DIFFUSION AND CELL SIZE ACTIVITY NAME _____

Hour _____

TERMS

- INDICATOR – chemical which changes color under certain conditions or in the presence of a specific substance.

MATERIALS (per team of two)

- 2 pairs of safety goggles
- plastic spoon or forceps (tweezers)
- 250 ml beaker
- plastic table knife (or scalpel)
- paper towel
- millimeter ruler
- One block of Bromocresol Green Agar measuring 3 cm x 3 cm x 6 cm.
- 150 ml of 0.1% HCl (hydrochloric acid)

PROCEDURE

1) Trim the agar block with the knife to make three cubes.
   3 cm squared
   2 cm squared
   1 cm squared

2) Place the cubes in the beaker and add the 0.1% HCl until the cubes are just covered.

CAUTION ! **HCl is an acid and an irritant and can destroy clothing. Avoid skin and/or eye contact; do not ingest. Immediately flush the spills and splashes with water for 15 minutes; rinse mouth with water. Tell the instructor.**

3) Record the time. **TIME STARTED: _____**

4) Use the plastic spoon to turn the cubes frequently for the next **ten** minutes.

5) Complete the table below by performing the necessary calculations.
   Surface area = sum of area of all 6 sides of the cube
   Volume = length x width x height
   Ratio of surface area to volume = surface area / volume
   This ratio should be expressed in its simplest form (example 3:1 rather than 24:8)

6) After TEN MINUTES, wear gloves and use the plastic spoon to remove the agar cubes from the HCl.

- Blot them dry. Avoid handling them until they are blotted dry.
- Cut each cube in half.
- Record your observations of the inner surfaces.
- Measure the depth of diffusion of the HCl in each of the cubes.

TABLE – COMPARISON OF AGAR CUBES

Cube Dimension	Surface Area (cm^2)	Volume (cm^3)	Simplest Ratio Surface : Volume	Depth of Diffusion
3 cm				
2 cm				
1 cm				

ANALYSIS

1) List the agar cubes in order of size (volume) from largest to smallest.

2) List them in order of the ratios of surface area to volume, from largest to smallest.

3) How do these lists compare?

4) In one of the blank rows on the table, calculate the surface area-to-volume ratio for a cube that is 0.01 cm on a side.

5) Which has the greatest surface area, a cube 3cm on a side or a microscopic cube the size of an onion cell? (Assume the cell to be 0.01 cm on a side)

6) Which has the greater surface area ***in proportion*** to its volume?

7) What evidence is there that HCl diffuses into an agar cube?

8) What evidence is there that the rate of diffusion is about the same for each cube? Explain

9) What happens to the surface area-to-volume ratio of cubes as they increase in size?

10) Most cells and microorganisms measure less than 0.01 cm on a side. What is the relationship between efficiency of diffusion and cell size?

11) Propose and explain one reason why large organisms have developed from ***more*** cells rather than ***larger*** cells.