SNC 2D
Grade 10 Science, Academic
Unit: Biology: Tissues, Organs, and Systems of Living Things

The Big Ideas:

- Plants and animals, including humans, are made of specialized cells, tissues, and organs that are organized into systems.
- Developments in medicine and medical technology can have social and ethical implications.

Some tips on using this manual:

1. Put this manual in your binder, then remove the staple. As you work on a lesson on any given day, just remove those sheets from your binder to work on them.
2. This manual is available on the class moodle. All links are live links from the moodle.
3. Write dates beside the Lesson on the table of contents.
4. Cross off Lessons as they are completed. That way, should you miss a day, you can easily refer to which Lesson you have to make up.

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

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Partner 2:_____ Partner 3:_____

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Partner 2:_____ Partner 3:_____

Lesson 1 Cells and Organelles

By the end of this lesson, you will be familiar with the structure and function of organelles found in animal cells and how they differ from those found in plant cells.

1. **Record** *(as a class)* Watch presentation to review the parts of the cell and practice taking notes from an oral presentation.

2. **Sketch** *(as a group)* On your whiteboard, and without the help of your textbook or the internet, sketch what a cell looks like. Draw whatever you can remember about a cell and label it.

3. **Discuss** *(as a class*) Share your sketches with your classmates. Make any additions or corrections to your sketch based on what others included in their diagrams.

Refer to the section in your textbook comparing plants and animal cells.

4. **Draw** *(individually)* Draw a **plant** and **animal** cell and carefully label it. Use coloured pencils if you wish.

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

5. **Reason** *(as a group)* For each organelle listed below write an **analogy** to demonstrate its function. Some examples of analogies might include a photovoltaic solar cell, a computer, a power plant or factory, or the human body. Be sure to explain the reasoning behind your analogies. Make sure to indicate whether the organelle is found in plant or animal cells.

Organelle & Analogy	
Nucleus *(animal and plant)* *Example. The **nucleus** is like a **brain** because it controls and coordinates the activities of the whole cell in the same way the brain controls and coordinates the activities of the body.*	Cell Wall
Cell Membrane	Golgi Bodies
Endoplasmic Reticulum	Mitochondria
Vacuole	Cytoplasm
Chloroplasts	

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

The function of the organelles is very closely related to its structure. For example, the golgi bodies look like a stack of flattened pancakes (this is their structure). This is because they are hollow sack, where protein can be placed. While a protein molecule is in the golgi body, it can be modified.

6. **Reason** *(as a group)* select 3 organelles from the list above and answer the question – How does its structure allow it to carry out its function?

Many medical advances have come about because of the research scientists have done on understanding how cells work. For example:

-A person with severe burns is often treated with skin grafts taken from another part of their body. However, sometimes there is little healthy skin left on the body. In these cases, doctors place **artificial skin** on the burns. The artificial skin is made of nylon-based material that has a substance that works with the blood to heal the wound.

-Medical doctors have discovered that reducing body temperature can help a person survive a **heart attack**. Cold temperatures reduce the harm to heart and brain cells after a heart attack.

-Did you know that **artificial sweeteners** can make us gain weight? Scientists have discovered that consuming artificially sweetened foods and drinks “disappoints” brain cells that were expecting real sugar, because it tastes different. Our brain cells then tell us to keep eating, hoping to get the sugar it was promised.

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

7. **Apply** *(as a group)* Discuss with your group how can our understanding of cells and organelles help us fight health conditions and develop strategies to lead healthier lifestyles? Record point form notes summarizing your discussion.

8. **Apply** *(as a group)* Can you think of any other medical advances that would require enhanced knowledge of cells and their organelles?

Summary

The relationship between structure and function is an important one in this unit. Be sure to consider both when responding to a question.

Homework:
Cell Video: https://www.youtube.com/watch?v=gFuEo2ccTPA
Read Section 2.1

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

Lesson 2 Animal Cell Organelles

GOAL:

Demonstrate your understanding of the structure and function of some organelles, as well as how they interact with other organelles in the same cell.

ROLE:

Imagine that you and your group members are organelles in a cell. Your job is to communicate with the other organelles in the cell to be able to carry out the important functions of the cell.

AUDIENCE:

Your classmates are the audience that you will be presenting your rap, poem, or short theatrical performance to.

SCENARIO:

As a group, decide on one of the following options:
Choice 1: Create a rap
Choice 2: Create a poem
Choice 3: Act it out

Step 1: Each member of the group will choose a different organelle. Decide which organelle each group member will be.

_____ _____
_____ _____

Step 2: As a group come up with a rap, poem, or act that includes all the organelles in the group. Your performance should clearly show how the structure of the organelle is related to the function of the organelle AND how different organelles work together to accomplish a task.

Step 3: Rehearse a short (2-3 min) performance. All group members must play a role.

PRODUCT:
Be as creative and unique as you want. Make sure to depict the organelles' structure, function, and collaboration with each other.

Performances will run today and move into tomorrow if needed
Homework
https://www.youtube.com/watch?v=Ao9cVhwPg84.

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

Lesson 3 The Cell Cycle

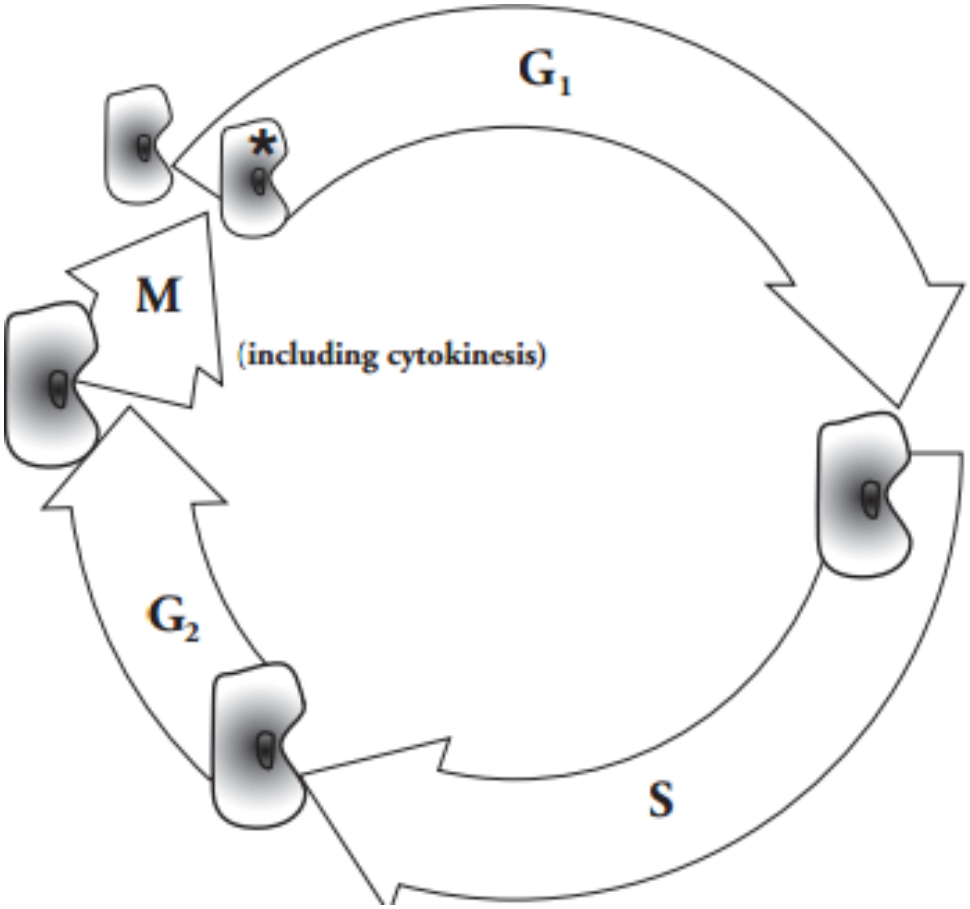
**Note – lessons 3, 4 and 5 can likely be completed in two classes.

***This lesson is adapted from*
POGIL Activities for High School Biology,
Developed through the High School POGIL Initiative Laura Trout, Editor-in-Chief
Published by FLINN Scientific INC

By the end of the lesson, you will know the stages of the cell cycle and what is happening at each stage.

In multicellular organisms, different types of cells have different roles and need to complete specific tasks. For example, a cell that isn't large enough is not useful for storing nutrients for later, but a cell that is too large will not be useful for transportation through a tiny capillary. In this activity, you will learn about the seasons of a cell's life, and in turn better understand how organisms function.

Model 1 – The Cell Cycle



Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

1. How many phases are in the cell cycle as shown in the diagram in Model 1?

2. Starting at the starred cell, what is the order of the stages of a cell's life?

3. During which phase does the size of the cell increase?

4. During which phase does the number of cells increase?

5. Considering your answer to Questions 3 and 4, identify two ways that the growth of an organism can be accomplished through the events of the cell cycle.

6. Cancer, the uncontrolled growth of cells, often results in a tumor, or mass of abnormal cells. Some cancerous tumors consist of many cells that are much smaller than normal. According to Model 1, what part(s) of the cell cycle is (are) most likely being affected?

7. In Model 1, if the length of the arrow represents time, then for those cancerous cells, what happens to the time that is necessary for the cell cycle?

   What implication might this have for doctors who are treating cancer patients?

Have number 6 + 7 checked by your teacher!

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

Model 2 – Cell Cycle Data

Phase	Key process	Time interval (hours)	Sets of DNA present in each cell at end of the phase	Number of organelles in each cell at end of the phase
Gap1		11	1	560
Synthesis		8	2	570
Gap2	Protein and organelle synthesis	4	2	600
Mitosis	Cell and nuclear splitting	1	1	300
	Total time:	24		

8. Model 2 presents cell cycle data for a typical human cell in culture. Use the phase names in Model 2 to label the G, M, and S phases in Model 1.

9. Looking at the third column of Model 2, compare the time spent in mitosis with the time spent in gap1 in human cells and describe any difference.

10. Imagine 100 cells were chosen randomly from a tissue sample and examined under a microscope. In which phase of the cell cycle would you expect to find the largest number of cells? Explain.

11. Look again at Model 2. Compare the amount of DNA at the beginning and end of synthesis. Why did the amount of DNA change?

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

12. Fill in the “Key Process” column for synthesis phase in Model 2.

13. Cyto = cell, kinesis = cutting. What do you think takes place during cytokinesis?

14. Other than cytokinesis, what else occurs during the mitosis phase? Hint: Consider the sets of DNA in each cell.

15. Look carefully at information given to you in Model 1 and Model 2. Fill in the key process column in the table for gap1.

16. If a culture in the lab starts with one human cell, how many cells will there be after:

    24 hours?

    48 hours?

17. Describe what happens to the original cell after mitosis?

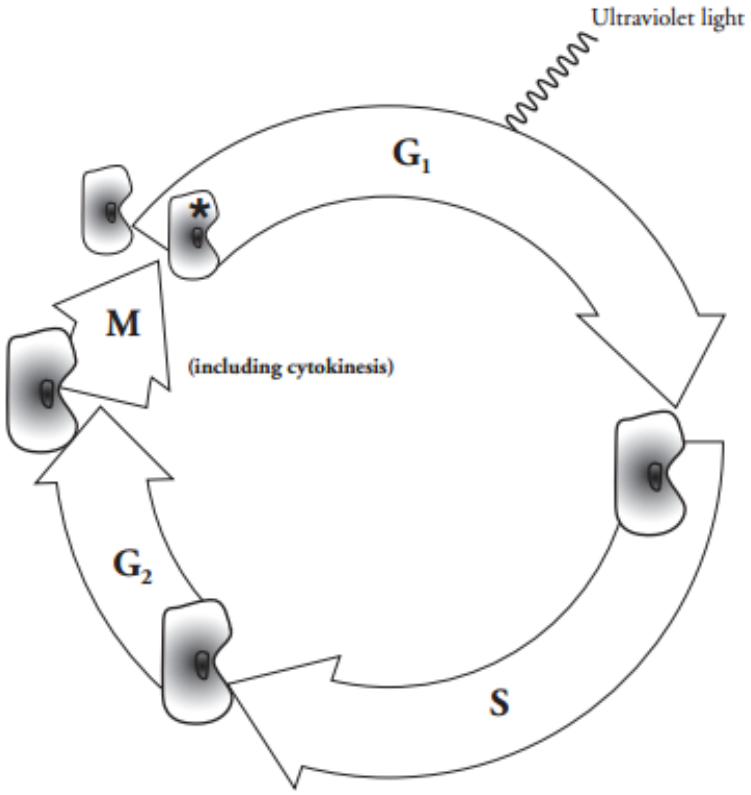
18. If a starfish sustains damage to a limb, it often grows a new one. If a human adult sustains damage to his or her spinal cord, mobility is often impaired. If a gecko loses its tail, it may grow a new one. Which type of cell is less likely to go through the cell cycle after being damaged— starfish limb, human spinal cord, or gecko tail? Support your answer.

Homework
Read 2.3 + 2.5, take notes
Do pg 37 #1-6
Do pg 44 #1-7
Additional Resources:
Review Handout - Cell - Ch. 2.1

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

Lesson 4 The Cell Cycle (continued)

Model 3 – Radiation



19. According to Model 3, ultraviolet light is affecting a cell in which phase of the cell cycle?

20. Ultraviolet light may cause DNA damage, which is known as a mutation. How might such damage affect events taking place during the synthesis phase? Hint: Use information from Model 2.

The cell cycle has a regular system of checks and balances that prevents damaged or mutated cells from proceeding to the next phase. One way an organism deals with the problems is to kill the damaged cell before it passes on the problem to its daughter cells. This is a normal process called apoptosis. (Some normal cells also go through this process.)

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

21. How might the DNA damage go on to affect the rest of the cell cycle if apoptosis did not occur?

22. Why might it be beneficial to an organism for damaged cells to stop dividing? Record your response on your whiteboard.

23. What could happen, after several cell cycles, to an organism whose damaged cells did not go through apoptosis? In other words, what if a damaged cell that is supposed to die does not?

24. Some types of cancers are treated with radiation, similar to ultraviolet light. Why might it be beneficial to irradiate cancer cells?

25. Plasmodial slime mold is an example of a multinucleated cell. It can be referred to as “one huge cytoplasmic mass with many nuclei” as seen to the right. What part of Model 1 is skipped in the formation of such a cell? Explain your answer.

26. Chemotherapy utilizes chemicals that disrupt various parts of the cell cycle, targeting rapidly growing cells. Paclitaxel (Taxol®) is one such drug that prevents the mitosis phase from taking place.
Explain how this drug is useful as a cancer treatment.

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

Lesson 5 Mitosis

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POGIL Activities for High School Biology,
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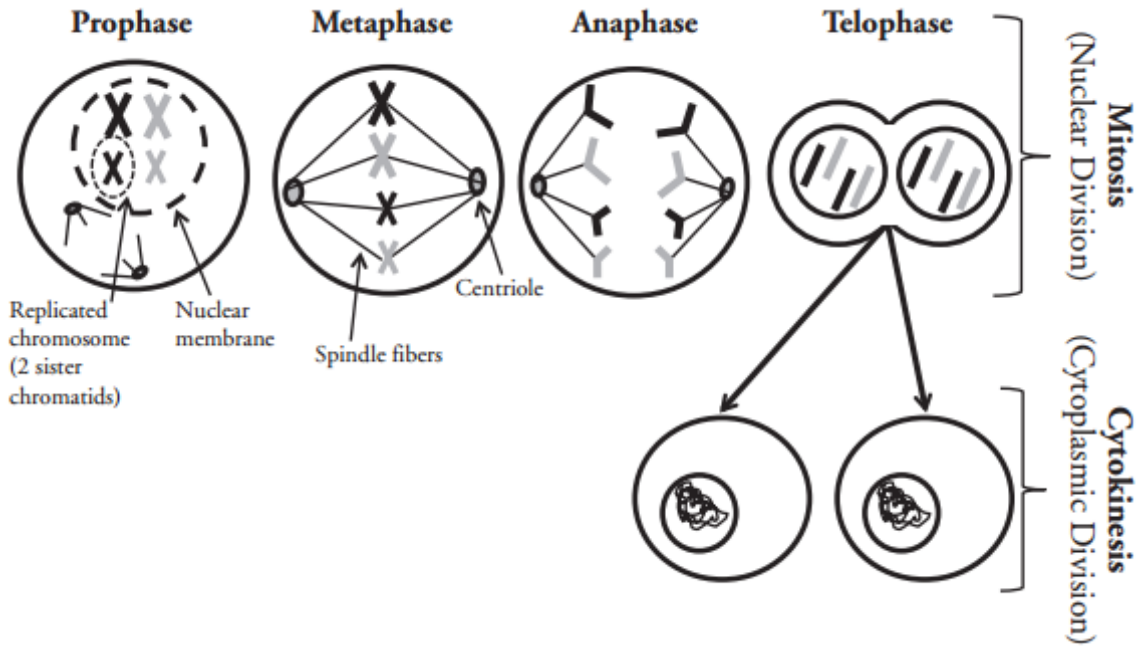
By the end of the lesson, you will know the phases of mitosis, how they relate to the cell cycle, what is happening at each phase, and be able to sketch a cell in each phase of mitosis.

Living things must grow and develop. At times they suffer injuries or damage, or cells simply wear out. New cells must be formed for the organism to survive. What process must occur to make a new, properly functioning cell?

Model 1 – Mitosis as Part of the Cell Cycle



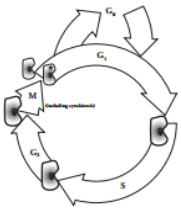
1. Refer to Model 1. List the four phases in the mitosis process.

2. Where is mitosis in the cell cycle? Before _____ and after _____.

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

3. What three phases of the cell cycle are considered interphase?

4. Refer to the cell cycle shown.
   a. How many cells are present at the beginning of mitosis?



   b. How many cells are present at the end of mitosis?

5. Refer to the chromosomes in the cells in Model 1.
   a. Draw a single chromosome as it appears in Model 1.

   b. Draw a replicated chromosome as it appears in Model 1.

   c. How many chromatids are in each replicated chromosome?

6. How many replicated chromosomes are in the original cell shown in Model 1 during prophase? Hint: When counting chromosomes, count “1” for a pair of sister chromatids.

7. How many single chromosomes are in each of the new cells in telophase?

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

8. As a group, write a grammatically correct sentence that explains what a chromosome is and why it is important.

9. Refer to the cells in telophase in Model 1.
    a. Use a complete sentence to describe what the new cells in telophase might contain if replication of chromosomes did not occur before cytokinesis.

    b. If the situation in Part A occurred, would the new cells be viable? Explain.

10. The S phase stands for synthesis, which means to make or build something more complex out of simpler parts. Scientists know that during the S phase DNA is being made in the nucleus of the cell. Why do you think the cell needs to make more DNA at this time in the cell cycle?

11. Refer to Model 1. The chromosomes that are shaped like “X” (made of two sister chromatids) have double the amount of DNA than the chromosomes that are shaped like “I.” During what phase of the cell cycle do you think the chromosomes are replicated (copied)?

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

12. Refer to Model 1.
    a. In which phase of mitosis do you see the spindle fibers forming?

    b. At what phase of mitosis do the replicated chromosomes (sister chromatids) separate?

    c. In which phase do you see that the spindle fibers have disappeared?

    d. Look at metaphase and anaphase. Suggest the purpose of the spindle fibers during mitosis.

13. Refer to Model 1.
    a. Describe what happens to the nuclear membrane after prophase.

    b. Explain why it is necessary that the nuclear membrane disintegrates during mitosis.

    c. At what point during mitosis has the nuclear membrane reformed?

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

14. What is actually dividing during cytokinesis?

15. Cellular division has two parts—mitosis is the division of the nucleus and cytokinesis is the division of the cell into two new cells. Explain why mitosis has to come before cytokinesis in the cell cycle.

16. During cytokinesis the chromosomes unwind and become a pile of very long, thin, thread-like DNA and the cell goes back to looking “normal” until mitosis begins again. Brainstorm with your group ideas why the DNA must coil up into chromosome structures before it divides.

17. Fill in the table below where each of the phases of nuclear and cell division is listed in the left hand column and write a description of what is happening during that phase in the right hand column.

Phase of cellular division	Description of what is occurring in the cell during this phase
P	
M	
A	
T	
C	

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

18. In some cells, mitosis occurs without cytokinesis. What would the resulting cell look like?

19. Explain the importance of mitosis of cells in a skinned knee and during the growth of a plant.

20. With your group, consider the effect on a cell if the sister chromatids did not line up correctly during metaphase. For example, if some lined up side by side instead of single file along the middle, how might this affect the resulting cells?

Extension Questions

21. Colchicine is a poison that acts to inhibit the development of spindle fibers. Describe the effects on mitosis in a cell that has been treated with colchicine.

22. Binary fission is cell division in prokaryotic organisms (bacteria), which have no nucleus. In addition, prokaryotic cells typically have only one circular chromosome. Together with your group, predict how binary fission in prokaryotic cells might be different than mitosis in eukaryotic organisms.

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

Lesson 6 Using the microscope

By the end of this lesson, you will know the parts of the microscope, have practice proper use of the microscope, and observed real cells in different stages of the cell cycle.

Part A - Parts of the Microscope

With the aid of your textbook (pg. 605), label the following diagram.

When you are done, work with a group member to quiz each other until you both know all the parts of the microscope. When you are certain you know them all, ask your teacher to quiz you. If you pass the quiz, you will be given a microscope to view a slide

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

Part B - Using the Microscope

In order to view a slide under a microscope the following steps should be followed to ensure:

1. Safety
2. Not damaging the microscope or slide
3. Easily locating examples of cells you are interested in observing.

Steps to effective use of a microscope:

1. When transporting the microscope, use two hands – one on the base and one on the arm
2. Ensure that the objective lens/eyepiece are raised to the highest position
3. Ensure that the objective lens is set to the lowest magnification.
4. Place the slide on the stage. Secure it with the stage clips if there are any.
5. Lower the objective lens/eyepiece to the lowest position.
6. Put your eye to the eyepiece and use the course adjustment knob to focus the image. Move the slide around until the sample is centered in your field of view.
7. Switch the objective lens to medium magnification.

NOTE: FROM THIS POINT ON, YOU CAN NO LONGER USE THE COURSE ADJUSTMENT KNOB. DOING SO WILL LIKELY RESULT IN CRACKING THE SLIDE!!

8. Use the fine adjustment knob to focus the image. You might try rock the knob back and forth to focus on cells at different depths. Move the slide around until the sample is centered in your field of view.
9. Switch the objective lens to high magnification.
10. Use the fine adjustment knob to focus the image. You might try rock the knob back and forth to focus on cells at different depths.

At this point, you should be able to see cells in all different stages of the cell cycle: interphase, mitosis (prophase, metaphase, anaphase, telophase) and cytokinesis.

Locate a cell in each of these phases. Have your group members confirm that you have accomplished this. Call your teacher over to show him/her your results.

Once you have completed this, follow these steps:

1. Raise the objective lens/eyepiece to the highest position
2. Remove the slide
3. Return both where you found them

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

Part C – The Cell Cycle in Action

The whitefish embryo is a good place to look at mitosis because these cells are rapidly dividing as the fish embryo is growing. Remember that when cells divide, each new cell needs an exact copy of the DNA in the parent cell. This is why mitosis is only visible in cells that are dividing, like the whitefish embryo and the onion root tip.
Mitosis can take several hours to complete. Scientists will make slides of cells that should be undergoing mitosis in order to find a particular cell in any of the stages - prophase, metaphase, anaphase, telophase. Remember that most cells you see will be in interphase, that's the cells "resting" state. *Taken from http://www.biologycorner.com/*

Draw the whitefish cells you observed under the microscope in the various stages of the cell cycle. Your diagram should include the major events that take place during each stage of the cell cycle.

1. Interphase

2. Mitosis

Prophase	Metaphase
Anaphase	Telophase

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

3. Cytokinesis

Part D – Analysis Questions: The Cell

1. Speculate why it is necessary for DNA to condense before cell division takes place?
   Explain and justify your answer.

2. Interphase consumes the majority of time in a cell cycle. Why do you think that is?

3. Distinguish between the first phase, prophase, with the final phase of mitosis, telophase?

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

4. Where are the chromosomes located in the cell during each of the four different phases of mitosis?

5. Using a dictionary look up the meaning of the prefixes *pro, meta, ana,* and *telo.* Why would these be used in the naming of the phases of mitosis?

6. Thinking Ahead. How would you explain why some cells have a shorter cell cycle than others?

Homework:
Additional Resources
http://faculty.clintoncc.suny.edu/faculty/michael.gregory/files/bio%20101/bio%20101%20laboratory/mitosis/mitosis.htm
1. Cell Structure Gizmo
2. Cell Division Gizmo (download it here)
http://www.explorelearning.com/

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

Lesson 7 What limits cell size?

In this lab activity, reasons for cell division will be investigated.

Purpose
The purpose of this lab is to investigate why cells stop growing and undergo cell division once they have reached a certain size.

Prelab

Imagine a spherical sponge is tossed into a swimming pool and is completely under water.

1. **Speculate** What part of the sponge gets wet first?

2. **Speculate** What part of the sponge will stay dry the longest?

Imagine you took the spherical sponge out of the pool and cut it in half.

3. **Represent** Draw a sketch showing what parts would be wet and what parts might still be dry.

4. **Explain** How could you calculate the volume of the sponge that was still dry? (label your diagram with any quantities you'd have to measure)

5. **Explain** How could you find/calculate the volume of the sponge that is now wet?

6. **Explain** How could you calculate the percentage of the sponge that has gotten wet?

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

Scientifically, the movement of the water into the sponge can be described as, "the water diffused into the sponge, through the process of osmosis". Often, it is useful to discuss rates of diffusion, which would involve measurements of how far the water diffused, as well as the time it took to do so.

Imagine two spherical sponges of different sizes have been in the pool for the same amount of time, and are taken out then cut in half.

7. **Represent** Draw a sketch showing the wet portions and dry portions.

8. **Speculate** In which sponge was the rate of diffusion higher?

9. **Speculate** Which sponge would get completely soaked first?

Math review

The ratio of two quantities, A and B, can be written as A:B or $\frac{A}{B}$. If A = B, then we say, "the ratio of A to B is 1". If A is a lot bigger than B, we can say, "the ratio of A to B is large". But what do we say if the variables are changing? Let's take a look…

Table 1: Ratio of A to B

A	B	A:B	$\frac{A}{B}$
1	1	1:1 = 1:1	1
2	4	2:4 = 1:2	0.5
3	9	3:9 = 1:3	0.3

To determine if a ratio is increasing or decreasing is easily done if you are looking at the ratio in the form of $\frac{A}{B}$. We can say that the data in Table 1 shows a decreasing ratio (went from 1 to 0.3). This information might be important later if this data was used to draw a conclusion.

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

10. For each set of data, **complete** the data table and **state** whether the ratio is increasing, decreasing or remaining constant.

Table 2: Population Growth

Population of bacteria	Time (hours)	P:Δt	$\frac{P}{\Delta t}$
10	2		
20	4		
40	6		
80	8		

Table 3: Growing Apples

Apples	Apple trees	A:T	$\frac{A}{T}$
2000	5		
4000	10		
6000	15		

Table 4: Surface Area to Volume Ratios

Area of a sphere of radius r ($A = 4\pi r^2$)	Volume of a sphere of radius r ($V = \frac{4}{3}\pi r^3$)	A:V	$\frac{A}{V}$
16	10.7		
48	85.3		
144	288		

Procedure

You will be given 3 cubes of different sizes and a solution that can diffuse into the cubes. You have to answer the question, "In order to quickly distribute nutrients throughout a cell, is it better for the cell to be big or small?"

11. **Explain** What would you do with the materials provided in order to gather data to answer this question? Write out your steps below. Pay special attention to identifying an independent variable, a dependent variable and all your control variables. Pictures/sketches may be used in your response.

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

Observations

12. As you work through the lab, record your observations in Table 5: Observations of 3 cubes in sodium hydroxide solution

Table 5: Observations of cubes in NaOH

Cell	Length of one side (mm)	Area of one side (mm^2)	Total surface area (mm^2)	Volume of cube (mm^3)	SA/Vol ratio (expressed as a number)	% of cell that has received sodium hydroxide (consult prelab)
		Formula = LxL	Formula =	Formula =		
A						
B						
C						

Analysis

1. Relate the analogy of the submerged sponge to an actual cell.

2. How does this lab relate to cells?

3. **Qualitative analysis** Using descriptions of what you observed, explain if it is better for a cell to be big or small.

Quantitative analysis On a separate sheet of paper, you are going to create a line graph of SA/Vol vs % of cell that got nutrient. You are expected to use all your graphing skills from other classes (descriptive title, label your axes, etc).

4. What is the variable that you changed as the experimenter (the independent variable)?
5. What is the variable that responded to your change (the dependent variable)?

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

6. Now create your graph on graph paper. Be sure to put the independent variable on the x-axis.
7. According to your graph, explain if it is better for a cell have a large or small surface area to volume ratio to facilitate easy diffusion of a nutrient to all parts of a cell.

Homework
Read section 2.7.
Make SUMMARY NOTES.
http://www.cbc.ca/news/health/story/2011/12/30/cancer-chasing-cures.html
http://www.newscientist.com/blogs/shortsharpscience/2012/03/sara-reardon-reporter-aspirin.html?DCMP=OTC-rss&nsref=online-news

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

Lesson 8 Cancer

For this lesson, we welcome guest speakers to discuss ongoing research in the field of cancer.

Lesson 9 Levels of Organization

***This lesson is adapted from*
POGIL Activities for High School Biology,
Developed through the High School POGIL Initiative Laura Trout, Editor-in-Chief
Published by FLINN Scientific INC

Do not use the Internet or your textbooks, unless instructed to do so.

Introductions:

A. In your groups answer the following questions:

(You do not have to write anything down here.)

1. Name and favorite food.
2. Favorite subject in school – or least favorite subject in school.

B. Decide "who should do what" – assign roles for the rest of the worksheet.

A. ***Reader*** – this person will read out loud the text below.

B. ***Recorder*** – this person decides what to "write down" as your group's answers. All students in the group should write down answers, but it is the recorder's job to decide what to write down – which is frequently done after a group discussion. The recorder should also say things like "are we sure of this?" or "does that sound accurate?" The recorder is also the group's spokesperson during class discussions.

C. ***Facilitator*** – This person keeps track of time, decides when the group should move on to the next question, and promotes / encourages all group members to contribute to the group's discussion.

D. **Connector** – This person make connections of information presented by the reader with previous concepts we have learned in class. They will also be responsible for looking things up in the textbook or on the Internet when necessary.

Note: "Roles" are an important part of any group activity. Assigning roles will help your group accomplish goals (such as completing the assignment) effectively and accurately.

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

Model 1: Anatomy & Levels of Organization

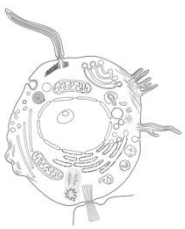
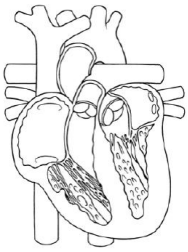
An **anatomist** is a person who studies the structure of a living thing – how all the little things are organized into bigger things. The smallest living structures are cells, but there are things even smaller than a cell, e.g., atoms and molecules. The following list shows the levels of organization (from least complex to most complex) used by anatomists. Also included are examples items for each level.

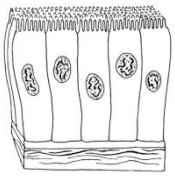
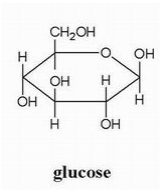
Atoms (carbon)
Molecules (glucose)
Cells (nerve cell or neuron)
Tissues (nerve tissue)
Organs (brain)
Organ systems (nervous system)
Organisms (you)

As you study human anatomy, you should be able to classify any structure into the above list.
A **physiologist** is a person who studies functions – they try to answer the questions "what does it do?" "how does it work?" or even "how does a structure respond to stress?" Physiologists work at all levels of organization, from atoms to the organism.

1. Using the levels of organization listed above, identify two items that can be found inside a cell.

2. Examine the follow images and classify (label) each into their proper level of organization.

3. Tissues can be found inside organs. **True or False**

4. Organs can be found inside tissues. **True or False**

5. Are tissues more or less complex than organs?

6. Spend 60 seconds working individually to create a definition for the following two terms. After 60 seconds, discuss your definitions with the group and decide who has

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

the best definition. Finally, look up the definitions in your text and make changes as necessary.

Tissue:

Organ:

7. *Without* the use of books or the Internet, list all the organ systems found in the human body that are associated with the example organs given below. After two minutes, consult your textbook or reliable Internet source.

Organ	**Organ system**	**Organ**	**Organ system**	**Organ**	**Organ system**
Femur		Skin		stomach	
heart		Pituitary gland		Spleen & appendix	
Brain		Lungs		Uterus	
Kidney		Biceps & brachi			

8. Organs are sometimes shared by two or more systems - for example, your mouth can be considered a part of both the digestive and the respiratory systems. *Without* your book or the Internet, try to name 3 organs that are shared by two or more body systems, and identify those body systems.

Organ	**System 1**	**System 2**
Ex: Mouth	Digestive system	Respiratory system

Homework
Read chapter. 3.1, make study notes
Do questions 1, 2, 3, 6 on pg. 76
Additional Resources:
Hierarchy of structure - Worksheet - 3.1.doc

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

Lesson 10 Catch up day

Lesson 11 Observing cells under a microscope

By the end of this lesson, you will observe two cell types: cells from an onion (plant cell) and cells from your own cheek (animal cell). You will also review how to make wet mount slides and how to use the compound microscope.

1. **Predict** - What will be some differences you might expect to see between onion and cheek cells?

Work with a partner. Each of you must prepare one wet mount. As a group, do both the onion and cheek cell. You must complete a biological drawing of at least one of the cells.

Part A - Plant Cell: Onion Cells

i. Get a microscope slide and create a label for it (your name, what sample is being prepared).
ii. Cut a small piece of onion. On the inner curve of the onion, peel off a thin, transparent layer of cells.
iii. Carefully place the layer in a drop of water on a slide. Try to straighten and flatten the layer.
iv. Place a small drop of iodine on top of the onion cells, then add a coverslip. Add the coverslip at an angle so as to avoid trapping air bubbles.
v. Observe the slide first at low power, then work your way through medium and high power. Be sure to adjust the diaphragm to obtain optimum lighting.

Part B - Animal Cell: Human Cheek Cells

i. Get a microscope slide and create a label for it (your name, what sample is being prepared).
ii. Place a small drop of water in the center of a clean glass slide.
iii. Using the square end of a toothpick, gently scrape the inside of your cheek. Caution: Do not use force when scraping the inside of your cheek. Only a few cells are needed. The end of the toothpick will have several cheek cells stuck to it even though you may see nothing.
iv. Stir the end of the toothpick into the drop of water. You may notice some "scum" floating off the toothpick. Those are your cells!!
v. Put one drop of methylene blue stain on top of the drop of water containing the cheek cells.
vi. Place a cover slip over the slide and observe the cells under low power. Look for tiny blue potato-chip looking objects. Keeping those cells in the center of your view, switch from low to high power. Adjust your diaphragm if necessary.

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

SNC 2D - RULES FOR A BIOLOGICAL DRAWING

Scientific drawings are an important part of the science of biology and all biologists must be able to produce good quality scientific drawings regardless of your artistic ability.

Drawing a specimen requires you to pay attention to detail so that you can re-create it on the sheet. While doing this, your brain is recording these same features in such a way that you can recall them if necessary (for example in an exam). Simply observing pictures of specimens in a book or on a computer screen is less effective when it comes to remembering and understanding what you observed. Remember to DRAW ONLY WHAT YOU SEE!! Do not include what you think you should see. The following are some guidelines that you are to use when illustrating specimens:

1. Use unlined paper. If you do one drawing, it should take up the entire page. If you do two drawings, they can both be done on one page.
2. Do <u>not</u> draw a circle to represent your field of view.
3. Draw with a sharp pointed pencil. Only pencil-- no pen, crayons, or markers.
4. Always print.
5. Leave at least a 3 cm (1”) margin on all four sides of the paper. Do not draw a boarder. All writing and drawing should be completed inside this margin.
6. Center the title.
7. Center the drawing on the page or ½ page.
8. Never cross labeling lines. Use only horizontal labeling lines drawn with ruler. Never use an arrowhead on the ends of you label lines.
9. All labels must be printed to the right of the field of view level, and spelled correctly.
10. Labels should be written directly under each other.
11. Never use the plural form of a word when pointing to a single object or part.
12. Do little or no erasing. Eraser impressions should not be seen.
13. Draw using continuous line with the same thickness, no blurred or uneven lines.
14. DO NOT shade or use color on your diagram. Highlight using stipples.
15. Drawings should be clear, neat, simple and easy to understand.

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

Criteria	Mark
Title: includes the cell type, organism, wet mount?	/1
Does the magnification appear somewhere on the diagram?	/1
Diagram include at least 3 of the following structures: • Cell wall • Cell membrane • Nucleus • Cytoplasm • Vacuole • Nuclear membrane	/3
Quality of diagram (consider rules of drawings): • Use unlined paper. • Draw with a sharp pointed pencil. Only pencil-- no pen, crayons, or markers. • Always print. • Leave at least a 3 cm margin on all four sides of the paper. • Center the title. • Center the drawing on the page or ½ page. Make your drawing in proportion to the size of your field of view • Never cross labeling lines. Use only horizontal labeling lines drawn with ruler. Never use an arrowhead on the ends of you label lines. • All labels must be printed to the right of the field of view level, and spelled correctly. • Labels should be written directly under each other. • Never use the plural form of a work when pointing to a single object or part. • Do little or no erasing. Eraser impressions should not be seen. • Draw using continuous line with the same thickness, no blurred or uneven lines. • DO NOT shade or use color on your diagram. Highlight using stipples. • Drawings should be clear, neat, simple and easy to understand. Appearance: • Quality and Accuracy • Size – 2 on page = half page each	/5
Total	/10

2. Complete a biological drawing of at least one of the cells. Be sure your biological diagrams are completely labeled, noting any organelles identified. <u>You should label at least three organelles or parts in each diagram</u>. Also note magnification and cell type, including the name of the organism.

Follow Up Questions:

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

3. Construct a comparative chart of the two cells, noting similarities and differences. Include organelles and cell parts seen, size, shape, arrangement, etc.

4. Why are stains such as methylene blue and iodine used when observing cells under the microscope?

5. Why don't onion cells have chloroplasts? (Hint: think about the habitat of an onion plant)

6. Why is it important to drop the cover slip at a 45 degree angle to your specimen?

7. List three rules you must remember when using the microscope.

Homework:
Finish Lab
Additional Resources:
CrashCourse - Mitosis

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

Lesson 12 Guest speaker

A guest speaker from Let`s Talk Science (http://www.letstalkscience.ca/) will join us today for a discussion on Stem Cells.

Homework:
Read and summarize 2.9
Finish handout, which is available on the moodle.

Lesson 13 Stem Cells

This lesson is meant to supplement the Let`s Talk Science presentation.

By the end of this lesson, you will have reviewed the content from the stem cell presentation, and should be familiar with the terms totipotency, pluripotency, multipotency, somatic (adult) stem cells, induced pluripotent stem cell (iPSC) differentiation, self-renewal and specialized cell.

1. **Reason** As a cell differentiates, it becomes more specialized, meaning it has less options of what it can become. Consider these two diagrams. Which one best represents the idea of stem cells and differentiation. Be sure to explain your reasoning.

   Figure ____ best represents the idea of stem cells and differentiation because...

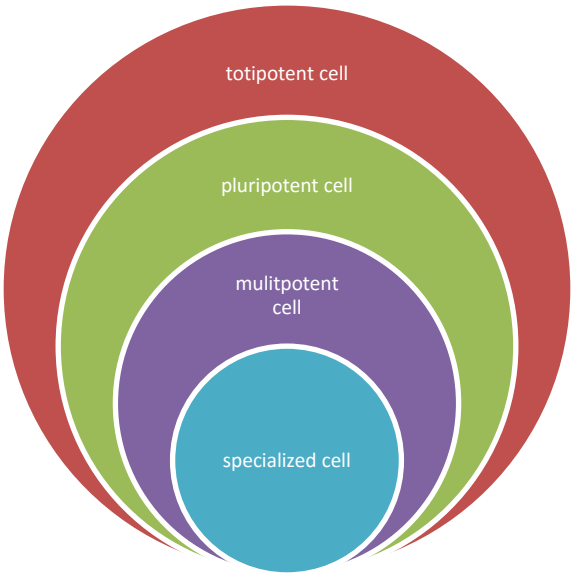


Figure 1

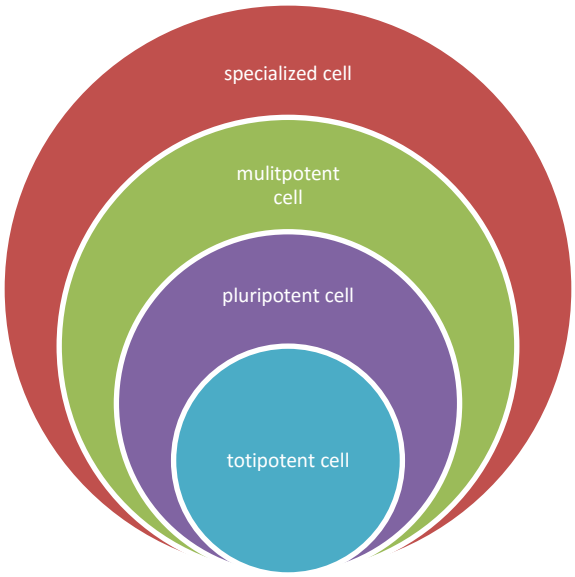


Figure 2

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

A stem cell is one that is able to undergo self-renewal and is able to differentiate.

2. **Draw** Sketch a single stem cell that goes through self-renewal to produce two new and identical stem cells.

To differentiate means that there are less options as to what a cell can become. This happens as a cell develops and progresses from a totipotent stem cell to a specialized cell.

3. **Draw** On the diagram you drew above, show that one of the daughter cells goes through the process of self-renewal again (producing two identical stem cells), and one of them differentiates into a specialized cell (you choose what type of cell).

4. **Describe** Write out the procedure discussed in class which scientist use to determine if a cell is a stem cell or not.

The progression of a cell developing from a totipotent stem cell to a specialized cell involves many instances and stages of differentiation. After each process of differentiation, the cell becomes more specialized and has fewer choices of what it can develop into, until it becomes a full-fledged specialized cell. The full diagram of development is a very complex one and is not necessary to learn for this course. However, here are some diagrams found online that can provide some context.

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

This diagram shows how a iPSC can differentiate into one of the 3 germ layers in the human body. It then shows that these germ layers give rise to all the different cells in the body. However, there are several iterations of differentiation that are not shown.

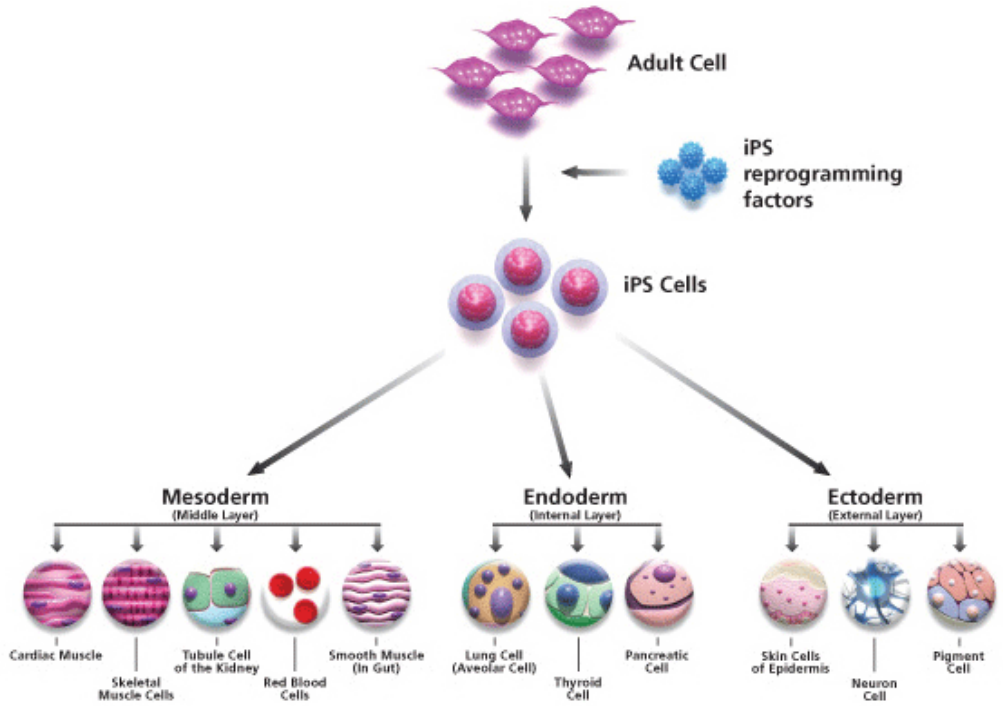


Figure 1: iPSC to specialized cells (taken from http://kennedysdisease.blogspot.ca/)

Figures 2 and 3 show the progression to the different types of blood cells (erythrocytes = red blood cells). These figures also do not show all the steps going from a pluripotent stem cell to a specialized cell

5. **Consolidate** With your group members, discuss how Figures 1, 2 and 3 fit together. Write out your descriptions below

After completing these activities, please consult your manual for the homework related to Lesson 12 and 13

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

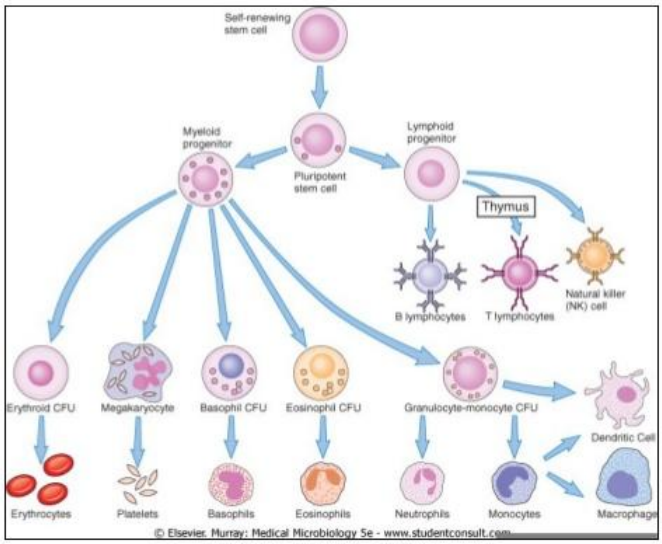


Figure 11-1 Morphology and lineage of cells involved in the immune response. Pluripotent stem cells and colony-forming units are long-lived cells capable of replenishing the more differentiated functional and terminally differentiated cells. (From Abbas K et al: Cellular and molecular immunology, ed 5, Philadelphia, 2003, WB Saunders.)

Downloaded from: StudentConsult (on 16 December 2007 01:16 PM)
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Figure 2: Blood stem cells (taken from http://www.slideshare.net/)

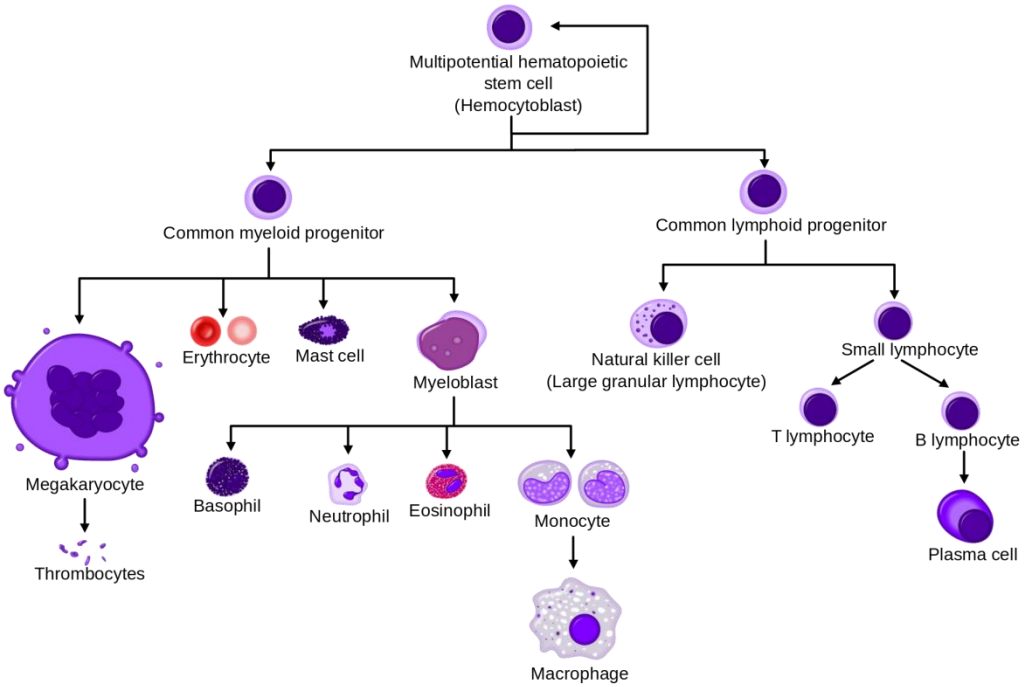


Figure 3: Blood stem cells (taken from Wikipedia)

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

Homework
Link:https://www.youtube.com/watch?v=2-3J6JGN-_Y
Question sheet relating to the video above which can be found on the moodle
Read 3.2 and take notes, do questions 1-7 on page 79

Lesson 14 Bio lab

Sheets will be distributed in class

Lesson 15 Bio lab (continued)

Lesson 16 Organ systems

Learning Objectives
There are more than 10 different systems found in the human body. Each system is made up of a set of organs which work together to perform a specific task or set of tasks. All systems interact with other systems, some with multiple systems; and all systems are subject to disease.

Task:
Over the next few days, you will investigate the role of a system in the body answering the question:

How does a certain disease affect the regular functioning of a system in the body?

You are to sign up to investigate a specific disease. The diseases are grouped based on which system they affect (respiratory, circulatory or digestive). Your teacher will then put you in a group with other students, to whom you will present your findings.

NOTE: All group members must focus on a different system. No two people in the class can investigate the same disease.

Evaluation
You will present your findings to your group members and they will evaluate you. This should comprise of both an individual presentation, followed by a general discussion about what you learned. After which, all group members will have time to evaluate each other using the *Audience Engagement Sheet.* Grades will not be recorded, but should be used to influence your research skills in the future.

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

Timeline

Day 1

1. Disease sign-up and group selection.
2. Spend the period doing some preliminary research on the overall layout of the system affected by the disease you choose.

Learning Check:

By the end of today, at minimum you should be able to answer the following questions about your system:

- ☐ Describe the overall purpose of your system (what does it do, how does it function, what waste does it produce).
- ☐ If you were shrunk down and travelled through the system, what organs would you encounter
- ☐ For the different structures in your system, describe the structure and how it relates to the function.

Day 2

1. Work on in-depth research about the disease you chose and how it affects a certain system.
2. Look for other systems that your system is connected to, and describe the interaction between the systems. Pay particular attention to whether or not your disease affects those interactions.

Learning check

By the end of today, at minimum you should be able to uUse the 'Outline of the Human Form` sheet, to indicate:

- ☐ where the system you chose is located
- ☐ where the disease you chose affects a person
- ☐ the site of interaction between the system you chose and other systems.

Day 3

1. **(40 mins max)**Present your findings to your group. This should be more of a discussion rather than three distinct presentations.
   Suggested Steps:
   a. Each person talks for about 5-10 minutes on what they have found.
   b. Once everyone has presented, confer with one another and build your knowledge base together by combining what each of you learned about your individual systems and analyzing how they work together to satisfy the needs of the entire organism. This would highlight any interactions of systems, as well as how the results of a particular disease might affect the functioning of more than one system.
2. **(10 mins)**Use the `Audience Engagement Sheet` to evaluate each other based on contributions to the presentations you just finished.

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

3. **(10 mins)**Do not just give the evaluation sheet to your group members. Take the time to discuss why you gave them the comments you did. Use this as a learning opportunity!
4. If for some reason you are done well before the bell, this should probably be reflected in your evaluations – it likely means that no one in your group had enough to say during the presentation. Revisit your evaluations of each other to see if this is adequately represented in the marks you gave each other.
5. Spend any remaining time studying for your unit test, which is _____.

Tips for Research!

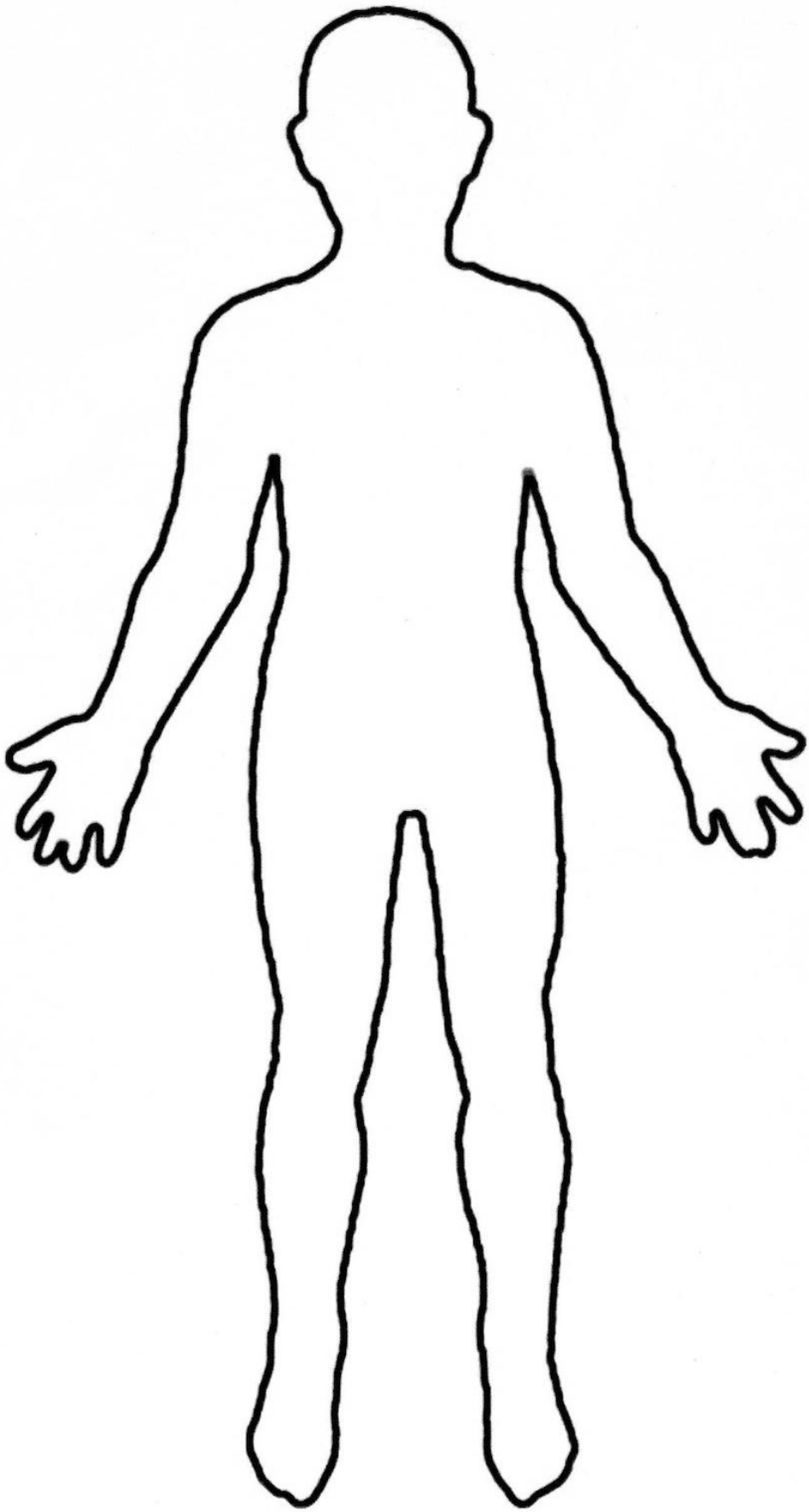
- Document all your sources (use bibme or some other online resource-list generator)
- Wikipedia is useful as a starting point, but should not be referenced. All information presented in your final work should be drawn from reputable sites.
- Re-read your source of information several times before you write anything. This is will result in less plagiarism.
- Do not cut and paste when making your research notes – actually write them.
- Organize your research notes by subtopic (along the lines of those outlined on the timeline above).

Resources to get you started

- http://digestive.niddk.nih.gov/ddiseases/a-z.aspx
- http://www.medicinenet.com/vascular_disease/article.htm
- http://www.webmd.com/lung/lung-diseases-overview
- http://www.who.int/respiratory/copd/en/
- http://www.who.int/en/
- http://www.phac-aspc.gc.ca/index-eng.php
- http://www.cdc.gov/
- http://www.cbc.ca/
- http://health.nih.gov/

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

Outline of Human Form



Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

Audience Engagement Sheet

Please use this sheet to comment on the presentation of your two other group members. You are encouraged to offer honest and constructive feedback. Try to find something good to say about the presentation, but if you do not feel you learned anything from your classmate, tell them so in a respectful way.

Question	Group member 1: (name)	Group member 2: (name)
How well did they know the parts of the system?	☐ Even with notes, missed some organs ☐ Could reasonably discuss the organs ☐ Could reasonably discuss the organs, their function, and how the system works ☐ Other:	☐ Even with notes, missed some organs ☐ Could reasonably discuss the organs ☐ Could reasonably discuss the organs, their function, and how the system works ☐ Other:
How well did they know how the disease they studied affects the system they studied?	☐ There was no evidence of any research related to the disease ☐ The disease was discussed in very general terms ☐ They had a pretty good idea of how the disease affect the system ☐ They could accurately discuss how the disease affected their system, and other systems, and the process by which the disease acted. ☐ Other:	☐ There was no evidence of any research related to the disease ☐ The disease was discussed in very general terms ☐ They had a pretty good idea of how the disease affect the system ☐ They could accurately discuss how the disease affected their system, and other systems, and the process by which the disease acted. ☐ Other:
In general, how much do you feel you learned after going	☐ They quickly presented their info, but then did not participate in the discussion that proceeded all 3 presentations ☐ They dominated the conversation, not allowing other to speak ☐ They contributed to the conversation in such a way that allowed everyone to speak. This included asking intelligent questions of all group members. This all added to the overall quality of our discussion ☐ Other:	☐ They quickly presented their info, but then did not participate in the discussion that proceeded all 3 presentations ☐ They dominated the conversation, not allowing other to speak ☐ They contributed to the conversation in such a way that allowed everyone to speak. This included asking intelligent questions of all group members. This all added to the overall quality of our discussion ☐ Other:
Overall rating – based on the descriptions below, give your partners a level as a rating on this assignment. No percent grade is needed.		

Remedial	Level 1	Level 2	Level 3	Level 4
Based on observations of how they worked over the last 3 days, plus the lack of written work, plus the lack of contribution on presentation day, this person should not get a passing grade.	This person did a little bit of work. They answered some of the basic questions listed on the assignment, but did not go any further than that. All the information they presented could be easily found on the internet in a matter of a few minutes.	This person did an ok job. The info they presented was good – I learned some stuff from them about their system and the disease they studied. However, they weren't able to engage much in the conversation part of the presentation.	This person knew their stuff. They had a clear understanding of the relationship between their system, the disease they studied, and could engage in a meaningful conversation about other human systems and diseases.	This person likely did a lot of research outside of class. They obviously practice their presentation, as they rarely had to refer to their notes. They knew many details about how the disease they researched disrupted the system they were assigned. They were able to make connections to other lessons/units from science class. Because of them, I understand something about the human body that I didn't before

Name:_____ Partner 1:_____
Partner 2:_____ Partner 3:_____

Homework
3.3: The Digestive system (read and take notes)
pg 82 #2-5
3.4: The Circulatory system (read and take notes)
pg 87 #1-5, 7a, 8
3.6 - The Respiratory system (read and take notes)
Page 95 #1-6 pg 118 #3, 5, 6, 8, 12, 16, 17

Lesson 17 Organ systems (continued)

Lesson 18 Organ systems (continued)

Lesson 19 Test