

## Pre-Lab, Skills, and Standards Alignments

### GLOWING GENES

This experiment illustrates the direct link between an organism's genetic complement (genotype) and its observable characteristics (phenotype). Two genes, for antibiotic resistance and luminescence, are introduced into the bacterium *E. coli*. Following overnight incubation, transformed bacteria will grow in the presence of ampicillin, and glow when exposed to ultraviolet light.

**Lab Length:** 1 hour or 2 hours

#### Suggested Pre-Lab Teaching

- DNA Structure
- Bacterial cell components, including plasmids
- Central Dogma (genes to proteins)

#### Lab Skills

- Measure small volumes of liquid using micropipettes.
- Use sterile technique while working with bacteria.
- Culture experiment results in Petri dishes.
- Follow a multi-step procedure to conduct a controlled experiment.

#### Conceptual Knowledge/Skills

- Explain the steps of bacterial transformation.
- Predict experimental and control results.
- Construct an explanation of how the transformation technique can be used in industry.

#### New York State Science Learning Standards/NGSS

Science and Engineering Practices	Disciplinary Core Ideas	Cross Cutting Concepts
<p><u>Planning and Carrying Out Investigations</u> Conduct an investigation and/or evaluate and/or revise the experimental design to produce data to serve as the basis for evidence that meet the goals of the investigation.</p> <p><u>Analyzing and Interpreting Data</u> Analyze and interpret data to provide evidence for phenomena.</p>	<p><u>LS1.B Growth and Development of Organisms</u> Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (MS-LS3-2)</p> <p><u>LS3.B: Variation of Traits</u> In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Some changes are beneficial, others harmful, and some neutral to the organism. (MS-LS3-1) (NYSED) Mutations may result in changes to the structure and function of proteins. (MS-LS3-1)</p> <p>(NYSED) Advances in biotechnology have allowed organisms to be modified genetically. (HS-LS3-2)</p>	<p><u>Interdependence of Science, Engineering, and Technology</u> Engineering advances have led to important discoveries in virtually every field of science and scientific discoveries have led to the development of entire industries and engineered systems.</p> <p><u>Cause and Effect</u> Cause and effect relationships may be used to predict phenomena in natural or designed systems.</p>