**Basic Equipment Used in Biology Experiments**

The daily routine of a biologist involves the use of basic equipment in their biology experiments — such as microscopes, test tubes, beakers, and Bunsen burners — as well as high-tech scientific equipment and computers.

This equipment is the bare-bone basics that you’d find in any laboratory. This equipment is necessary for the basic studies of biology: visualizing cells and organelles, as well as preparing samples of cells or fluids for testing or visualization, dissecting specimens, or mixing chemicals.

**Microscopes**

Biologists use microscopes of differing powers to see organisms and samples more closely. They are high-powered, extremely expensive, and sensitive pieces of equipment that can make even the smallest parts of a single cell seem clear.

Instead of using beams of light to illuminate the specimen being viewed, as inexpensive light microscopes do, an electron microscope uses beams of electrons. The beams of electrons bring the finest details of the cell into focus and can allow even large molecules to be seen.

The smallest size you can see with your naked eye is 0.2 mm, which is equal to 200 micrometers. This size is equivalent to one ridge on your fingerprint. Light microscopes magnify cells up to 1,000 times. Using the shortest ray of light, which allows the highest resolution, light microscopes can view things as small as 0.2 micrometers in width — that is, 0.0002 mm.

For objects smaller than 0.2 micrometers, an electron microscope must be used. Electron microscopes allow you to see objects that are as small as 0.2 nanometers (nm), which is equal to 0.000000002 mm. In comparison to a light microscope being able to magnify 1,000 times, electron microscopes can magnify objects 200,000 times.

**Slides, test tubes, and petri dishes**

To examine a specimen, biologists must place a sample — whether the sample is blood, mucus, saliva, skin cells, or urine — in or on something:

* **Slides:** If the sample is going to be viewed under a microscope, some of the cells are gently smeared onto a glass slide, treated with a fixative so that the cellular components don’t move, and covered with a glass cover slip.
* **Test tubes:** If the sample needs to be *centrifuged*— spun very rapidly to separate fluid and particles — or needs to have solutions added to it, then the sample most likely is placed in a test tube.
* **Petri dishes:** If a sample must be grown before it can be identified, the sample must be *cultured*. To culture a sample, a petri dish containing a culture medium is *inoculated,* or smeared and pressed, onto the medium.

The scientist must keep the petri dish at normal body temperature for the species being studied (humans: 98.6ºF, 37ºC) for approximately 24 to 72 hours and wait for the specimen to grow. A series of tests can then be done on the cultured specimen to determine what organism it is.

**Dyes and other indicators**

*Dyes* are agents that color structures of the cell, which allow the structures to be more easily viewed when using a microscope. In some cases, stains make usually invisible structures visible. Some common stains include iodine and methylene blue. If iodine is placed on a sample that contains starch, such as a piece of potato, it will turn the sample dark blue.

*Indicators* are premade solutions or papers that are used to determine chemical characteristics, such as acidity and composition). Litmus paper is a common example. When dipped into a solution, litmus paper will turn red if the solution is acidic and blue if the solution is basic. Strips of pH paper have a range of colors that can be matched up to estimate the approximate pH of a solution.

**Forceps, probes, and scalpels**

Sometimes animals are *dissected,*or cut apart in an orderly fashion, to find out more about structure or to teach the person doing the dissecting. Scientists already know volumes of information on the structure of animals, but dissection not only teaches you structure, it teaches you technique.

The following equipment is used to perform a dissection:

* A *scalpel* is an extremely sharp bladed instrument that can neatly split open skin and cut through muscle and organs.
* *Forceps* are used to hold tissue out of the way or to pick up a structure.
* A *probe* can be used to remove connective tissue or to lift a structure before it is dissected.

**Beakers, flasks, and Bunsen burners**

The equipment that is common in a chemistry laboratory often is seen in a biology laboratory, too. Biologists also mix solutions and chemicals.

* *Beakers* are used when the solution mixed in it is going to be poured into something else. (They have a lip on them for pouring.)
* *Flasks* have a narrow neck and are used when the solution may splash out of a beaker or when the container of solution needs to be plugged at some point in the experiment.
* *Bunsen burners* are heat sources. They are cylinders attached to a gas line. When the gas line is opened, a spark ignites a flame in the Bunsen burner, which is then used to heat solutions. Sometimes solutions need to be boiled to release gases or to dissolve a solid into the solution.