# *Cell Pathology Research Assignment*



***Equilibrium Unit Project, Biology***

**INTRODUCTION:**

Pathology refers to the study of disease, which is the malfunctioning of an organism’s normal processes leading to negative consequences for the organism. Therefore, “cell pathology” refers to the disruption of normal cell processes in a way that has a negative consequence for the organism. In this assignment, you will research a specific example of cell pathology. Your research will focus on a particular cellular structure, its normal roles within the cell, and the consequences for the cell and organism when that function is disrupted. A major concept to keep in mind throughout this assignment is the dynamic nature of cells. That is, cells are active systems that are constantly working to maintain homeostasis; they are not the static cartoons that you see in biology textbooks.

**ASSIGNMENT PROCEDURES:**

1. You will choose one of the cellular structure/disease pairs listed in the table below.
2. Conduct research on your topic. The goal of your research is to describe the normal role of the assigned cellular structure and the consequences for the cell and organism when that function is disrupted. You should also describe the specific disease or condition that leads to the malfunctioning of the cellular structure.
3. You must locate at least three sources. All references are properly cited with author, date, title, and publication information.
4. You may choose one of the formats listed below to report your research. Your product will be evaluated based on the scoring rubric provided on the next sheet.
5. ***Please email me if you have questions about the assignment.***

**Possible Project Formats**

* Keynote® Presentation
* Prezi
* Paper or Electronic Poster
* Research Report
* Video
* Brochure
* Magazine Article
* Graphic Novel
* Animation

# Cell Pathology Research Assignment - *SCORING RUBRIC*

**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Topic: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Product: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Grading:** This project assesses your understanding of standard SB1a (Explain the role of cell organelles for both prokaryotic and eukaryotic cells, including the cell membrane, in maintaining homeostasis and cell reproduction) and will be reported in the SB1 – Cells domain of our gradebook. In order to receive full credit, your product must meet each of the following criteria.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Component** | **Rating Scale** | | | | **Notes** |
| **Limited** | **Approaching** | **Meets** | **Exceeds** |
| 1. **Cellular Structure:** Location and physical structure are described. | ***2*** | ***4*** | ***6*** | ***8*** |  |
| 1. **Normal Function:** Typical function of cellular structure is described. Describes why structure is important to survival of the cell and organism. | ***2*** | ***4*** | ***6*** | ***8*** |  |
| 1. **Cell Pathology:** Detailed description of causes and effects of disruption of cellular processes is provided. How is the process disrupted? How is the cell affected? How is the organism affected? If possible, a specific disease example should be discussed. | ***2*** | ***4*** | ***6*** | ***8*** |  |
| 1. **Content Presentation:** Key concepts are addressed through supporting details, examples, and applications. All vocabulary is defined within the context of the product. | 1 | 2 | 3 | 4 |  |
| 1. **Visual Presentation:** Design is logically organized and appealing. | 1 | 2 | 3 | 4 |  |
| 1. **Overall quality of work is neat and professional.** | 1 | 2 | 3 | 4 |  |
| 1. **Information Use:** At least three (3) creditable sources are used. **All references are properly cited with author, date, title, publication information.** All information and graphics sources are properly cited and ownership of all words, images, and ideas is clearly indicated. ***\*\*Plagiarism will result in an incomplete grade and project must be redone for a maximum 75% credit.****\*\** | 1 | 2 | 3 | 4 |  |
| **TOTAL SCORE (40 possible):** |  | | | |  |

# Cell Pathology Disease List

***Project Assignments***

|  |  |
| --- | --- |
| **Feature** | **Related Disease** |
| Cell Membrane | * Cystic fibrosis * Heart disease * Diabetes mellitus |
| Cytoplasm |  |
| Cytoskeleton | * Sickle cell anemia * Duchenne muscular dystrophy (DMD) |
| Ribosome | * Alzheimer's Disease * Hemotalogic diseases |
| Cell Wall | * Cell wall degrading enzymes |
| Nucleus | * Cancer * Huntington’s disease |
| Chromosome | * Down syndrome * Turner syndrome * Klinefelter’s syndrome |
| Endoplasmic Reticulum | * ER storage diseases * ER stress |
| Vesicle | * Mad Cow Disease * Atherosclerosis * Type II Diabetes * Alzheimer's Disease * Cystic Fibrosis * Griscelli Disease * Retinitis Pigmentosa * Choroideremia * Polycystic Kidney Disease * Williams Syndrome * Liddle's Syndrome * X-linked mental retardation * Usher's Syndrome * Mucolipidosis |

|  |  |
| --- | --- |
| **Feature** | **Related Disease** |
| Golgi Apparatus | * Alzheimer’s disease * Tangier disease |
| Lysosome | * I-cell disease * Krabbe’s * Guacher’s Disease * Niemann-Pick Disease * Fabry’s Disease * Tay-Sachs Disease * Zellweger Syndrome * Adrenoleukodystrophy (ALD) * Hermansky–Pudlak syndrome * Griscelli syndrome |
| Mitochondria | * MELAS (mitochondrial encephalopathy with lactic acidosis and stroke-like episodes) * Chronic myalgia * Kearns-Sayre Syndrome * Leigh’s syndrome * Alper’s poliodystrophy * Menke’s syndrome * Alexander’s disease |
| Chloroplasts | * Tobacco mosaic virus * Other plant viruses affecting chloroplasts |
| Vacuole | * Motor neuron disease * Creutzfeldt-Jakob disease * Alzheimer's disease * Parkinson's disease |

**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_\_\_\_\_**

# Cell Jobs Graphic Organizer

## Biology

**Essential Question:** How do the parts of a cell work together to carry out life processes?

**Directions:** Your textbook provides a good discussion of the main jobs that a cell has to carry out to survive and how the parts of a cell work together to complete these jobs. For each job listed below, explain which cell structures work together to accomplish the job and how they do this.

|  |  |
| --- | --- |
| **Cell Job** | **What cell structures are responsible, and how is this job carried out?** |
| 1. Providing a Framework for the Cell | List all structures needed to carry out this job:  Describe how the cell structures listed above work together to carry out this process: |
| 1. Directing Cell Activities | List all structures needed to carry out this job:  Describe how the cell structures listed above work together to carry out this process: |
| 1. Protein Processing | List all structures needed to carry out this job:  Describe how the cell structures listed above work together to carry out this process: |
| 1. Storage and Maintenance | List all structures needed to carry out this job:  Describe how the cell structures listed above work together to carry out this process: |
| 1. Energy Production | List all structures needed to carry out this job:  Describe how the cell structures listed above work together to carry out this process: |

# Cell City Worksheet

Floating around in the cytoplasm are small structures called organelles. Like the organs in your own body, each one carries out a specific function necessary for the cell to survive.

Imagine the cell as a miniature city. The organelles might represent companies, places or parts of the city because they each have similar jobs. Below are the descriptions of important parts of the Cell City.

1. City Limits - Controls what goes in and out of the city
2. Road System - Allows for movement throughout the city.
3. City Hall - Controls all the activities of the city.
4. City Auditor - Stores all the records of the city and passes them on as the city grows.
5. City Planning Office - A place in the city hall where plans are made for the construction of the city.
6. Construction Company - Builds structures for the city.
7. Delivery Van - Delivers products made at the construction company to other locations in the city.
8. Food Processing Plant - Processes large quantities of food entering the city into smaller packages that can be used more easily.
9. Warehouse - Stores materials needed by the city.
10. Power Company - Produces energy for the city.
11. Solar Power Plant – Uses the sun’s energy to produce power for the city.

As you move through this worksheet, see if you can match the important parts of the city listed above to the specific organelles found in cells. Be sure to write neatly, and in complete sentences.

1. The nucleus is a large, round/oval structure usually located near the center of the cell.  
   It is the control center for all the activities of the cell. i) What company or place does the nucleus resemble in a Cell City? ii) Why do you think so?
   * 1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
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2. The cell membrane is a thin, flexible envelope that surrounds the cell. It allows the cell to change shape and controls what goes into and out of the cell. i) What company or place does the cell membrane resemble in a Cell City? ii) Why do you think so?
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
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5. The endoplasmic reticulum consists of a network of tube-like passageways that proteins from the ribosomes are transported through. i) What company or place does the endoplasmic reticulum resemble in a Cell City? ii) Why do you think so?
6. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
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7. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
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8. The ribosomes are small grain-like bodies made mostly of RNA and produced in the nucleolus. Proteins are constructed at the ribosomes. i) What company or place do the ribosomes resemble in a Cell City? ii) Why do you think so?
   * 1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
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9. The nucleolus is a small, dense object fond in the middle of the nucleus. It makes the RNA for the cell. i) What company or place does the nucleolus resemble in a Cell City? ii) Why do you think so?
   * 1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
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     2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
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10. The jelly-like area between the nucleus and the cell membrane is called the cytoplasm. It helps organelles move throughout the cell. i) What company or place does the cytoplasm resemble in a Cell City? ii) Why do you think so?
11. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
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12. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
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13. The mitochondria are tiny bean-shaped structures in the cytoplasm with a smooth outer membrane, and a greatly folded inner membrane. They supply the energy for the cell by transforming sugars into energy. i) What company or place does the mitochondria resemble in a Cell City? ii) Why do you think so?
    * 1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
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      2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
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14. The chromosomes are rod-shaped bodies found in the nucleus. They are made of DNA and protein. They contain all the information to run the cell. They also pass on the hereditary traits of the cell to new cells. i) What company or place do the chromosomes resemble in a Cell City? ii) Why do you think so?
    * 1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
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15. The chloroplast is an oval, green structure found in the cytoplasm. It contains chlorophyll. It captures the sun’s energy and uses it to produce sugars in a process called photosynthesis. i) What company or place do the chloroplasts resemble in a Cell City? ii) Why do you think so?
    * 1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
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      2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
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16. The lysosomes are small round structures found in the cytoplasm. They contain digestive enzymes that break down large food particles in to sugars and other simple substances.   
    i) What company or place do the lysosomes resemble in a Cell City? ii) Why do you think so?
    * 1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
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      2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
         \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
17. The vacuole is a large, round sac found in the cytoplasm. It stores water, food, wastes, or other materials needed by the cell. i) What company or place does the vacuole resemble in a Cell City? ii) Why do you think so?
    * 1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
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# Cell Analogy Project

## Introduction

Cells need to carry on the same basic functions as we do to sustain life; the difference is cells do this with much smaller parts. These smaller structures that allow the cell to function are called organelles – “tiny organs.” Also plant and animal cells have some similar parts and some parts that are not similar.

It’s only common sense that if you are able to relate things you learned in class to everyday things, you’ll remember it better. It’s not every day that you and your friends sit around at Starbucks discussing the rough endoplasmic reticulum. However, you probably *do* discuss things like cars, your homes, places to visit, etc. Therefore, your task in this assignment is to relate the different cell organelles to an everyday situation or thing using an analogy.

## Your Task

You will come up with an analogy for the cell of your choice and its organelles. Your analogy will be represented in the form of a poster that represents a cell and its organelles. You should compare roles of 10 organelles to a part of the analogy.

## Example: the Cell City

* + - * The nucleus of a cell is the main control center of the cell. It holds all of the information needed for the cell to function properly. Therefore, it is like city hall because this is where the information, policy and governing is done to run the city.
      * The **mitochondria** of a cell are where energy (ATP) is created through the breakdown of glucose(fuel) in a process known as cellular respiration. In a city, the **power plant** would be similar to a mitochondria because this is where electricity (energy) is made from fuel (coal) in a process known as combustion.
      * etc…etc…etc…

## The Poster

### **There are 2 parts of the poster:**

* + - * **Part 1 –** The analogy. You should have a well-drawn or constructed picture of your analogy (i.e. if you were doing a cell city, you would have a picture of a city and each of the parts of your analogy), and short 2-3 sentence descriptions of each organelle analogy (like shown above)
      * **Part 2 -** Structure and function table on the back of the poster that indicates a relationship between the organelle and its function within the cell. In other words, what is its role and what can it be compared to in a living cell? Also, indicate how you know whether the cell is plant or animal! For a small bonus, include a picture of each organelle (separately, or include a big picture of a real plant/animal cell with its parts correctly labeled…)