Pipe Cleaner Activity

Introduction

Multicellular organisms, like you, begin as a single cell. In this activity, you will explore how a cell reproduces (divides) to form two new cells by modeling each stage using pipe cleaners as chromosomes. Human body cells normally have 46 chromosomes. For this simulation, you will only use 2 chromosomes for simplicity.

Materials

- Activity Report
- 2 large white backgrounds (paper, pencil, eraser, etc.)
- 4 pipe cleaners (2 of color “A”, 2 of color “B”)

Procedure

Step 1: Take two papers and stack them one on top of the other. The papers represent a cell. Place 2 pipe cleaners (1 of each color) on the top plate. This represents a cell with 2 uncopied chromosomes.

- Using colors draw a picture of this cell on your Activity Report.
- Draw a nuclear membrane around these chromosomes to show the nucleus.

Step 2: Group 2 pipe cleaners of the same color next to each other. Twist each pair together by one turn at the midpoint. Each “X” represents a duplicated chromosome. Chromosomes duplicate (are copied), through the process of DNA replication. <u>The copying of DNA occurs before mitosis, in the S phase of Interphase.</u>

Step 3: Put these duplicated chromosomes on the top paper. This is a cell with 4 copied chromosomes in **Prophase**.

- Using colors draw a picture on your Activity Report.
- **<u>Add</u>** & **<u>label</u>** spindle fibers & centromeres to your picture.

Prophase can be recognized when the chromosomes become visible with a microscope.

Step 4: Line up the chromosomes in a single line in the middle of the paper.

- Draw a picture of this cell on your Activity Report. This represents a cell in **Metaphase.**

Step 5: Now separate each duplicated chromosome by untwisting them. Leave them side by side on the midline that runs through the center of the plate. Next, move one single chromosome to the left side of the paper and one to the right.

- Draw a picture on your Activity Report. This represents a cell in **Anaphase**.
- **Add** spindle fibers & centrioles to this picture.

Step 6: Take the two papers and put them side by side, similar to the telophase diagram in the Activity Report. Place one set of chromosomes on each paper. Each daughter cell should look identical to each other and to the original parent cell.

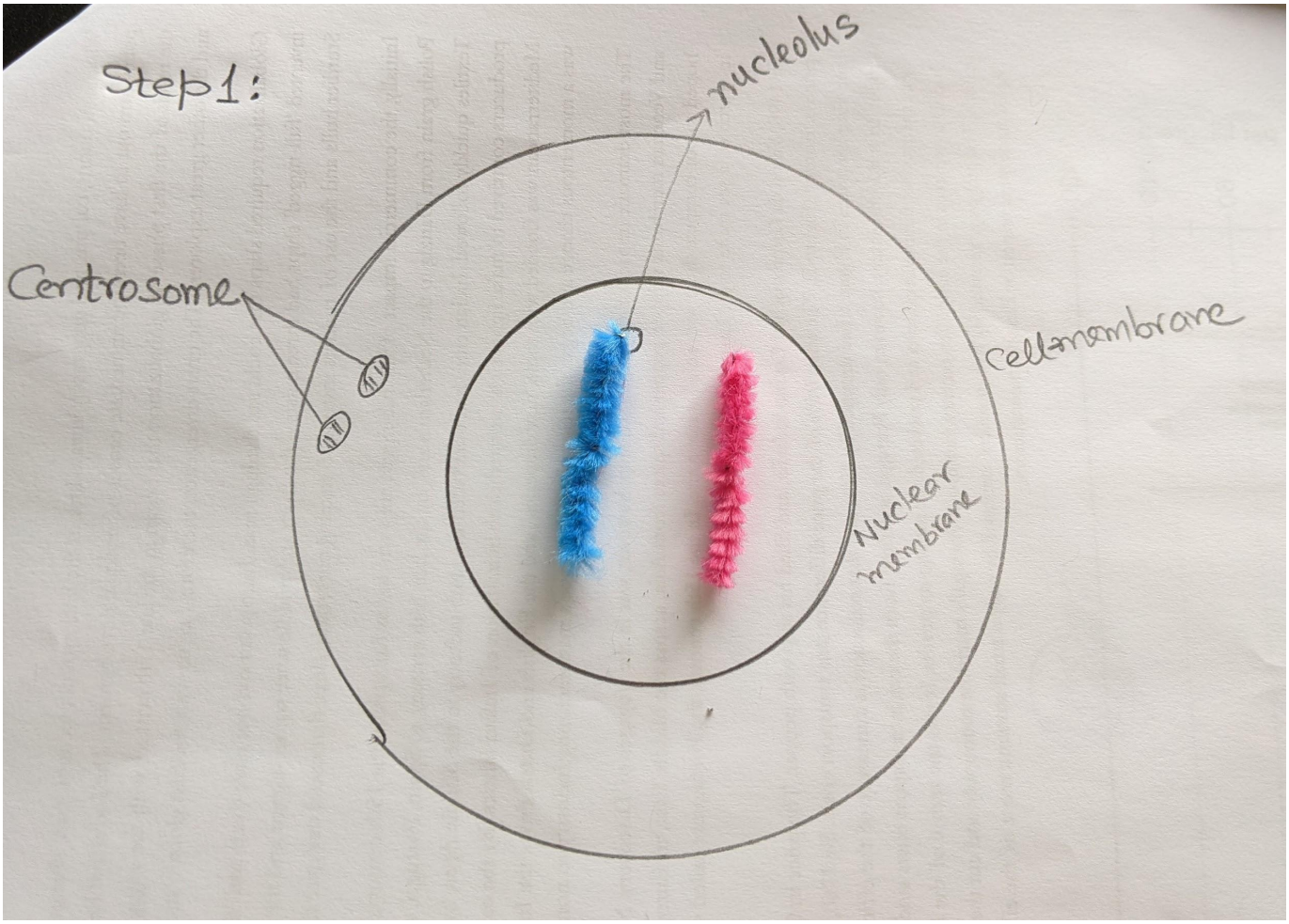
- Draw a picture on your Activity Report.

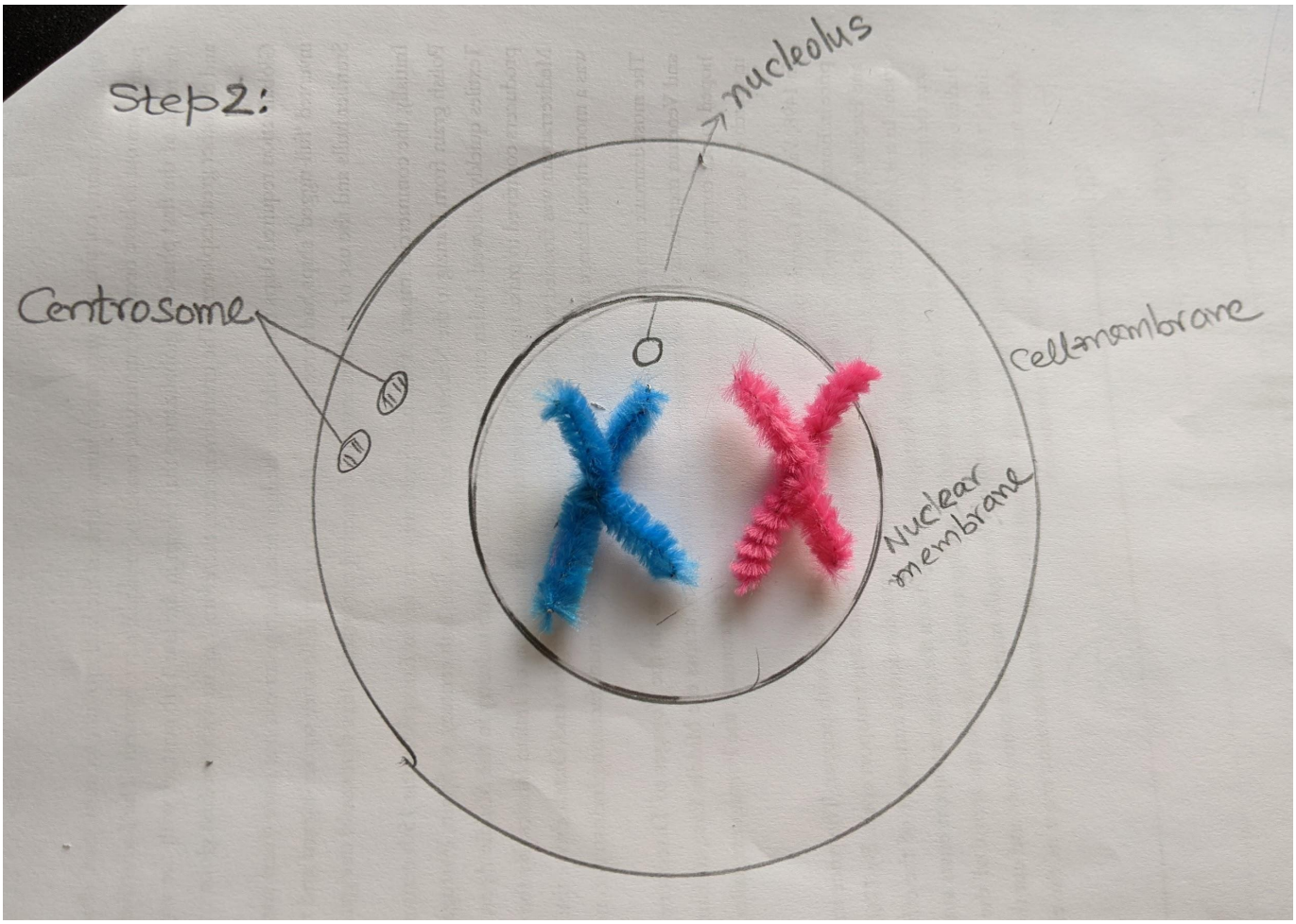
Step 7: Towards the end of **telophase**, the last phase of mitosis, **cytokinesis** begins. The cytoplasm is divided up & the sides of the membrane pinch in forming a cleavage furrow if it's an animal cell.

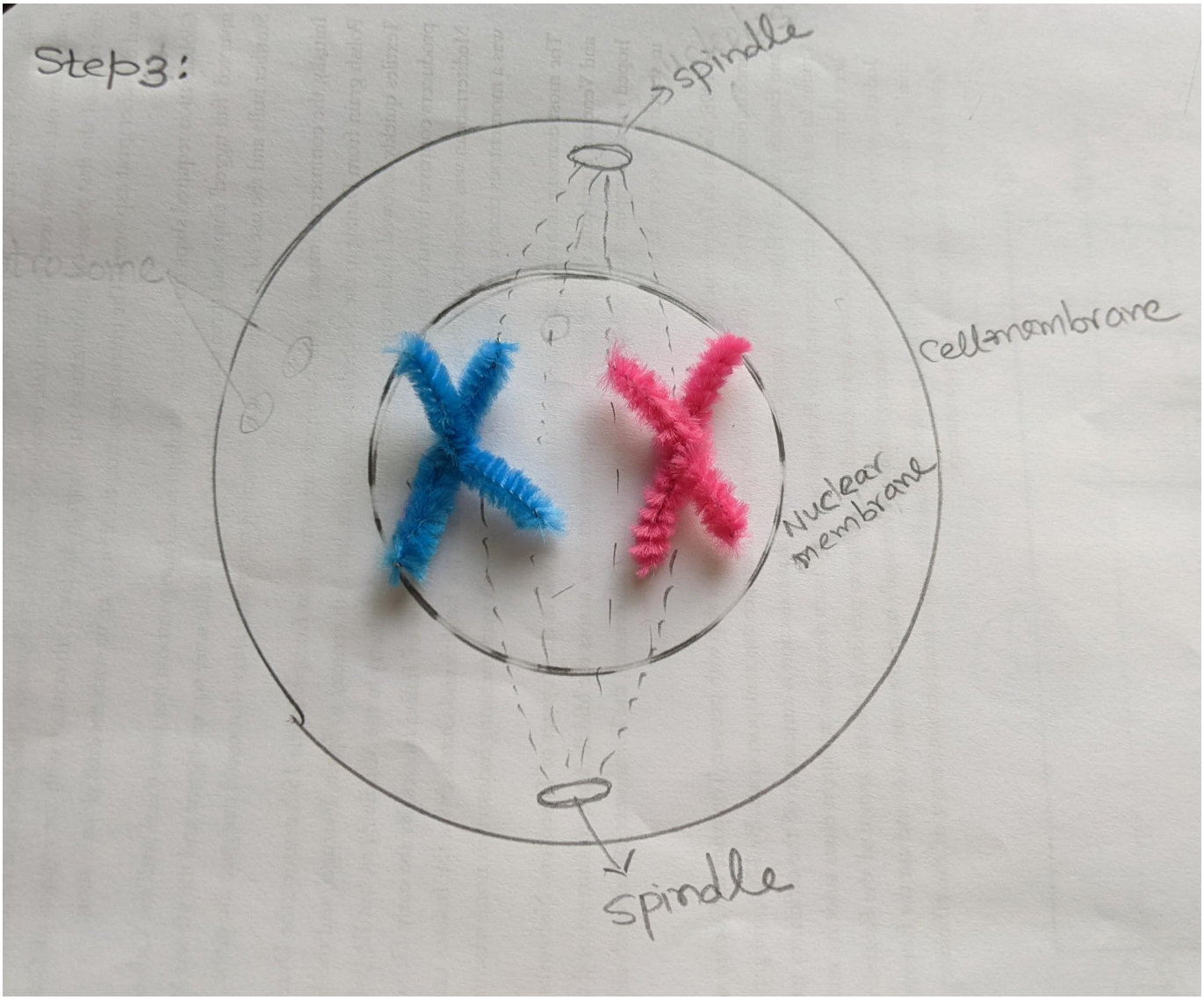
- On your activity report, draw the chromosomes unwinding back to chromatin form & nuclear membranes reforming around the DNA.
- The spindle fibers and centrioles disappear at the end of telophase.
- **Label** as many elements as you can.

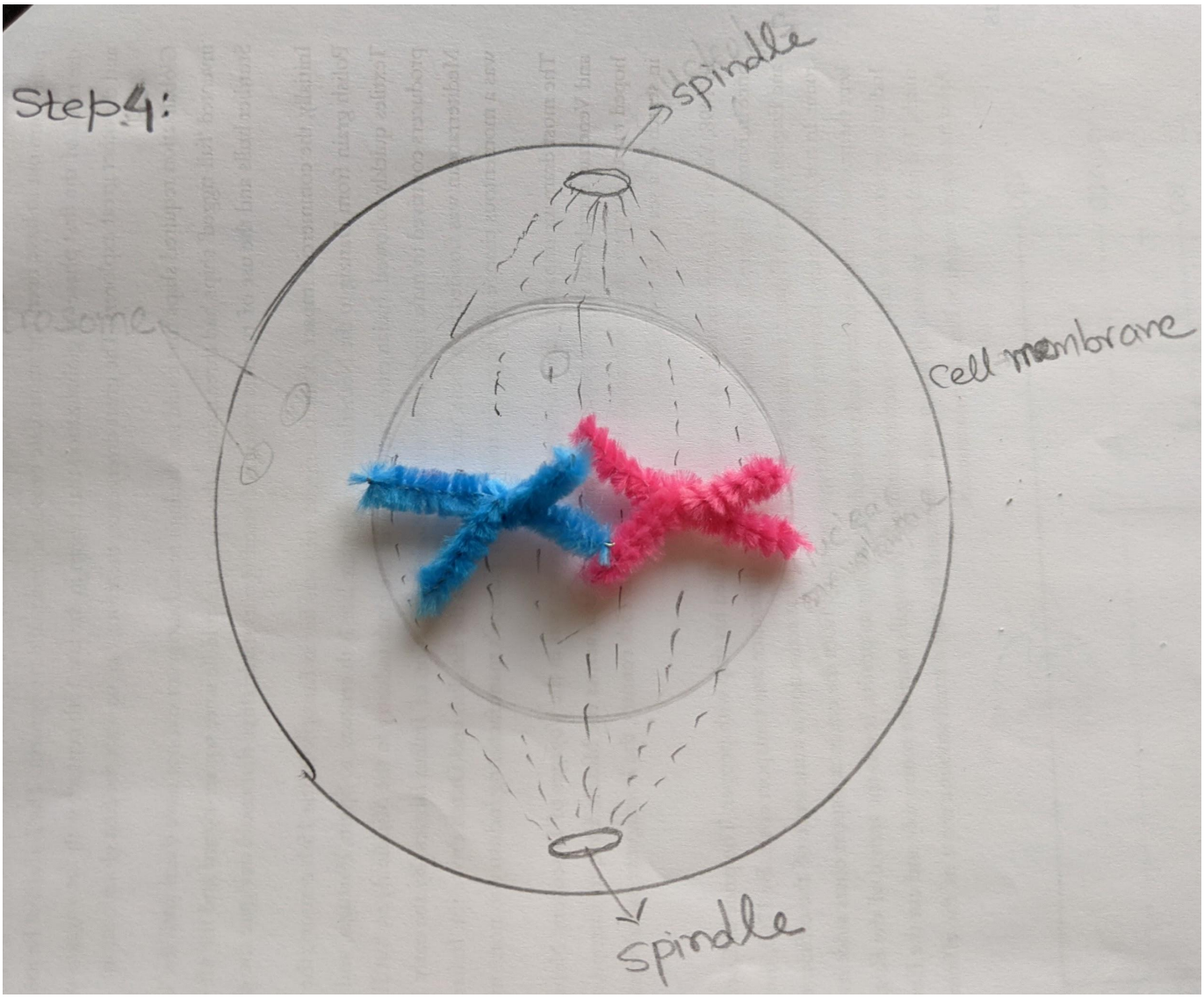
Drawings

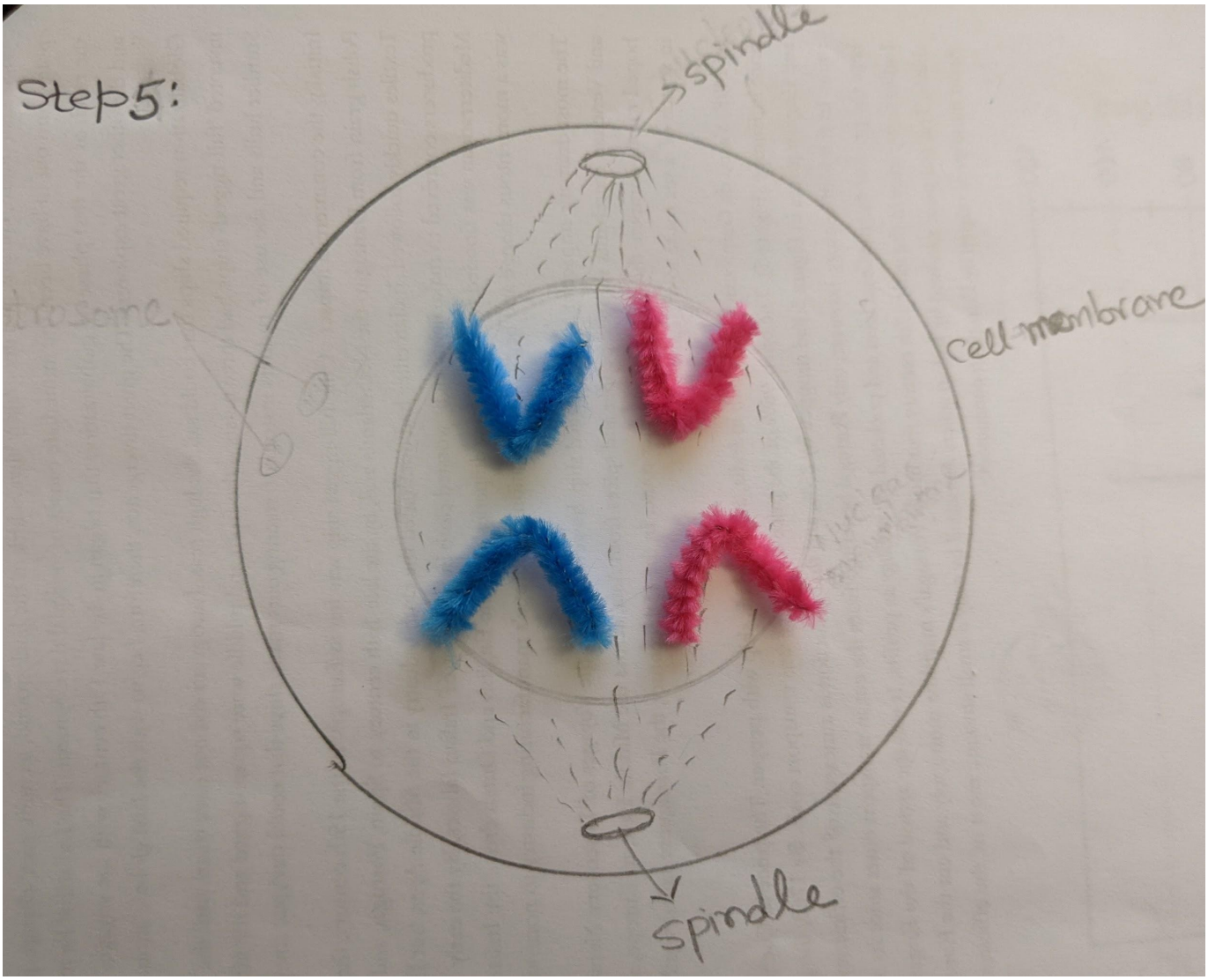
To create the drawings, please paste below:

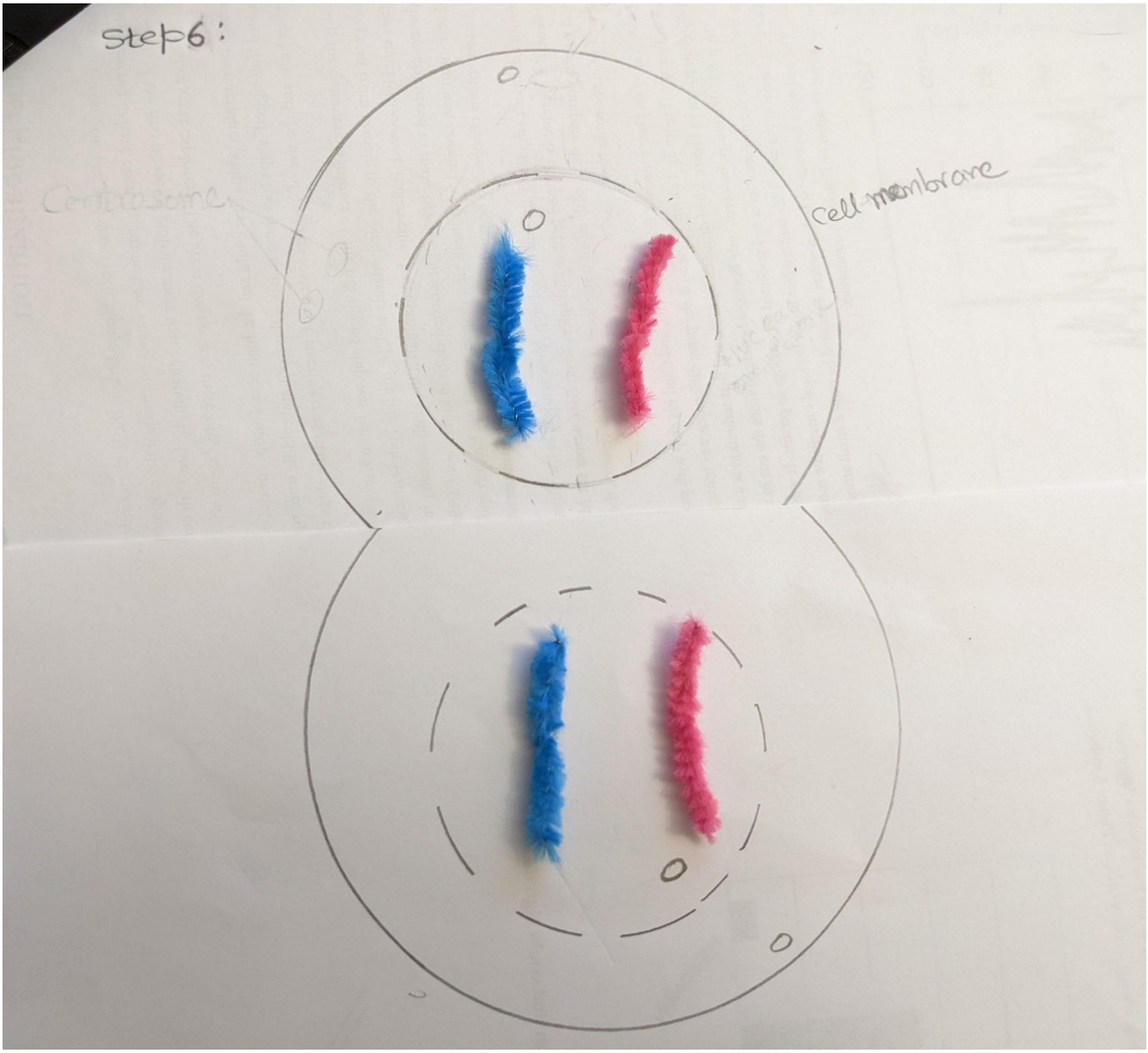



Step2:
nucleolus
Centrosome
Cell membrane
Nuclear membrane

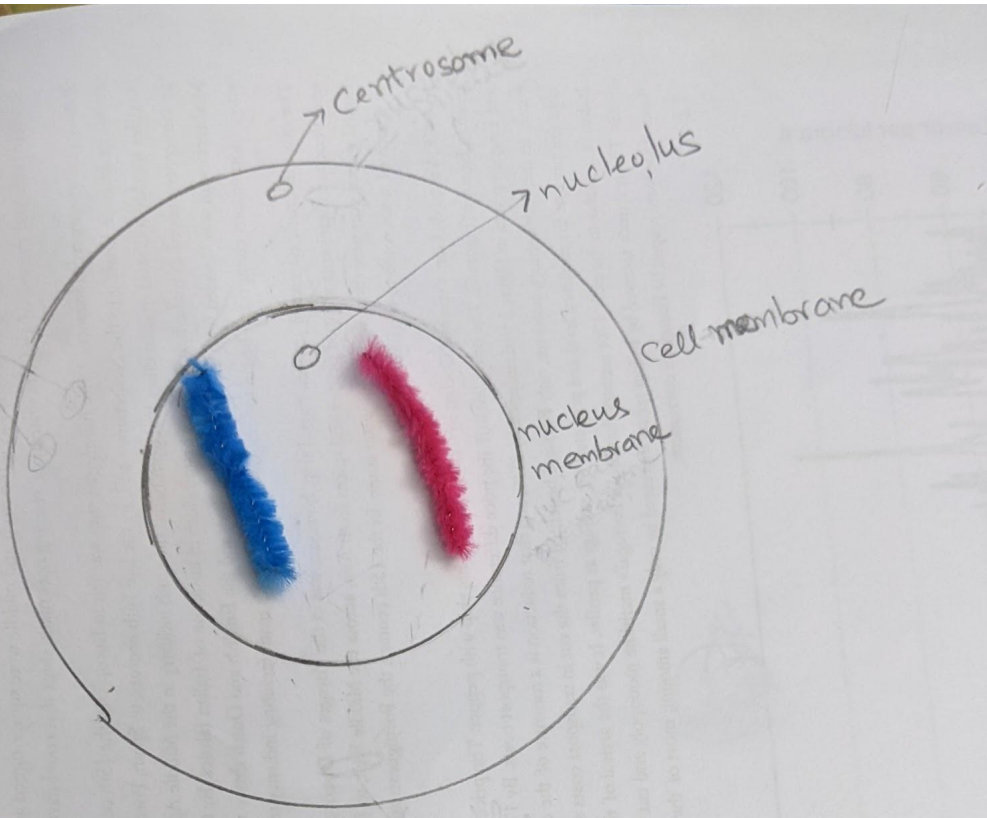

Step3:
spindle
ribosome
cellmembrane
Nuclear membrane
spindle

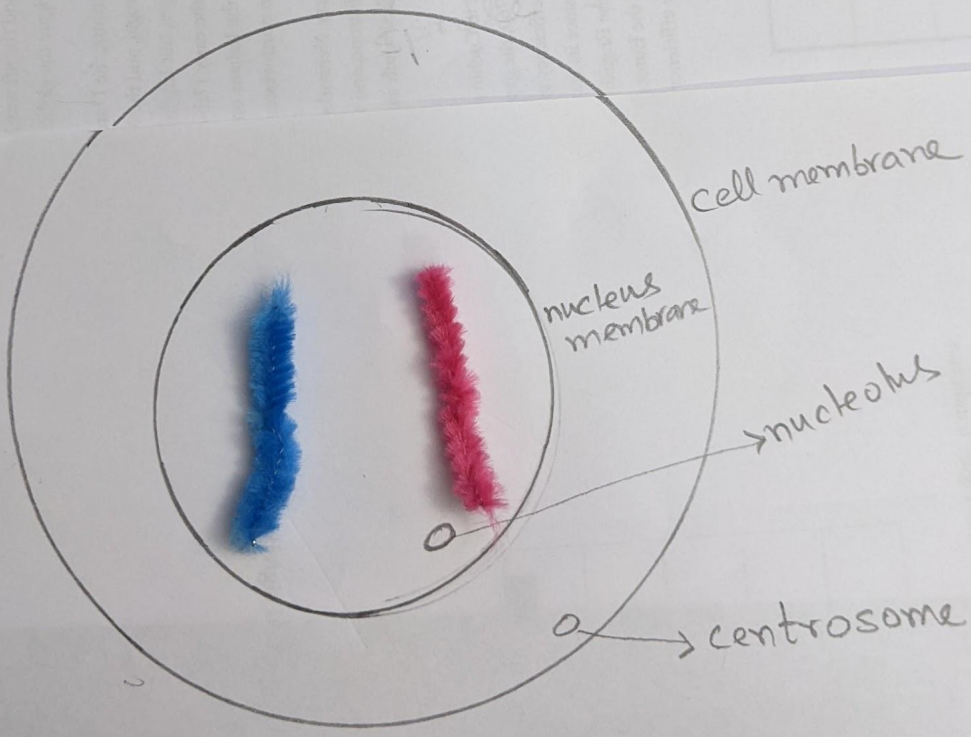

Step 4:
spindle
cell membrane
spindle


Step5:
spindle
cell membrane
spindle


step6:
Centrosome
cell membrane

Step 7:


Centrosome
nucleolus
cell membrane
nucleus membrane


cell membrane
nucleus membrane
nucleolus
centrosome

Review Questions

1. Compare the chromosome number of the parent cell with that of each daughter cell.

2. Compare the genetic information of the parent cell with that of each of the two daughter cells.

3. You have 46 chromosomes in each of your somatic cells. If you cut your arm, how many chromosomes would be in each newly formed skin cell?

4. Why must human cells do mitosis? Give at least 2 reasons.

5. Examine the diagram below and label the phase each cell is in. Cells are either in Interphase, Prophase, Metaphase, Anaphase, or Telophase/Cytokinesis.

1.
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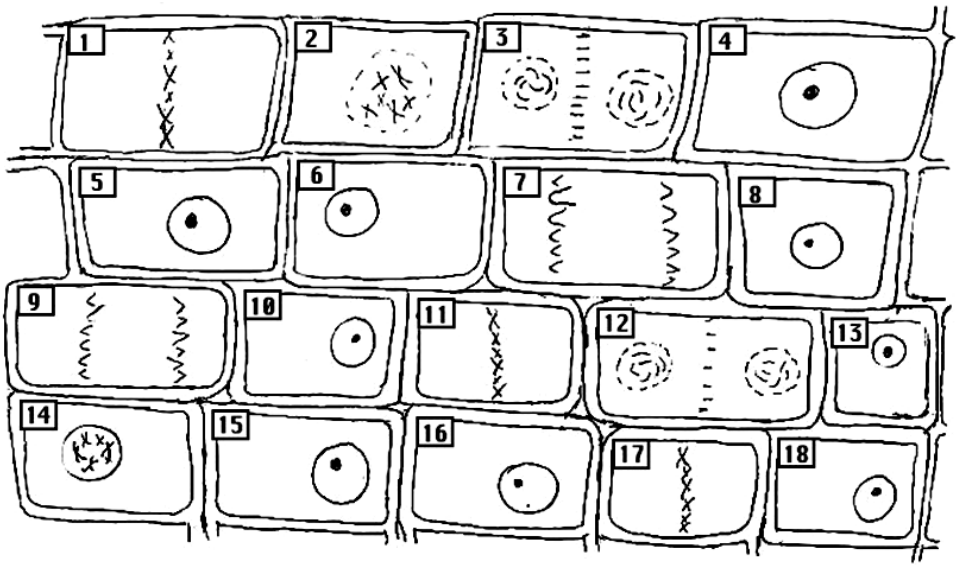
15.



6. According to the diagram, cells spend most of the time in which phase?

Jamboard Activity: Group

Contribution of Scientists in Physiology or Medicine

Instructions:

● Every group has been assigned the name of the scientist

● Jamboard link of class D will be shared

You have to elaborate on the life of the given scientist. You are supposed to finish your Jamboard activity in 30 minutes. After that one of the group members can present in 3-4 minutes.

The following points to be included

● Early life and education of scientist

● Achievements of scientist

● Personal life of scientist

Rationale: Students can appreciate the achievement of scientists and its advantages in day today life. It is important for students to know about personal life of scientists so that they can correlate their life with scientist's life and realize the fact that scientist is also a normal person like them at personal front. The hardships faced by scientists will inspire students to know their struggles vs achievements. Most of the times, students read about theories, inventions, and technologies benefits, but don't bother to know who is behind this technology. This activity has facilitated students to think over on all these points.

Students Name: X, Y and Z

Grade: 4- (Every point was addressed properly but the references of information are missing)

https://jamboard.google.com/d/1mjY0WoJ0rXtro51PimYiQ1eLYqPkmSAzUu9KRve0PYU/viewer?f=0

Class D- Groups

1 / 7

Share

Set background | Clear frame | Open on a Jamboard

Name of Scientist: Charles Louis Alphonse Laveran (Early life and education, Achievements and Personal life)

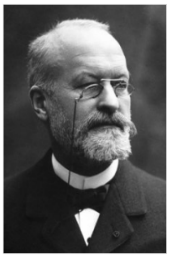
Born June 18, 1845 in Paris.

Educated at the Collège Saint Baube and later at the Lycée Louis-le-Grand.

He then went on to study at the Public Health School at Strasbourg, at the wish of his father, for four years.

In 1866, he was appointed as a resident medical student in the Strasbourg civil hospitals.

His family moved south of Paris to Algeria when Alphonse was five.



Both his Father and his Paternal Grandfather worked in medical professions as well. His father worked as an army doctor.

Immediately after the War, he worked at hospitals upon returning home. He also resigned from the army during this time

He served in the Military as a doctor during the Franco-Prussian War, which was from 1870-71. During this time, Malaria was a major problem in the colonies for the military

He Married Mademoiselle Pidancet in 1885

He used half of the prize money from the Nobel Prize to establish the research institute Société de Pathologie Exotique, which would research tropical medicine.

Charles Louis was awarded a Nobel Prize in Medicine in 1907 because he discovered parasitic protozoans cause infectious diseases such as malaria and trypanosomiasis.

Gizmos

Name: [redacted] Date: 05-26-2022

Student Exploration: Cell Structure

Directions: Follow the instructions to go through the simulation. Respond to the questions and prompts in the orange boxes.

Vocabulary: cell membrane, cell wall, capsule, centriole, chloroplast, cytoplasm, cytoskeleton, endoplasmic reticulum, flagellum, Golgi apparatus, lysosome, mitochondria, nucleoid, nuclear membrane, nucleolus, nucleus, organelle, pilus, plasmid, plastid, ribosome, vacuole, vesicle

Prior Knowledge Questions (Do these BEFORE using the Gizmo.)

1. What are some of the structures inside a cell that help it to live and perform its role in an organism?

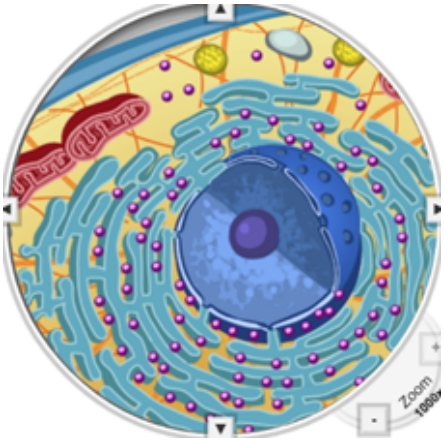
   Mitochondria, nucleus, lysosome

2. How do you think plant cells differ from animal cells? (Hint: What can plants do that animals cannot?)

   Plants have chloroplasts that allow them to convert radiant energy from the sun into chemical energy(photosynthesis)

Gizmo Warm-up

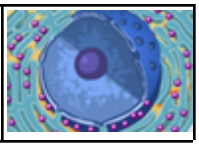
The *Cell Structure* Gizmo allows you to look at typical animal, plant, and bacterial cells under a microscope. On the ANIMAL CELL tab, click **Sample** to take a sample of an animal cell. On the dropdown menu, select **Centriole**.



3. Find the **centrioles** (Highlighted in green). ✏️ Make a sketch of the centrioles in the space below. Either hand draw in the space below or edit using the drawing tools.

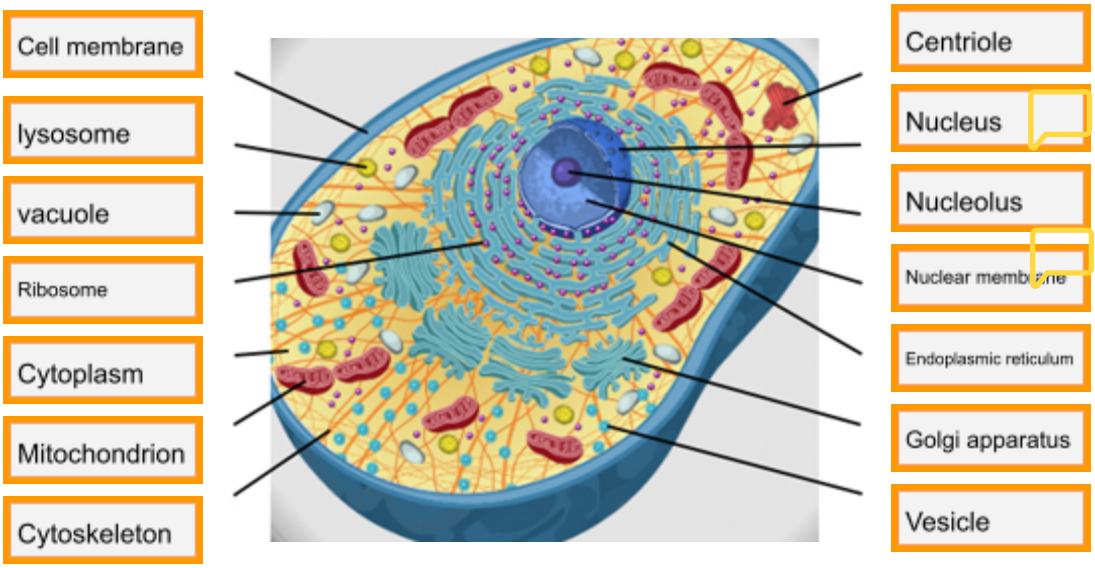
4. Read the description of the centrioles. What is their function?

   Centrioles play a role in organizing the movement of chromosomes during cell division.

Activity A: **Animal cells**	Get the Gizmo ready: • Check that an **Animal cell** is mounted on the microscope.	

Question: Organelles are specialized structures that perform various functions in the cell. What are the functions of the organelles in an animal cell?

1. Label: Locate each organelle in the animal cell. ✏️Label the organelles in the diagram below. (Double-click on each box, then add the text to the box and click **Save and Close**.)



2. Match: Read about each organelle. Then match each organelle to its function/description.

H	**Cytoplasm**	A. Structure that organizes motion of chromosomes.
E	**Lysosome**	B. Stack of membranes that packages chemicals.
F	**Mitochondria**	C. Membrane that protects the nucleus.
A	**Centriole**	D. Membrane that surrounds and protects the cell.
G	**Endoplasmic reticulum**	E. Sac filled with digestive chemicals.
M	**Vacuole**	F. Structures that convert nutrients to energy.
D	**Cell membrane**	G. Passageways where chemicals are made.
J	**Nucleus**	H. Jelly-like substance within the cell membrane.
N	**Cytoskeleton**	I. Structure that manufactures ribosomes.
L	**Ribosome**	J. Structure that contains DNA and regulates genes.
C	**Nuclear membrane**	K. Package created by the Golgi apparatus.
B	**Golgi apparatus**	L. Small structure that synthesizes proteins.
K	**Vesicle**	M. Sac that stores water, nutrients, or waste products.
I	**Nucleolus**	N. Tubules and filaments that give the cell its shape.

3. Investigate: Select the **Cell membrane**. Turn on **Show closeup**. Read the description, watch the animation, and answer the following questions below.

   A. What kind of molecules diffuse (go through) the cell membrane directly?

   Small, uncharged molecules diffuse the cell membrane directly.

   B. How can some large molecules and charged ions get through the cell membrane?

   Some large molecules and charged ions can get through the cell membrane through special transport proteins.

4. Investigate: Select the **Nuclear membrane** closeup. How is the nuclear membrane similar to the cell membrane?

   They both let some things in and out. Some molecules are prevented from going in or travelling back in the wrong direction. The nuclear membrane and the cell membrane both use transport proteins.

5. Investigate: Select the **Mitochondrion** closeup. What happens inside the mitochondrion?

   In the cytoplasm, glucose is broken down into smaller molecules. When this process happens, water is produced. In the mitochondria, those small molecules which were broken down by the cytoplasm and oxygen are converted into carbon dioxide, a form of energy the cell can use.

6. Investigate: Select the **Ribosome** closeup. How does the cell make proteins inside the ribosome?

   The ribosome translates mRNA into amino acid sequences(proteins).
   tRNA molcecules bring amino acids into the ribosome. Inside the ribosome, the amino acids are bound together to create a long chain. This chain then folds into a complex shape to form protein

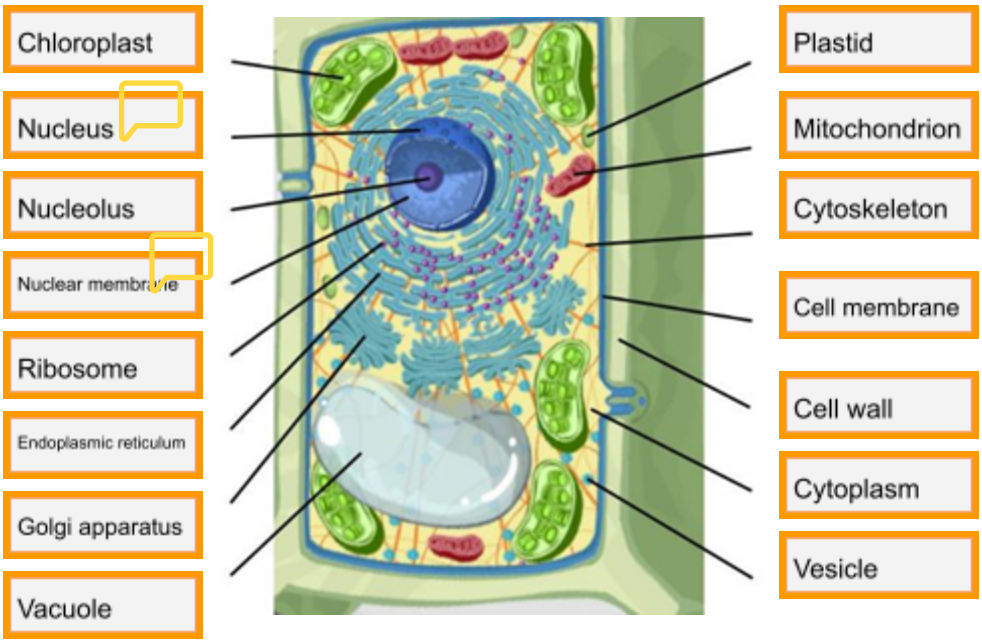
7. Investigate: Select the **Vesicle** closeup. How do vesicles move through the cell?

   Vesciles are pulled along the cytoskeltob by a protein called kinsin. This protein walks along microtubles.

Activity B: **Plant cells**	Get the Gizmo ready: • Select the PLANT CELL tab, and click **Sample**.	

Question: What functions do the organelles in a plant cell perform?

1. Label: Locate each organelle in the plant cell. Label the organelles in the diagram below. (Double-click on each box, then add the text to the box and click **Save and Close**.)



2. Compare: What structures are present in an animal cell, but not in a plant cell?

centroile,lysosome, (animal celles have small vacuoles, but plant cells have 1 larger vacuole, but they both have vacuoles)

What structures are present in a plant cell, but not in an animal cell?

Plastid, chloroplast,cell wall

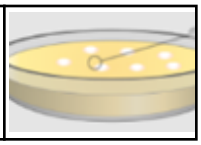
3. Fill in: Name the organelle or organelles that perform each of the following functions.

A. chlrorplast convert sunlight to chemical energy.

B. The cell wall , the cell membrane , and the vacuole support the plant cell and help it to maintain its shape.

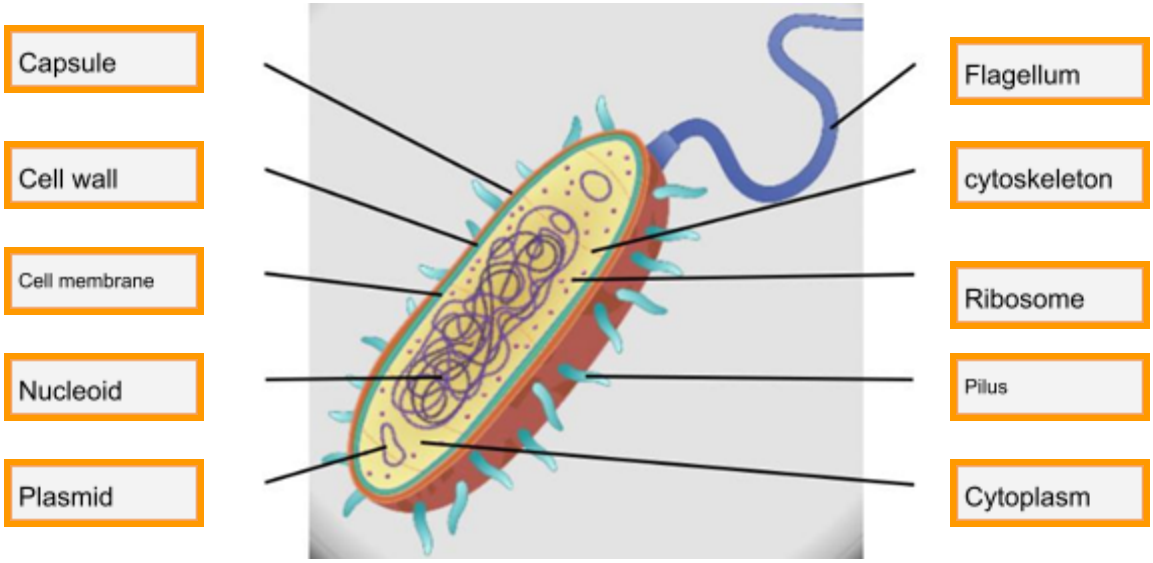
C. the plastid store food or pigments.

D. The Mitochondrian convert food into energy. They are found in plant and animal cells.

Activity C: **Bacterial cells**	Get the Gizmo ready: • Select the BACTERIAL CELL tab and click **Sample**.	

Question: How are bacterial cells different from plant and animal cells?

1. Label: Locate each organelle in the bacterial cell. ✏️Label the organelles in the diagram below. (Double-click on each box, then add the text to the box and click **Save and Close**.)



2. Match: Read about each organelle. Then match each organelle to its function/description.

D	**Capsule**	A. Hair-like structure that the cell uses for movement.
C	**Nucleoid**	B. Hair-like structure that attaches the cell to a surface and can transfer genetic material from one cell to another.
E	**Plasmid**	C. Region inside the cell that contains genetic material but is not surrounded by a nuclear membrane.
A	**Flagellum**	D. Outermost layer of the cell that provides protection.
B	**Pilus**	E. Circular piece of genetic material.

3. Compare: What structures are present in a bacterial cell, but not in a plant or animal cell?

pilus, flagellum, plasmid, Capsule

What structures are present in plant and animal cells, but not in a bacterial cell?

Mitochondrion, vacuole

What structures inside plant and animal cells look like bacteria? Mitochondrion, chloroplast

Chloroplasts and mitochondria have their own DNA. Long ago, these structures may have originated as bacteria that were engulfed (eaten) by larger cells.

Graded by Swati Tewari

Criteria	Level R	Level 1	Level 2	Level 3	Level 4
Comprehension Add Feedback	insufficient evidence	demonstrates limited understanding of content	demonstrates some understanding of content	demonstrates considerable understanding of content ✓	demonstrates thorough understanding of content
Communication Add Feedback	insufficient evidence	uses conventions, vocabulary, and terminology of the discipline with limited effectiveness	uses conventions, vocabulary, and terminology of the discipline with some effectiveness	uses conventions, vocabulary, and terminology of the discipline with considerable effectiveness ✓	uses conventions, vocabulary, and terminology of the discipline with a high degree of effectiveness
Application Add Feedback	insufficient evidence	applies knowledge and skills with limited effectiveness	applies knowledge and skills with some effectiveness	applies knowledge and skills with considerable effectiveness ✓	applies knowledge and skills with a high degree of effectiveness