

Group Number: \_\_\_\_\_

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

Date: \_\_\_\_\_

Online Participation: \_\_\_\_\_ / 10 points

### Membrane Function Inquiry Investigation

Biological membranes are selectively permeable, which means that some substances can pass through the membrane and some substances cannot. Diffusion is the spontaneous tendency of molecules to spread apart and move from areas of high concentration to low concentration. When diffusion occurs across a biological membrane, it is a form of passive transport. Passive transport occurs when substances diffuse across a biological membrane without an energy boost from the cell. Passive transport does not require energy, distinguishing it from active transport, which does require energy. Active transport occurs when a cell uses energy to force substances to move across a biological membrane.

Yeast is a unicellular organism. It can be used to make bread and alcoholic beverages such as beer and wine. Different species of yeast may cause infections. Yeast cells are smaller than animal and plant cells, but slightly larger than bacteria. Like all cells, the plasma membrane of a yeast cell is selectively permeable.

Congo red is a red dye consisting of small molecules suspended in water and ethanol. It was formerly used to dye cotton but is now used to stain biological tissues for microscopic examination. Small molecules like Congo red can freely diffuse across the plasma membrane of yeast cells. Since Congo red can disrupt yeast metabolism, healthy yeast cells carry out active transport to remove this foreign molecule from their cytoplasm. This means the cytoplasm of the active yeast cells will become colorless over time as the dye is pumped out of their cytoplasm. Unhealthy or dead yeast cells cannot carry out active transport and will be unable to remove the dye from their cytoplasm.

#### Guiding Question:

How does Congo red move across the plasma membrane of yeast cells?

**Background Information:** (Record your observations from our class discussion.)

#### Hypothesis (Your Claim):

*The stain moves into the yeast cells through passive transport (diffusion) and moves out of the yeast cells through active transport.*

**Prediction:** (If...[restate hypothesis] ... then...[describe expected observations].)

**Materials:** (List the equipment and supplies needed for your experiment.)

**Independent Variable:** (What variable are you testing?)

**Dependent Variable(s):** (What will you be measuring?)

**Constant Variable(s):** (What will you be holding constant?)

**Control:** (How will you ensure the reliability of your results? Repeat trials? Control group?)

**Procedure:** (List the steps with enough detail that a 5<sup>th</sup> grader could repeat your experiment.)

**Results:** (Create a data table for qualitative data and/or a graph to represent quantitative data.)

**Conclusion:** (Based on your hypothesis [Claim-Evidence-Reasoning]. Address possible sources of error.)