I. Describing bacteria
   A. Colony Morphology
      1. Colony morphology is used to describe the ________________. Remember that a colony arises from a single cell so a colony represents a pure culture.

      **Colony morphology terms**

      When recording colony morphology, it is important to also record color, optical properties (translucence, sheen) and texture (moist, mucoid, dry). However, remember that color is often influenced by environment.

      | Shape:              | Margin (edge):  | Elevation: |
      |---------------------|-----------------|------------|
      | Circular            | Entire (smooth) |            |
      | Irregular           | Undulate (wavy) | Raised     |
      | Punctiform (tiny)   | Rhizoid         | Convex     |
      | Lobate              |                 | Pulvinate  |
      | Filamentous         |                 | Umbonate   |

   B. Turbidity and broth growth
      1. Can be used to estimate the ____________________

      | Turbidity  | Bacteria per mL |
      |------------|-----------------|
      | None       | 0-10^6          |
      | Light      | 10^7            |
      | Moderate   | 10^8            |
      | Heavy      | 10^9            |

      **Turbidity and bacteria count**

      Note: Bacterial populations grown in liquid medium usually do not exceed 3x10^9 bacteria/mL.

      2. Some bacterial have distinctive growth patterns in broth.
C. Bacterial Cell Shapes and Arrangement
1. Shape refers to the individual cell shape when viewed under a microscope
2. We will deal mainly with the two most common shapes: ____________________________

Bacterial Cell Arrangements

Strepto- chain of cells  Diplo-  Tetrad-  Sarcina-  Staphylo- Irregular clusters of cells

II. Wet mounts
A. In the last lab we viewed samples (_____________________) under the microscope. This is a fast way to view ________________ that is ____________________. We were able to make true assessments of ________________ ____________________. However, these wet mounts are ________________ and can be a potential ________________ _________________.

III. __________ samples (smear preparations)
A. Fixation
1. ____________ fixation: simultaneously __________________________. This is the ____________ ________________ fixation method.
2. ____________ fixation: has the same results as the heat fixation. Often used when heat can damage cells structures you are trying to observe. Examples of chemical fixatives are alcohol and formaldehyde.

B. Disadvantages of a fixed sample
1. Can’t observe specimen ______________________
2. Causes a slight ________________________________________________

C. Advantages of a fixed sample
1. __________________—— can be used for long-term study.
2. The preparations __________________—— (below) to enhance contrast and reveal specialized cell structures (e.g. flagella, endospores, capsules, cell walls etc..)
IV. Staining

A. The composition of a stain
   1. Solvent
   2. A solute contains
      ____________________________, which are highly conjugated and give the dye its ____________.
      i. __________________________
         a. Contain __________ charged groups, which bind to ____________
         b. Direct dyes are the ____________ and examples include methylene blue, basic fuchsin, crystal violet, safranin and malachite green.
      c. Applied to bacterial smears that have been ________________.
   ii. __________________________
      a. Possess ___________ such as carboxyls (-COO-) and hydroxyls (-OH-).
      b. Can be used to determine morphology and cellular arrangement in bacteria that are ________________ to withstand heat-fixing.

A. Staining categories
   1. __________________________ (today)
      i. Uses a _____________ (acidic or basic) and all organisms stain the ________________.
      ii. Is a ________________ method to determine cell size, shape and arrangement.
   2. __________________________
      i. Divides bacteria into ________________ based on staining properties.
      ii. Is ________________ but the color of staining gives information ________________ in addition to size, shape and arrangement.

V. Some processes used in the identification of bacterial unknowns:

A. __________________________ (staining)
B. __________________________ (e.g. type of colony and time it takes to grow) and __________________________
   (e.g. carbohydrate fermentation and production of virulence factors)
C. Results can be coupled with a __________________________.
New tools you will encounter in this lab course:

- **Pipet**
  Used to transfer exact volumes of fluid.

- **Inoculating Loop**
  Used to pick up colonies, inoculate by streak and transfer small volumes of culture. Used when making a smear preparation from liquid culture.

- **Inoculating needle**
  Used to pick up a small piece of a colony and inoculate either by streak or stab. Commonly used when making a smear preparation from a colony.

- **Small pipet aide**
  Used to draw liquid into 1 mL pipets.

- **Large pipet aide**
  Used to draw liquid into 5 and 10 mL pipets.

- **Hockey Stick**
  Used to spread bacterial suspensions evenly over an agar surface.