3.7 Fitness

**SYI-3.A Explain the connection between variation in the number and types of molecules within cells to the ability of the organism to survive and/or reproduce in different environments.**

- Variation at the molecular level provides organisms with the ability to respond to a variety of environmental stimuli.
  - Different types of phospholipids in cell membranes allow the organism flexibility to adapt to different environmental temperatures.

**SYI-3.A Explain the connection between variation in the number and types of molecules within cells to the ability of the organism to survive and/or reproduce in different environments.**

- Variation in the number and types of molecules within cells provides organisms a greater ability to survive and/or reproduce in different environments.
  - Different chlorophylls give the plant greater flexibility to exploit/absorb incoming wavelengths of light for photosynthesis.

**SYI-3.A Explain the connection between variation in the number and types of molecules within cells to the ability of the organism to survive and/or reproduce in different environments.**

- In hot weather, stomates close to save water; CO₂ concentration decreases in leaves; O₂ increases.
  - In C₃ plants, O₂ competes with CO₂ for the active site of rubisco.
  - Called "photorespiration" since oxygen is taken up and CO₂ is produced.
  - No sugar or ATP is produced.
  - Relic of evolution when O₂ was in short supply.

**SYI-3.A Explain the connection between variation in the number and types of molecules within cells to the ability of the organism to survive and/or reproduce in different environments.**

- Different types of hemoglobin maximize oxygen absorption in organisms at different developmental stages.

**ENDURING UNDERSTANDING**

SYI-3 Naturally occurring diversity among and between components within biological systems affects interactions with the environment.
C₄ Plants
- Sugarcane, Corn, Grasses
- Fix CO₂ by first forming a C₄ molecule
- Shuttle C₄ into Bundle sheath cells
- CO₂ is released and used in Calvin Cycle.
- In hot, dry climates, net photosynthetic rate of C₄ plants (e.g., corn) is 2-3 times that of C₃ plants.

CAM (crassulacean-acid metabolism) Plants
- Succulent desert plants, cacti, pineapple
- CAM plants open stomates only at night
- Store CO₂ as aC₄ molecule
- Released during the day in Calvin Cycle