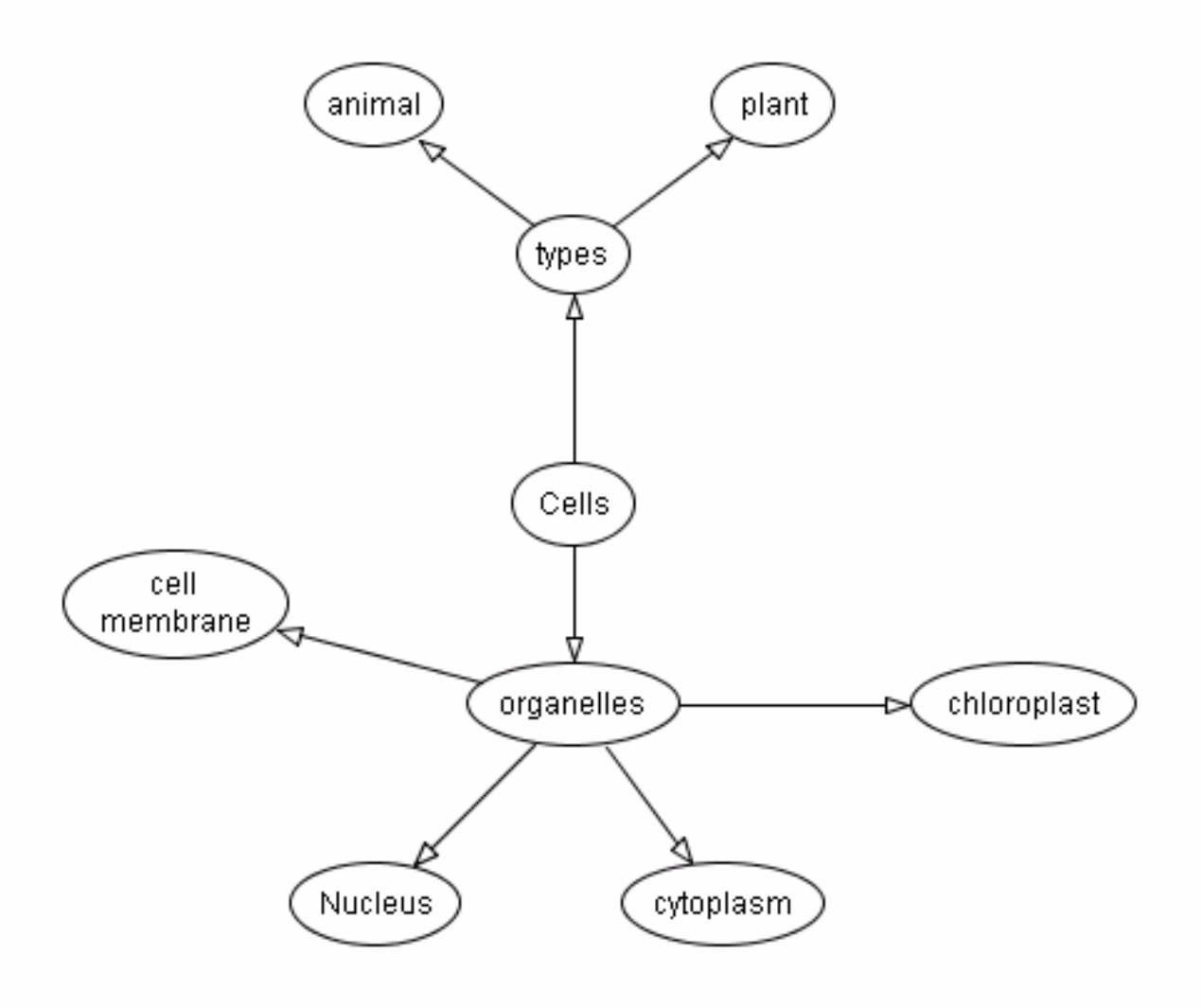
Diagnostic Activity: Cell Division

Using the concept map below as a starting point add to it some of the ideas you remember from previous science courses. A few words have been added to help you get started.



Cell Division

Suggested Time: 1.25 Hours

What's important in this lesson:

Cells are the basic unit of life and it is important for cells to undergo division so that life may continue. Any factors that alter division can prove harmful for the organism (e.g. Cancer)

Complete these steps:

1. Try the diagnostic activity to review some of the ideas you have learned about cells.

2. Get a copy of the Student Handout: Cell Division and work through it at your own pace. You'll need a copy of a textbook for help in places. Check your answers with your teacher where needed.

3. Try the Assessment: Cell Division. Make sure you have about 10 -15 minutes to complete the test and give this to your teacher.

4. Complete the Reflection Activity: Cell Division.

Hand-in the following to your teacher:

1. Concept Map - Diagnostic activity
2. Assessment: - Cell Division
3. Concept Map – Reflection response

Questions for the teacher:

Cell Division

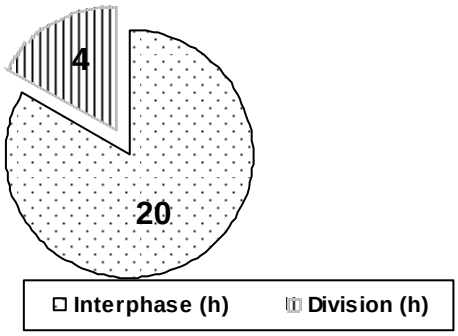
The Importance of Cell Division

All organisms begin life as a single cell. There are only two ways that an organism may grow: the cell may become bigger or it may divide into more cells. To live cells must get necessary nutrients across their cell membranes and into the cytoplasm where the nutrients will be used. Likewise waste materials also leave the cell. If a cell becomes too large, there is too much cytoplasm compared to the membrane and materials do not exchange efficiently. Cells will therefore undergo division to prevent this problem from occurring. Another reason why cells undergo division in multi-cellular organisms is to replace cells that are injured or dying.

Normal Cell Replacement

Cell Type	Time to Replace
Brain Cell	30-50 years
Red Blood Cell	120 days
Stomach	2 days
Skin	20 days

Cell Cycle



Cell Division

All cells have a predetermined cell cycle. Most of a cell's lifespan is spent in interphase where it will do all the necessary functions for life. Towards the end of interphase the DNA or Deoxyribonucleic acid (nuclear material) will be duplicated to give two complete sets of DNA in preparation for cell division.

Cells division is made up of two processes:

- **Mitosis** – this is the process where the DNA is divided into two complete and identical nuclei. There are four stages to mitosis, they are: Prophase, Metaphase, Anaphase and Telophase.
- **Cytokinesis** – this is the process which completes cells division by separating the cytoplasm and its contents into equal parts to form two identical daughter cells.

Read through the section in your textbook (pg. 18 Science Power, pg. 72 Concepts and Connections, pg. 152 Science 9) and fill in the chart below titled “Animal Cell Mitosis”. You must neatly draw out what is occurring during each phase as well as write a description.

* *The website* http://biology.nebrwesleyan.edu/benham/mitosis/ may be used in place of a textbook

Animal Cell Mitosis

Diagram	Description of Stage
	Prophase
	Metaphase
	Anaphase
	Telophase

Cancer

Under normal conditions the genes on the DNA will control cell division. However if these genes become mutated so they no longer function correctly the rate of cell division will be out of control. Therefore the cell will reproduce itself again and again and will not die. At this point the cell has become cancerous. The causes of cancer are not completely understood but we know that some things such as too much exposure to the sun, and chemicals found in cigarette smoke are carcinogens (cancer-causing agents) If a group of cancer cells does not spread to other parts of the body a **benign tumor** is formed, this is generally not life threatening and easier to remove. If a group of cancer cells move a **malignant tumor** occurs which is more dangerous because it tends to grow rapidly and not isolated easily so removal is very difficult.

Answer the following:

1) Why do you think that stomach cells are replaced roughly every 2 days but your red blood cells are replaced roughly every 120 days?

2) Define the following:

a) DNA

b) Chromosomes

c) Genes

3) Why do the chromosomes need to duplicate before a cell divides?

4) A human cell normally has 46 chromosomes. After division of a skin cell how many chromosomes would you expect in each of the new daughter cells?

5) X-rays can break chromosomes apart. Why would doctors and dentists ask women if they are pregnant before taking an X-ray?

6)

a) Some cancer cells divide every 24 h (or 1 day). Complete the table below that observes the number of cells each day. Draw a fully labeled line graph with time on the horizontal and number of cells on the vertical axis. (Hint: the number of cells doubles each division).

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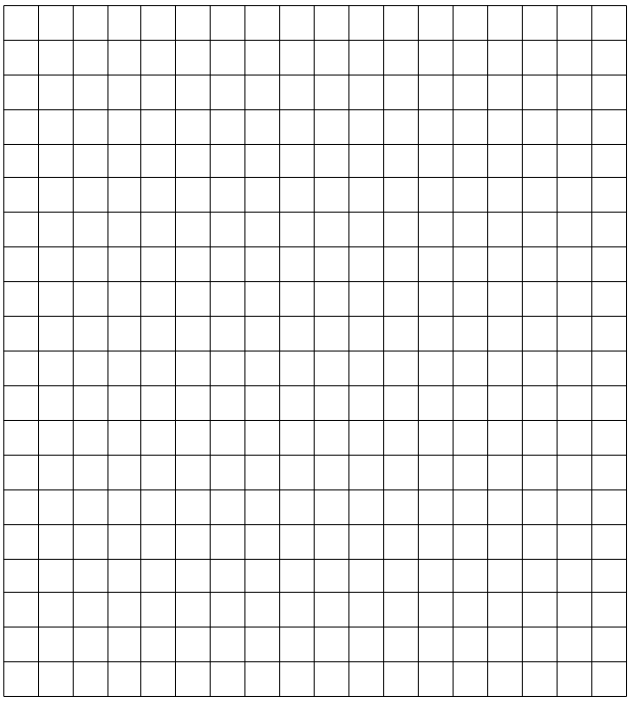
Time (day)	**Number of Cells**
0	1
1	2
2	4
3	
4	
5	
6	
7	
8	



b) When you finish your graph, explain the pattern you observe in the number of cells.

Assessment and Evaluation: Unit 2 Lesson 1

Modified True/False

Indicate whether the sentence or statement is true or false. If false, change the identified word or phrase to make the sentence or statement true.

_____ 1) Mitosis is a process in which cells divide, producing identical daughter cells.

_____ 2) Replication of the DNA ensures that each new cell contains genetically different information in its nucleus.

_____ 3) All cells in the human body divide at the same rates.

_____ 4) Cancer cells divide at a faster rate than normal cells

Short Answer

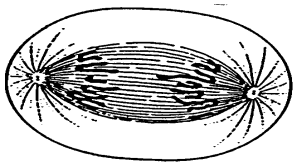
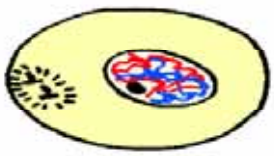
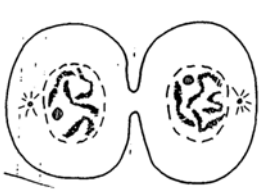
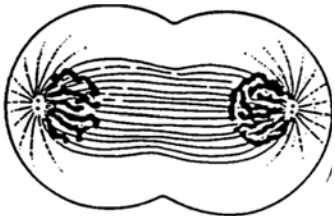
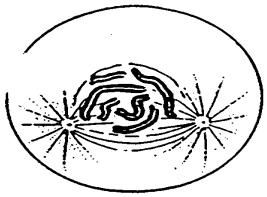
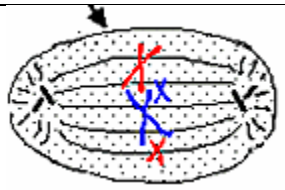
5) Cells continue to be replaced for a long time after you stop growing. Give two reasons why your cells need to be replaced throughout your lifetime.

6) a) Identify two factors that are linked to the development of cancer in humans.

b) Which type of tumor is more harmful a benign or malignant one? Explain your answer.

7) The following cells are in various stages of their life cycle.

a) Starting with interphase as step #1 place the rest in order according to the stages of mitosis and cytokinesis. Name each stage after you have numbered them.

 a) _____ .	 b) _____ .	 c) _____ .
 d) _____ .	 e) _____ .	 f) _____ .

(b) Which picture shows metaphase? How can you tell?

Reflection Activity: Unit 2 Lesson 1

Create a concept map using some of all of the terms given below. Place the word **Cell Division** in the middle of the page to get you started.

Terms

Cell cycle, Cell division, Interphase, Growth, Healing and Tissue Repair, Mitosis, Cytokinesis, Prophase, Metaphase, Anaphase, Telophase, Uncontrolled Division, Cancer Cells, Daily Life functions, duplication of DNA