**Activity 1A**

Use the terms and phrases below to create a concept map that summarizes the problems that occur when a cell grows too large.

|  |  |  |  |
| --- | --- | --- | --- |
| **Information “overload”** | **DNA** | **Control of cellular activities** | **Higher demand for proteins** |
| **Cell becomes too large** | **Instructions for building proteins** | **Exchange of materials** | **Surface area** |
| **Cell membrane** | **Transport** | **Diffusion** | **Facilitated diffusion** |
| **Oxygen** | **Glucose** | **Carbon dioxide** | **Volume** |
| **Surface-area-to-volume ratio** | **Decreases** | **Increases** | **Demand for materials/creation of waste** |

 **Activity 1B**

|  |  |  |
| --- | --- | --- |
| Problem | Analogy | Description(s) |
| Information “overload” | Traffic problems within the cell | Problems with transport across the cell membrane |
| As the cell grows, the volume increases producing more waste than the cell can dispose of. | As the cell grows, the surface area (cell membrane) does not grow as fast as the volume of the cell. This causes transport to slow down. | Fixed amount of DNA in the cell cannot control all activities as the cell grows. |
| A town grows in population size, but the library does not increase the number of books it has. People now have to wait to check out books. | A town grows in size, but does not increase the number of streets leading into the town. | As the cell grows, the volume increases demanding more oxygen and nutrients than the cell can take in. |

 Use the descriptions below to create a table that summarizes the major problems that occur when a cell grows too large.

**Activity 2A**

Use the diagram below to help you explain how cell division solves the problems of a cell becoming too large. Assume all measurements are in millimeters (mm). *Be sure to use SEE format!*



**Activity 2B**

* Examine the diagram below and make a statement about which would have faster rates of transport: one big cell or many small cells.
* Compare two pieces of data from the diagram above that support your statement. Assume all measurements are in millimeters (mm).
* Explain how cell division solves the problems that occur when a cell becomes too large.



**Activity 3A**

*Cut out each of the strips below and categorize them as an example of sexual or asexual reproduction. Once you have all strips categorized, discuss the major identifying features of these two types of reproduction.*

A pollen grain lands on the pistil of the same flower. A pollen tube grows down the pistil into the ovary. Sperm from the grain of pollen fertilize the eggs inside the ovary.

A bacterium carries out binary fission by replicating its circular DNA and then splitting in half, with each new bacterium containing its own circular DNA.

A female whiptail lizard produces eggs that grow into new female whiptail lizards. The new baby females are genetic clones of the mother lizard.

Two hermaphroditic earthworms meet and mate with one another. Sperm is exchanged between both worms and each has eggs that are fertilized.

A male frog mounts a female frog and squeezes the eggs out of her. As the eggs are released from her body, his sperm fertilizes the eggs.

You plant strawberries in your garden in the spring. Later that summer, you notice there are new strawberry plants growing on the other side of your garden. You examine the original plants and find long, thin stems (stolens) running along the ground connecting the original plant to these new plantlets. The new plantlets have begun to develop their own root system.

A pollen grain lands on the pistil of a different flower on a different plant. A pollen tube grows down the pistil into the ovary. Sperm from the grain of pollen fertilize the eggs inside the ovary.

Hydras produce small, genetically identical polyps that grow out of the parent. These polyps eventually break off of the parent and form a new individual.

**Activity 4A**

Use the materials in your basket to model how DNA is packaged into chromosomes prior to cell division.

**Activity 5A**

Create a diagram or concept map that summarizes the features and events of the cell cycle.

|  |  |  |  |
| --- | --- | --- | --- |
| Interphase | M phase | G2 Phase | Mitosis |
| Metaphase | Telephase | Centrioles separate | Anaphase |
| Division of the cytoplasm | DNA replication | Preparation for mitosis | Cell is carrying out its function |
| S Phase | Cell growth | G1 Phase | Chromatin condenses into chromosomes |
| Cell division | Division of the nucleus | Cytokinesis | Prophase |
| Centrioles replicate | Microtubules organized into spindles | Nuclear envelope breaks down  | Spindle fibers connect to the centromere of each pair of sister chromosomes |
| Sister chromatids line up along the center of the cell | Sister chromatids are separated from one another | Chromosomes begin to unwind | Sister chromatids move apart from one another, pulled by the spindle fibers to opposite poles |
| Nuclear envelope reforms around chromosomes | Spindle fibers break apart | Animal cells | Cell membrane pinches inwards until cytoplasm separated |
| Plant cells | Cell plate forms halfway between nuclei | Cell plate develops into cell membrane and cell wall |  |

**Activity 5B**

Create a diagram or concept map that shows the order of events in the cell cycle as well as what occurs in each phase.

|  |  |  |  |
| --- | --- | --- | --- |
| Interphase | M phase | G2 Phase | Mitosis |
| Division of the cytoplasm | DNA replication | Preparation for mitosis | Cell is carrying out its function |
| S Phase | Cell growth | G1 Phase | Centrioles replicate |
| Cell division | Division of the nucleus | Cytokinesis |  |

Create a diagram or concept map that shows the order of events in cell division as well as what occurs in each phase.

|  |  |  |  |
| --- | --- | --- | --- |
| Metaphase | Telephase | Centrioles separate | Anaphase |
| Chromatin condenses into chromosomes | Prophase | Plant cells | Cell plate develops into cell membrane and cell wall |
| Centrioles replicate | Microtubules organized into spindles | Nuclear envelope breaks down  | Spindle fibers connect to the centromere of each pair of sister chromatids |
| Sister chromatids line up along the center of the cell | Sister chromatids are separated from one another | Chromosomes begin to unwind | Sister chromatids move apart from one another, pulled by the spindle fibers to opposite poles |
| Nuclear envelope forms around chromosomes | Spindle fibers break down | Animal cells | Cell membrane pinches inwards until cytoplasm separated |