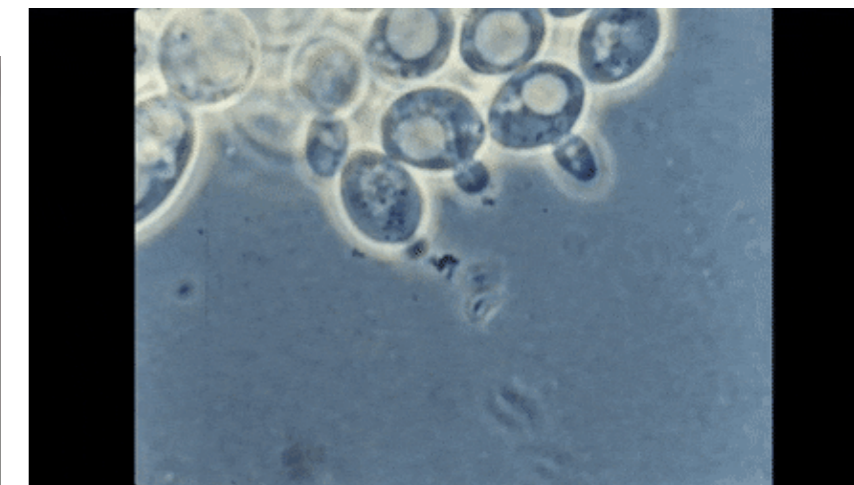
***Banana cell
stained***



Elodea leaf cells



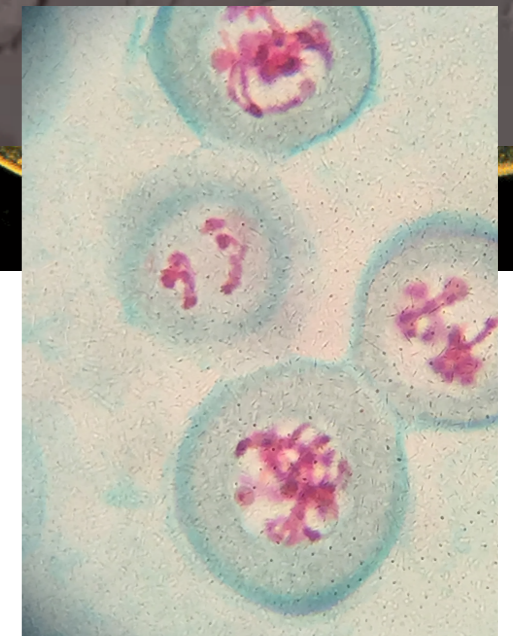
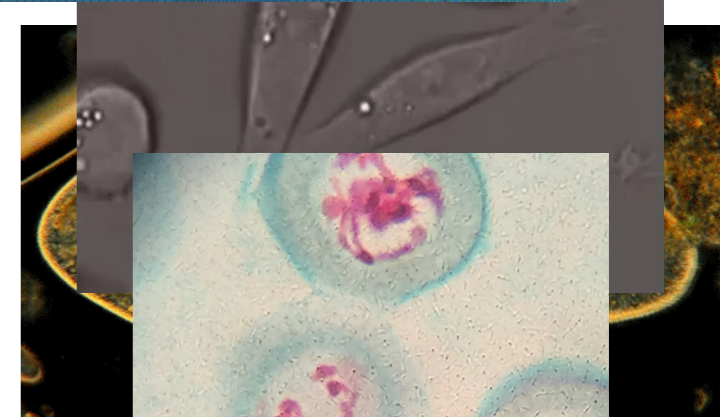
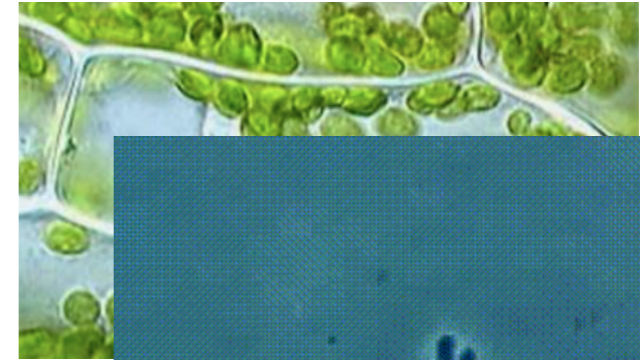
***Human T-Cells killing
cancer cells***



Yeast cells

Cell Theory

- Living things are made of cells.
- All living cells arise from pre-existing cells by division.
- The cell is the fundamental structural and functional unit
- Activity of organisms depends on its cells.
- Energy transfer occurs within cells.
- Cells contain the genetic info - DNA (nucleus) and RNA (throughout the cell)
- All cells are basically the same in chemical composition in organisms of similar species.



Exceptions to the Rules

- Skeletal muscles - made of fibres enclosed in a membrane,
 - larger than most cells
 - multinucleate (hundreds)
- Giant algae *Acetabularia*
 - 100mm in length
 - consists of many cells
 - contain only one nucleus

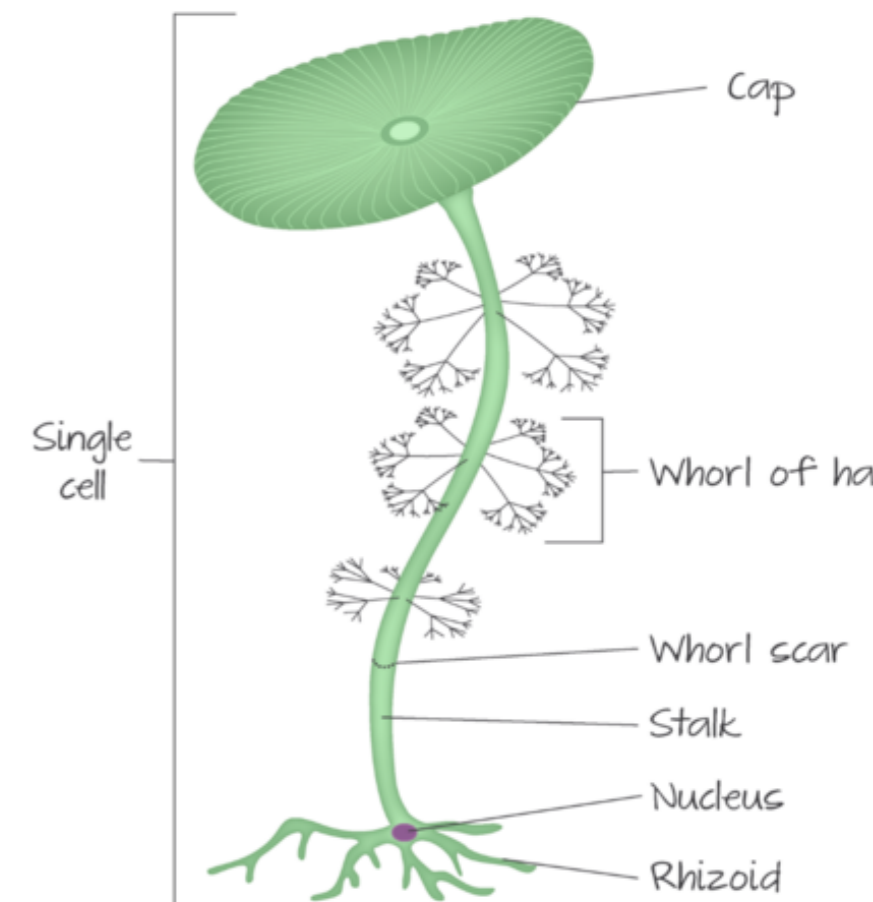
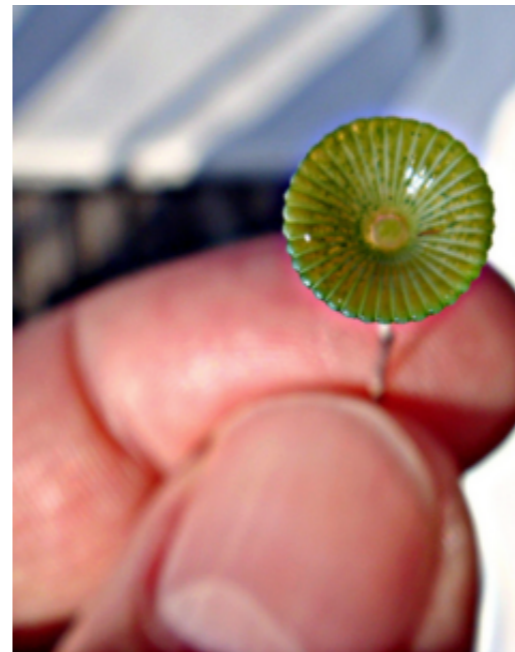
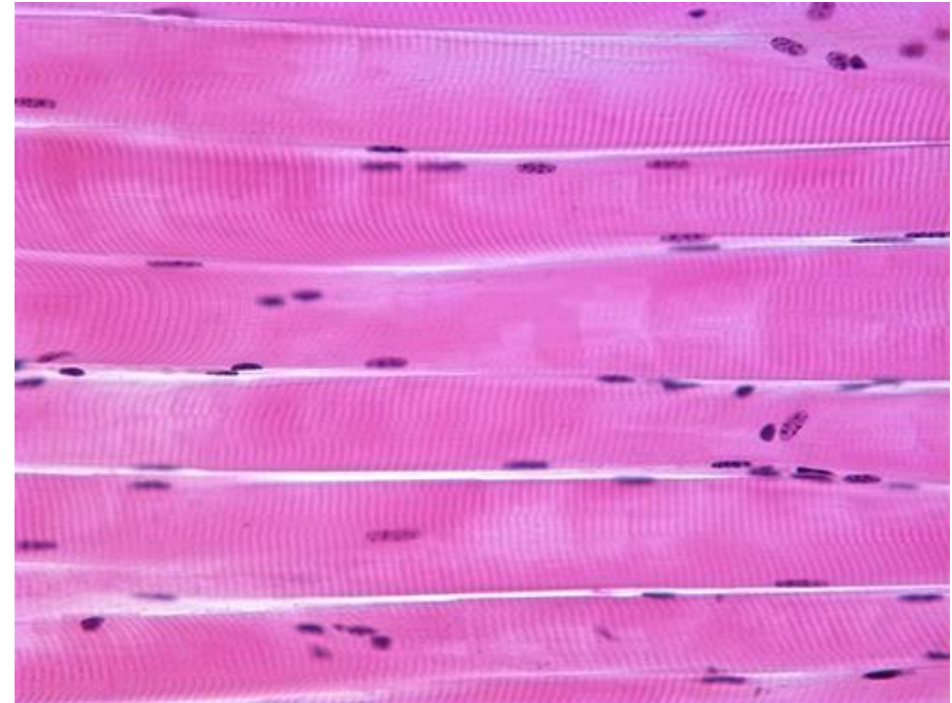
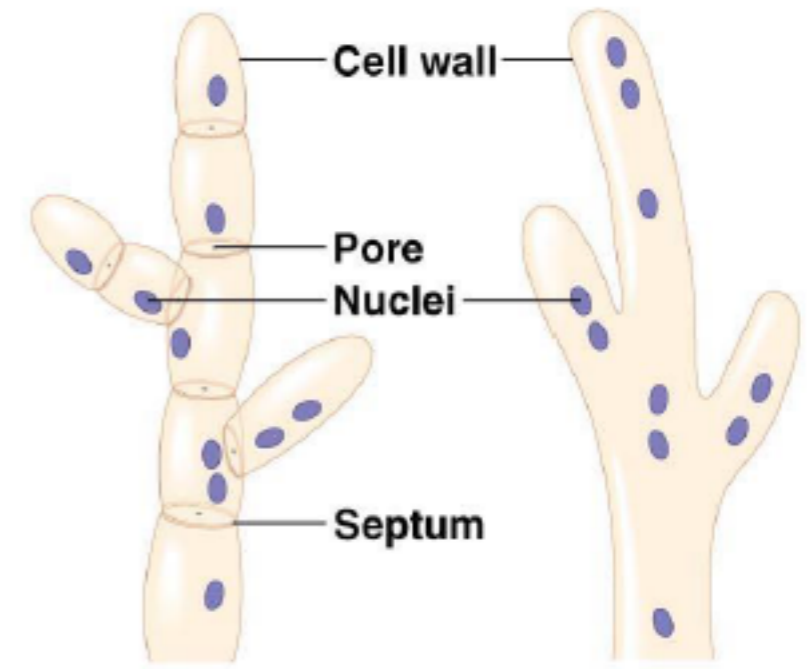


Figure 2. *Acetabularia*.

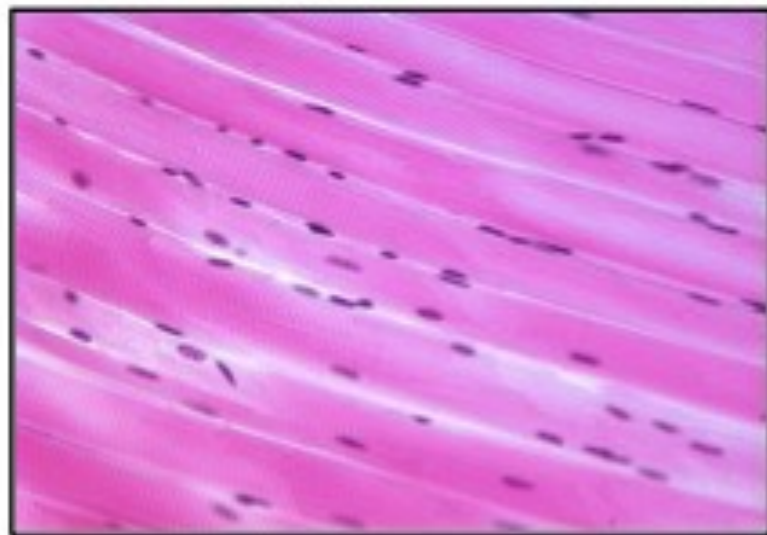
Exceptions to the Rules

- Aseptate fungi - hyphae or branches of the fungi lack septum of divisions to mark individual cells
 - multinucleate cytoplasm



(a) Septate hypha

(b) Coenocytic hypha



Muscle cells form long, multinucleated fibres

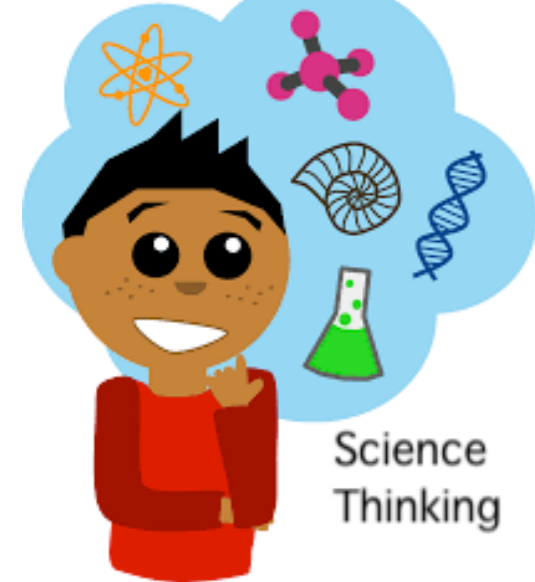
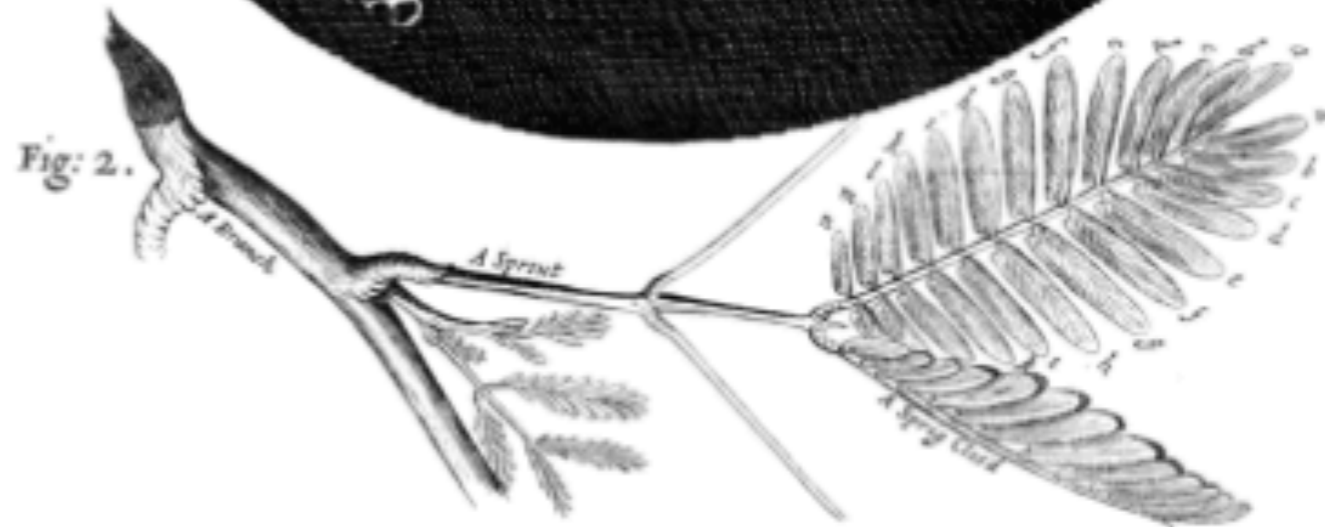
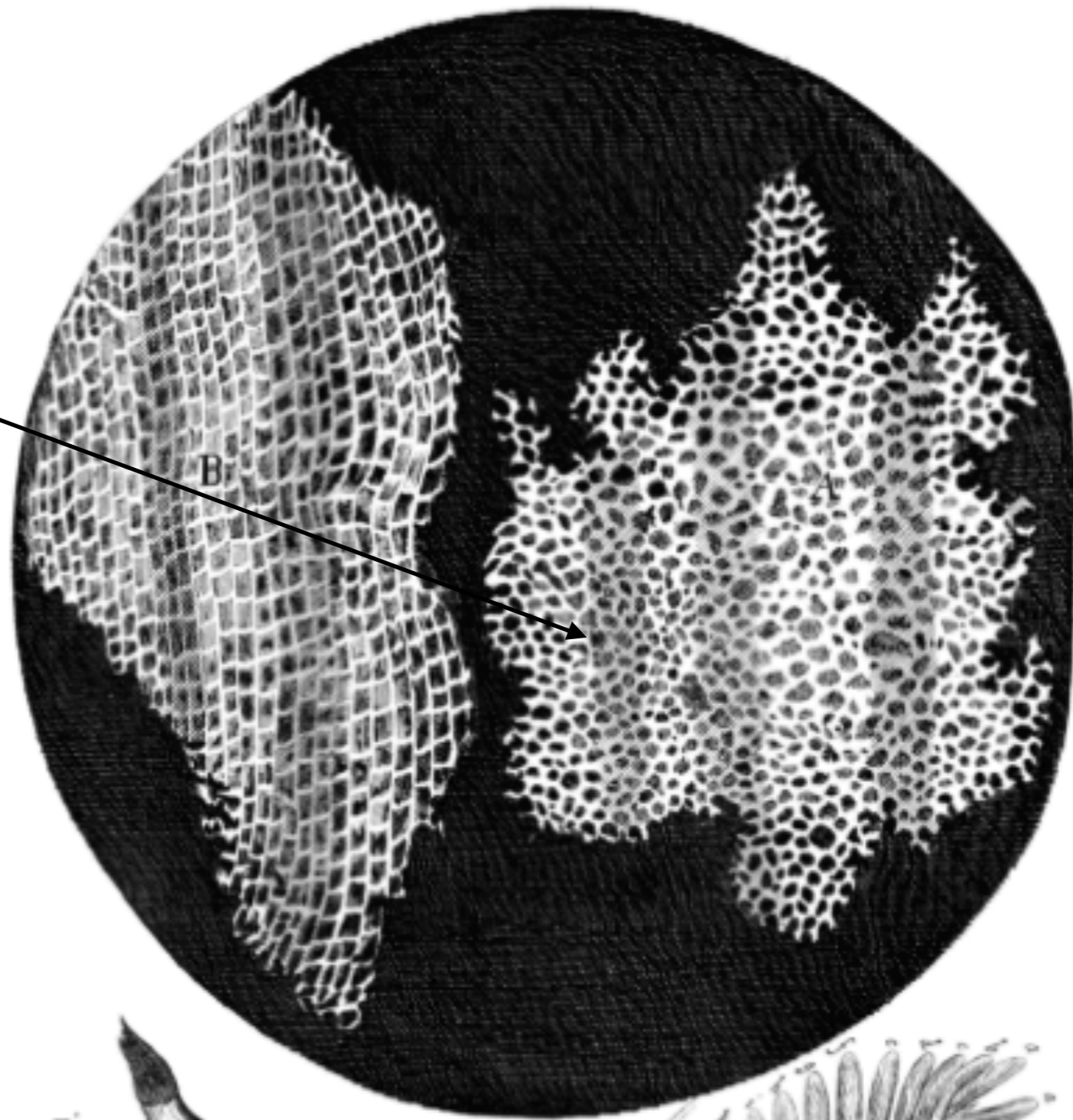


Aseptate hyphae have **no** cellular partitions

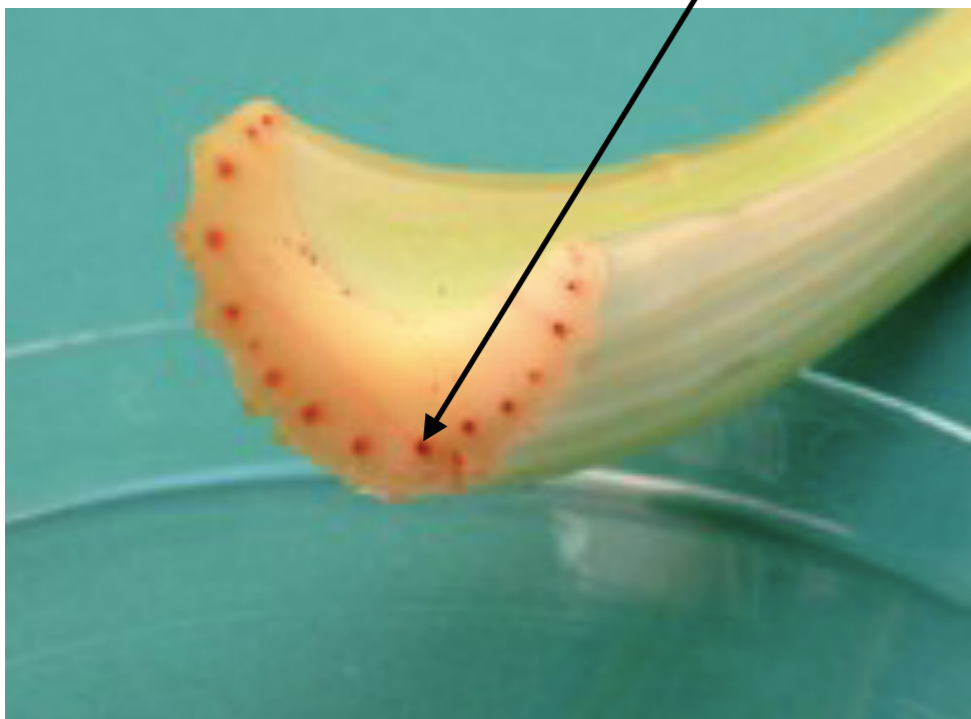


Giant algae can be very large in size (>70mm)

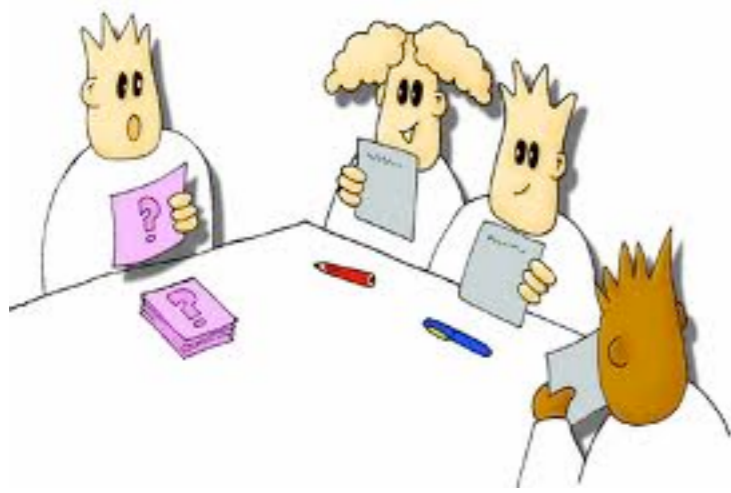
Fig: 1.



These structures are relatively hollow. Discuss whether they qualify as cells?



Unicellular life



List activities a unicellular organism must do or conduct in its cell in order to survive?

Unicellular life

What must a unicellular organism do or conduct in its cell in order to survive?

Gather nutrition

Conduct metabolic activity

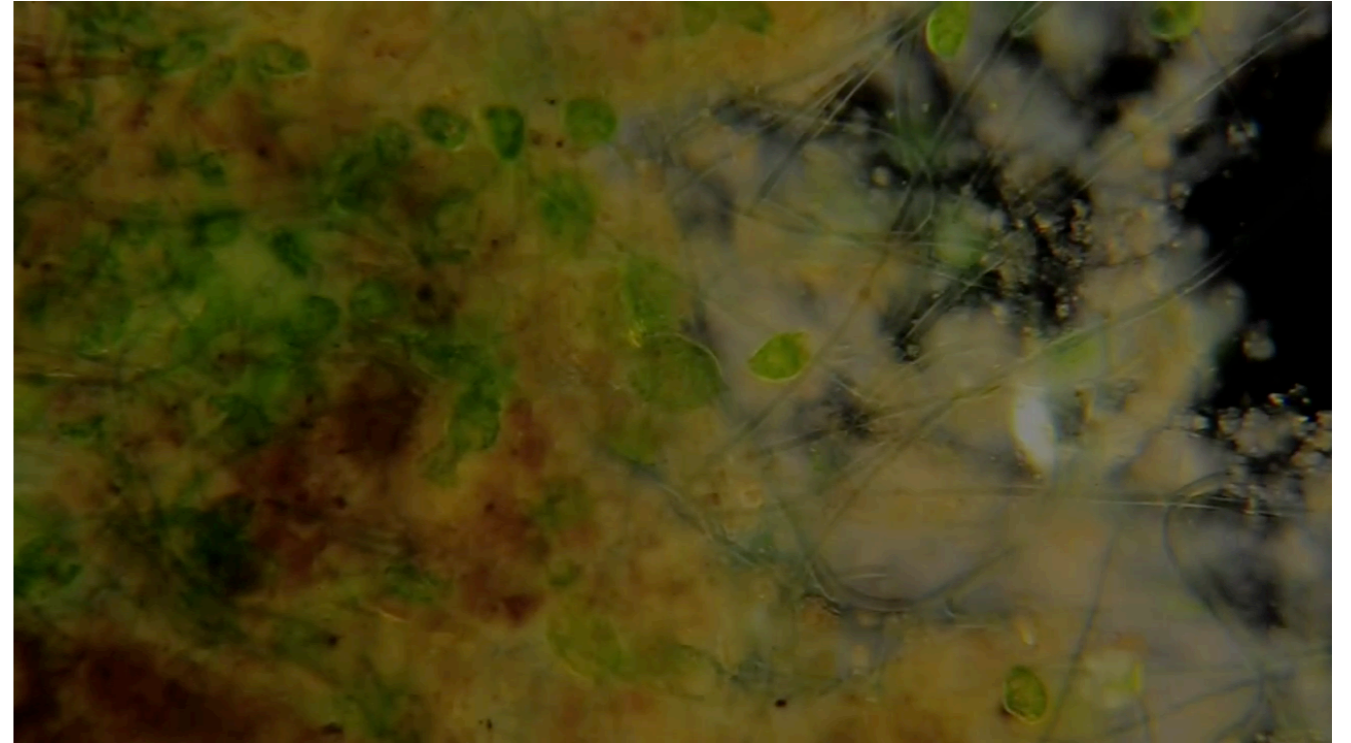
Grow in Size

Respond to stimuli

Excrete waste

Maintain Homeostasis

Reproduce



Unicellular life

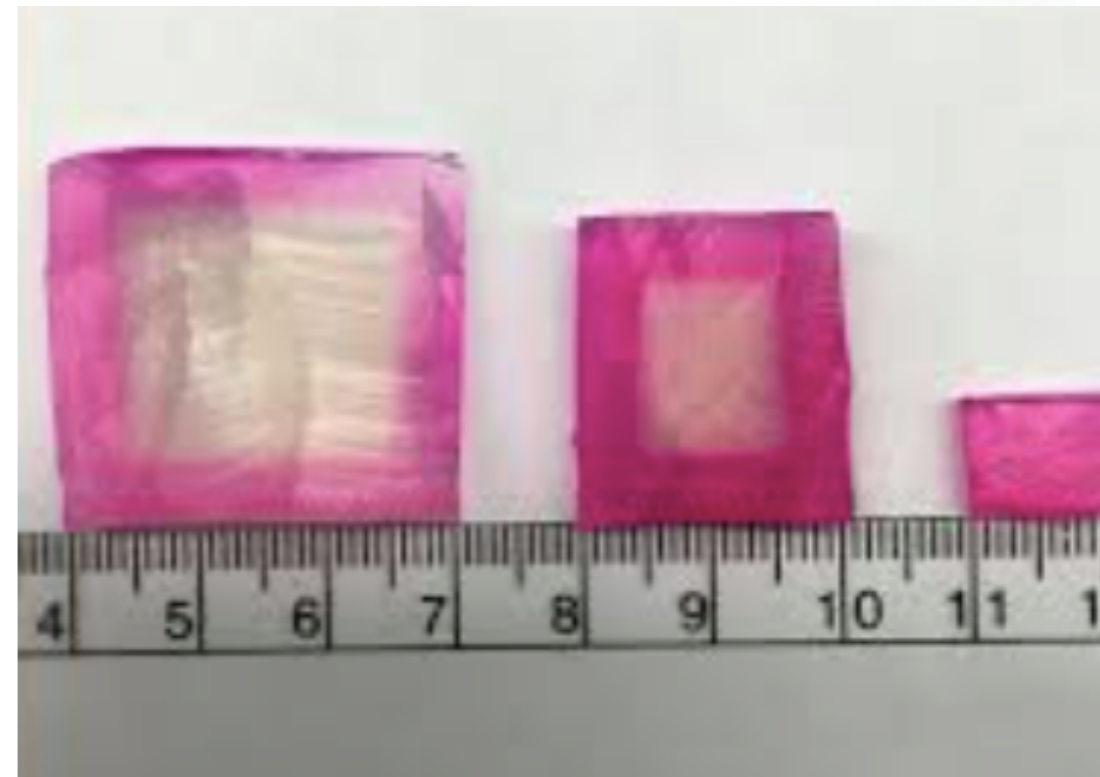
Limitation to Size in Cells

Demo:

- Make cells of three different sizes with a desk partner
- Place the cubes in a sodium hydroxide solution
- Leave it sit for 15 minutes

Questions:

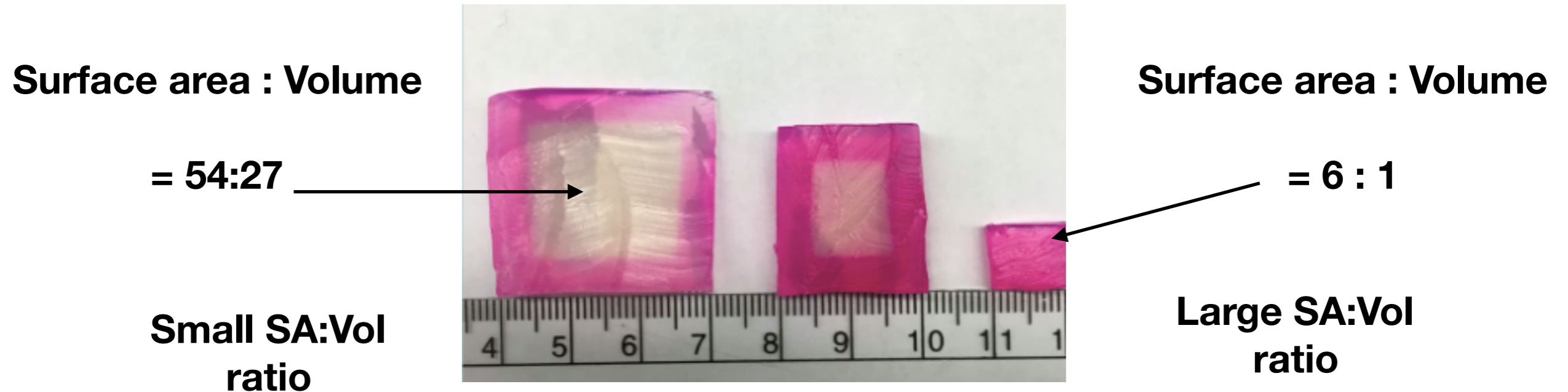
- What did you notice?
- State at least two conclusions you can draw
- From this demo explain why size matters in cells



Unicellular life

Limitation to size in cells

- Cells conduct metabolism or chemical reactions to maintain life



- Reaction rate is limited by the **surface area : volume** ratio in cells
 1. Reactant uptake (too small - slow uptake)
 2. Heat production in reactions
 - Cells can overheat and die (too small- overheat)

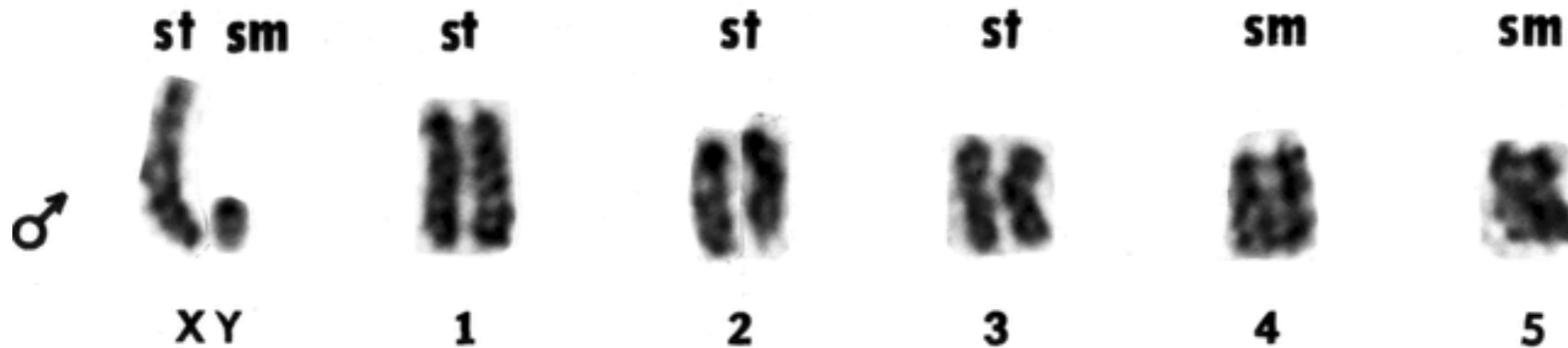
Multicellular Life

- **Multicellular life have properties that emerge from interaction of their cellular components**
 - eg Cells in volvox are few but allow the organism to move by flagella in co-ordination
 - *Caenorhabditis elegans* has neurons, digestive cells that form organs and function independence of other cells but co-ordinate together



Multicellular Life

Specialization of cells

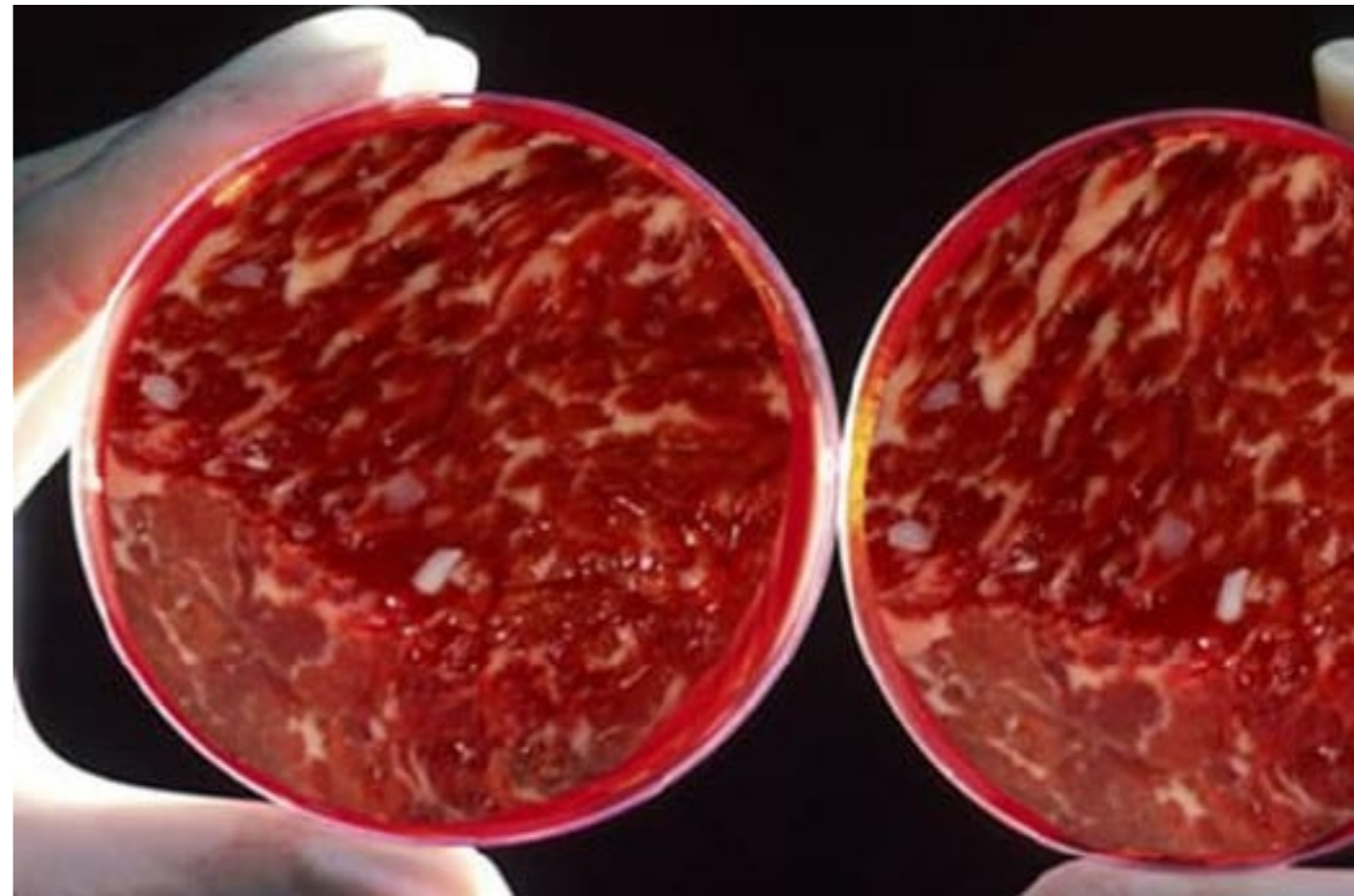


- **Specialized cells** develop through **cell differentiation** of **stem cells**
- **All cells are genetically identical, but express the DNA information differently different specialized cells**
 - eg - some skin cells will produce tanning pigments while other cells produce hair proteins. Both these cells have the exact same genetic info, but use specific parts called genes related to that specialized cell

Multicellular Life

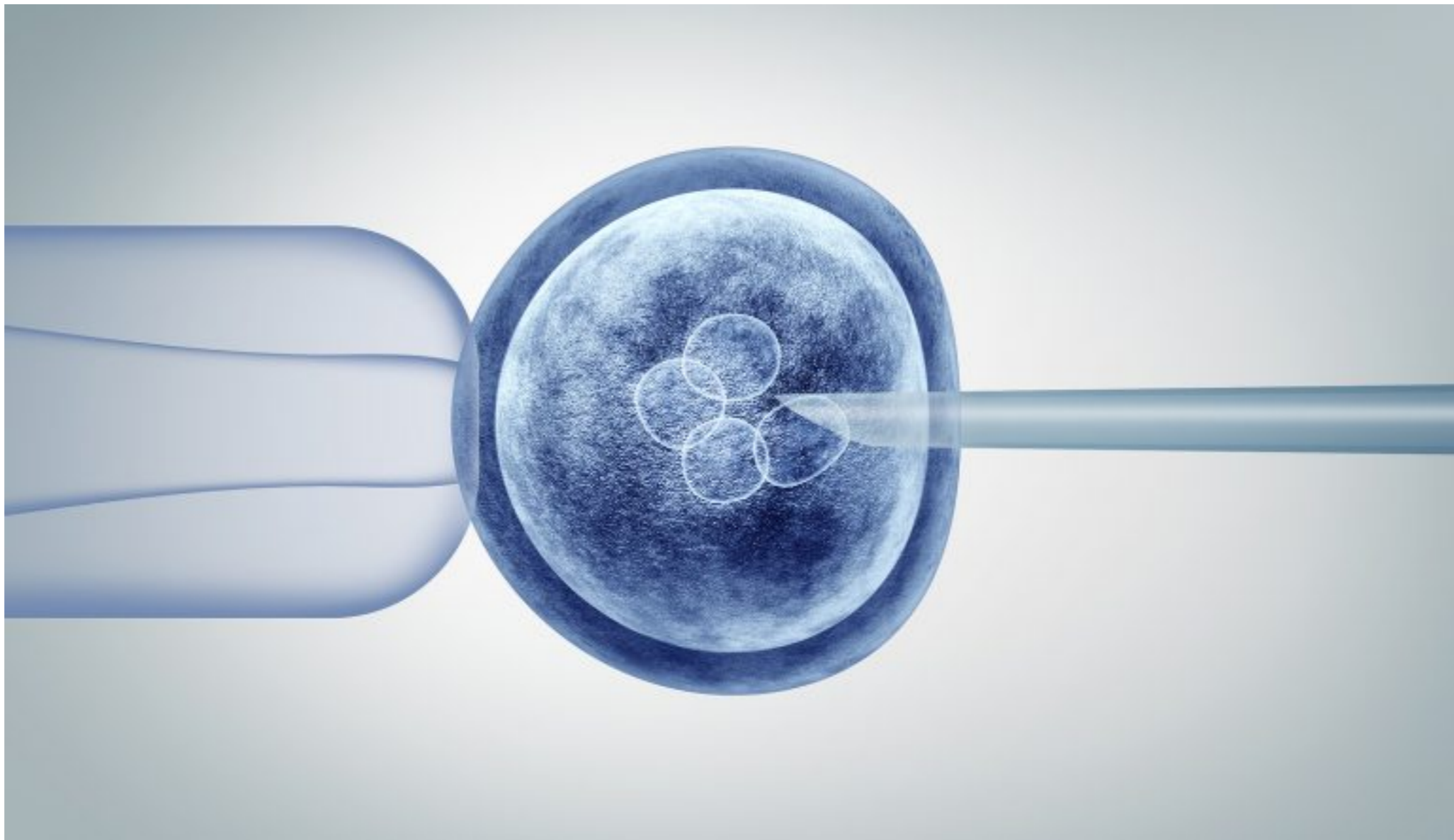
Stem Cells

- Can divide repeatedly to produce lots of cells
- Are not specialized or differentiated, but can differentiate to form specific cell types
- Embryonic are the most useful therapeutically. Research and disease treatment
- Adult stem cells occur in adults and





Many embryonic stem cell lines have been acquired by terminated embryonic development, often by in vitro fertilization. Given the potential benefits of embryonic stem cell therapy, do you agree with using these stem cell sources?





As you watch....

- 1. What is the difference between embryonic stem cells and adult stem cells?**
- 2. How is does leukemia get treated using stem cells ?**

SAMPLE USE ONLY

Stem Cells