

TOTALLY
AWESOME
SCIENCE



PROMISE

EQUIPMENT

LENDING

LIBRARY

SANFORD[®]
RESEARCH



EQUIPMENT

SCIENCE WITHIN REACH

Sanford Research created the equipment lending library to put real-world science equipment in the hands of students. We believe careers in science and research should be accessible to every student, so we're sharing resources with classrooms across the region.

The library has over \$40,000 of equipment and supplies available to classrooms. Educators at institutions across the region can access the technology housed in the Sanford PROMISE Community Lab at no charge.

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VERNIER & PROBES



LabQuest 2

LabQuest 2 is used in conjunction with Vernier probes for data collection.



Vernier Labpro Interface

The Labpro Interface is helpful for connecting Vernier probes to computers.



Exercise Heart Rate Monitor

This chest strap monitor is used for monitoring heart rate before, during, and after exercise or while a person is stationary. Data is transmitted via bluetooth.



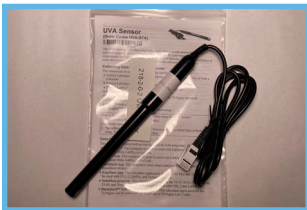
25-g Accelerometer

Use this to study large, one-dimensional accelerations.



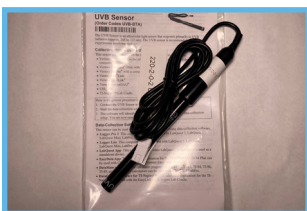
Colorimeters

Use this to study changes in concentration.



UVA Sensors

This is an ultraviolet light sensor that responds to UVA radiation.



UVB Sensors

This is an ultraviolet light sensor that responds to UVB radiation.

EQUIPMENT LENDING LIBRARY

VERNIER & PROBES



Radiation Monitor

The radiation monitor detects alpha, beta, gamma, and X-ray radiation.



Oxygen Gas Sensor

The O₂ Gas Sensor measures oxygen concentration in air, 0-271 ppt.



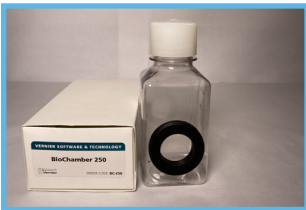
Carbon Dioxide Gas Sensor

The CO₂ Gas Sensor measures oxygen concentration in air, 0-271 ppt.



Dissolved Oxygen Probe

Use the Dissolved Oxygen Probe to determine the concentration of oxygen in aqueous solutions.



BioChamber 250

A chamber with two ports for conducting experiments with two gas probes.



Conductivity Probe

Determines the ionic content of an aqueous solution.



Stainless Steel Temp Probe

General-purpose temperature sensor that can be used in organic liquids, salt solutions, acids, and bases.

VERNIER & PROBES



Surface Temp Probe

The Surface Temperature Sensor is designed for use in situations in which low thermal mass or flexibility is required.



Digital Multimeter

Use this to measure current, voltage, and resistance.



Light Sensors

The Light Sensor can be used for measurements of light intensity in a variety of situations.



EKG Sensors

The EKG Sensor measures cardiac electrical potential waveforms (voltages produced during the contraction of the heart).



Hand-Grip Heart Rate Monitor

The Hand-Grip Heart Rate Monitor is ideal for continuously monitoring heart rate before, during, and after exercise or while a person is stationary.



Spirometers

The Spirometer can be used to make human respiratory measurements at rest and during moderate activity.



Hand Dynamometers

This can be used to measure grip strength, pinch strength, and muscle fatigue.

EQUIPMENT LENDING LIBRARY

VERNIER & PROBES



Gas Pressure Sensor

The Gas Pressure Sensor can be used to monitor pressure changes in a gas (0-2.1 atm).



Blood Pressure Sensors

The Blood Pressure Sensor is a non-invasive sensor designed to measure human blood pressure.



Respiration Monitor Belt

The Respiration Monitor Belt is used to measure human respiration rates. It is used with a Gas Pressure Sensor.



Force Plates

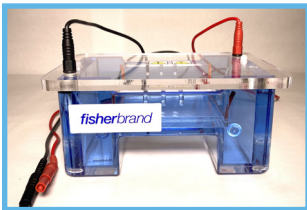
This is designed to collect data on forces such as stepping and jumping.

DNA & PROTEIN ANALYSIS



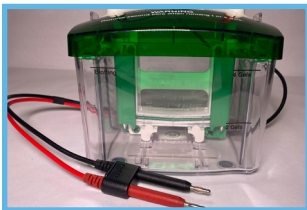
Thermocycler

Use this to amplify DNA samples (PCR).



Electrophoresis Chamber

Electrophoresis chambers are used for analyzing DNA fragments after PCR.



Protein Electrophoresis Chamber

Use this for analyzing proteins.



Gel Imager

A gel imager is used to illuminate a gel and visualize DNA after electrophoresis.



Power Supply

This provides the power for electrophoresis chambers.

MICROSCOPY



Dissecting Microscope

This is useful for 20x and 40x magnification observation of samples.



GoDigital Microscope Cam

This is useful for photographing a subject under a microscope.



Celestron TetraView Microscope

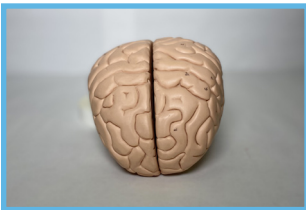
This is a microscope with a built in LCD screen capable of 40x to 400x magnification.

MODELS & ACTIVITIES



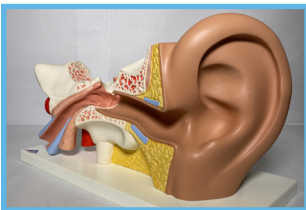
Heart

Heart model displays all major parts of the heart making examination of structures easier.



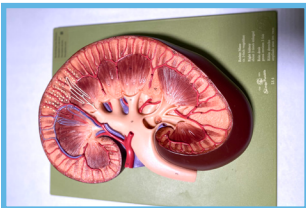
Brain

Brain model displays all major parts of the brain making examination of structures easier.



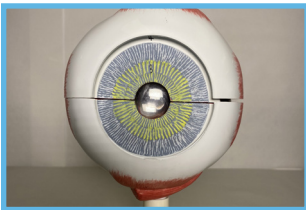
Ear

Ear model displays all major parts of the ear making examination of structures easier.



Kidney

Kidney model displays all major parts of the kidney making examination of structures easier.



Eye

Eye model displays all major parts of the eye making examination of structures easier, outer parts can be removed to examine internal structures.



Skull

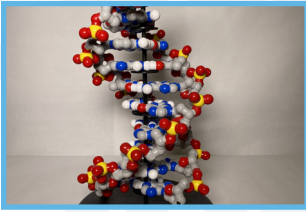
Skull model displays all major parts of the skull making examination of structures easier.



Lungs

Lungs model displays all major parts of the lungs making examination of structures easier.

MODELS & ACTIVITIES



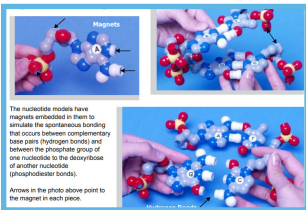
DNA

DNA model displays nucleotides and sugar phosphate backbone making examination easier.



Cell

Cell model displays general layout and major organelles in a mammalian cell.



3D DNA Discovery Kit

This is a magnetic modeling kit that allows students to build DNA and discover its unique structure.



Escape the Cell

A fun escape room challenge that brings students together to unlock the cell. Suggested for use as a review after learning about cell organelles. Grades 7-12

SLIDES

Onion Root-Tip Mitosis

This is useful for showing students cells undergoing mitosis.

Human Skin Cross Section

This allows you to visualize the different layers of skin.

Spirilla Flagella

Microscope slide is of the bacterium *Spirillum volutans*.

Coccus Smear Gram+

This slide is excellent for studying the characteristic size and spherical shape of coccus bacteria.

Bacillus Smear Gram+

This slide is excellent for studying rod shaped *Bacillus* morphology.

Compact Bone Ground

The cross-sectional view allows students to easily view the osteons, or the Haversian systems.

Spongy Bone Section

Students can explore the structure of spongy bone, also called cancellous or trabecular bone, the lamellar matrix and osteocytes are easily identified.

Escherichia Coli Gram-

This slide shows gram negative *E. Coli* bacteria, ideal for discussion about pathogenic vs non-pathogenic bacteria.

Blood Smear WR

This slide shows the three major functional classes: red cells, white cells, and platelets.

Blood Comparison Forensic

The kit contains a set of 11 prepared microscope slides, including several different mammalian sperm specimens, male and female human chromosomes, female squamous epithelial with Barr bodies, male squamous epithelial without barr bodies and an assortment of blood samples.

Mammalian Cells

Collection of the following: Squamous epithelium, Fibrous connective tissue, Adipose tissue of mammal, Hyaline cartilage of calf, Compact bone of cow, Striated muscles of cat, Smooth muscles of cat, Blood smear of human, Artery of cat or rabbit, Kidney of cat, Liver of pig, Small intestine of cat or rabbit, Stomach of cat, Tongue of cat, Pancreas of pig, Lung of cat, Vein of cat or rabbit, Scalp human, Motor nerve cells, Nerve fibers, Spinal cord of cat, Cerebellum of cat, Testis of mouse, Ovary of rabbit

Accu-Scope Prepared Slide Specimen

Collection of the following: Stem of dicotyledon, Epidermis broad bean leaf showing stomata, Paramecium, Leaf of dicotyledon, Pine needle, Lung, Liver, Mouth of mosquito, Blood smear (human), Squamous epithelium, House fly legs, Root of monocotyledon, Wing of house fly, Fish scale, Leaf of cotton, Nerve cell, Daphnia, Connective tissue

EQUIPMENT

HEATERS



Isotemp Hot Plate and Stirrer

This simultaneously heats and stirs solutions.



Isotemp Heat Block

This is used to evenly heat liquids in 1.5mL tubes.



Hot Water Bath

This is used to heat liquids in different sized containers.



Incubator

Insulated enclosure in which temperature, humidity and other environmental conditions can be regulated.

PIPETTES



Micro Pipettes

These are useful for making precise measurements of liquids in molecular biology.

Sizes available: 0.2-2 ul; 2-20 ul; 20-200 ul; 100-1,000ul

CENTRIFUGE & MIXER



Mini Centrifuge

This can centrifuge 8 samples at up to 2,000 x g.



Micro Centrifuge

This can centrifuge 24 samples at up to 17,000 x g.



Vortex Mixer

This is used to rapidly mix liquids.

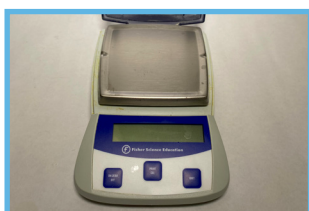
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SCALES



Digital Scale (0.01g readability)

This is used for making precise measurements of solids in grams. More precise than the 0.1g readability scale.



Digital Scale (0.1g readability)

This is used for making precise measurements of solids in grams.

EQUIPMENT LENDING LIBRARY

PACKAGED LESSON:

LI-FRAUMENI SYNDROME: P53 MUTATION

GRADE LEVEL: 7-12 LIFE SCIENCE

ABOUT THE LESSON

Students will learn about different causes of cancer. Viruses, environmental factors, and genetics can cause cancer. Cancer can be inherited through a germline mutation or acquired through a somatic mutation. One of these inherited cancers is Li-Fraumeni syndrome, in which the P53 tumor suppressor gene is “turned off.” In this investigation, students will be presented with the case of Valerie Brown, who has breast cancer. The students will determine whether her cancer is located only in the breast or if she has a germline mutation that will cause her to have other types of cancer.

PERFORMANCE EXPECTATION ALIGNMENT

HS-LS3-2 Make and defend a claim based on evidence that inheritable genetic variations may result from new genetic combinations through meiosis, viable errors occurring during replication and/or mutations caused by environmental factors.

CLASS TIME REQUIRED

3 - 50 Minute class periods

Day 1: Discuss DNA mutations and complete the patient pedigree

Day 2: Complete DNA electrophoresis

Day 3: Analyze DNA results and draw a conclusion for the patient

LESSON MATERIALS INCLUDED WITH PACKAGE

- PowerPoint Presentation
- Student Worksheet
- Facilitator Guide

Li-Fraumeni Syndrome: P53 Mutation

Grades 7-12



MATERIALS REQUIRED

- Electrophoresis Chamber (1 for every 4 students)
- Electrophoresis Power Supply
- 6 Well Combs for gels
- UV light supply
- Micropipettes
- Micropipette tips
- Optional: Latex Gloves, Erlenmeyer Flasks, Scale, Hot Plate

REAGENTS REQUIRED

- TAE buffer
- Agarose
- Gel Red
- Control DNA
- Patient Blood Sample
- Patient Tumor Sample
- Patient Healthy Breast Sample
- DNA ladder

PACKAGED LESSON:

PTC GENETICS: TESTING GENOTYPES AND PHENOTYPES

GRADE LEVEL: 9-12 BIOLOGY/ANATOMY

ABOUT THE LESSON

PTC is a chemical that is tasted by about 75% of the population. The TAS2R38 gene is responsible for the proteins needed to taste PTC. This experiment allows students to determine their genotype through electrophoresis as well as their phenotype by tasting PTC.

PERFORMANCE EXPECTATION ALIGNMENT

HS-LS3-1 Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

CLASS TIME REQUIRED

4 - 50 Minute class periods

Day 1: Taste PTC paper, isolate DNA, get samples into the thermocycler

Day 2: Add restriction enzyme, complete restriction enzyme activity

Day 3: Analyze DNA through electrophoresis

Day 4: Analyze DNA results and complete punnett square activity

LESSON MATERIALS INCLUDED WITH PACKAGE

- PowerPoint Presentation
- Student Guide
- Facilitator Guide
- Restriction Enzyme Activity

PTC Genetics: Testing genotypes and phenotypes Grades 9–12



MATERIALS REQUIRED

- Electrophoresis Chamber (1 for every 5 students)
- Electrophoresis Power Supply
- 10 Well Gel Combs
- Centrifuge
- PTC tasting paper and control paper
- Thermocycler
- Vortex
- Heat Block
- UV light Source
- Micropipettes
- Micropipette tips
- Microcentrifuge tubes
- PCR tubes
- Optional: Latex Gloves, Erlenmeyer Flasks, Scale, Hot Plate

REAGENTS REQUIRED

- TAE Buffer
- Agarose
- Chelex
- PCR master mix
- HaeIII restriction enzyme
- Gel Red
- DNA ladder

PACKAGED LESSON:

DIAGNOSING SMITH-LEMLI-OPTIZ

GRADE LEVEL: 9-12 BIOLOGY/ANATOMY

ABOUT THE LESSON

Students will investigate and diagnose patients with Smith-Lemli-Opitz Syndrome (SLOS). SLOS is a rare disease that results from a missing enzyme in the cholesterol synthesis pathway. This lesson includes genetic analysis of patient DNA to determine their genotypic status related to SLOS. It also includes a few activities to help students understand the processes involved in the disease.

PERFORMANCE EXPECTATION ALIGNMENT

HS-LS1-1 Construct an explanation based on evidence for how the structure of DNA determines the structure or proteins, which carry out the essential functions of life through systems of specialized cells.

CLASS TIME REQUIRED

3 - 50 Minute class periods

Day 1: Present patient case study and get patient samples into the thermocycler

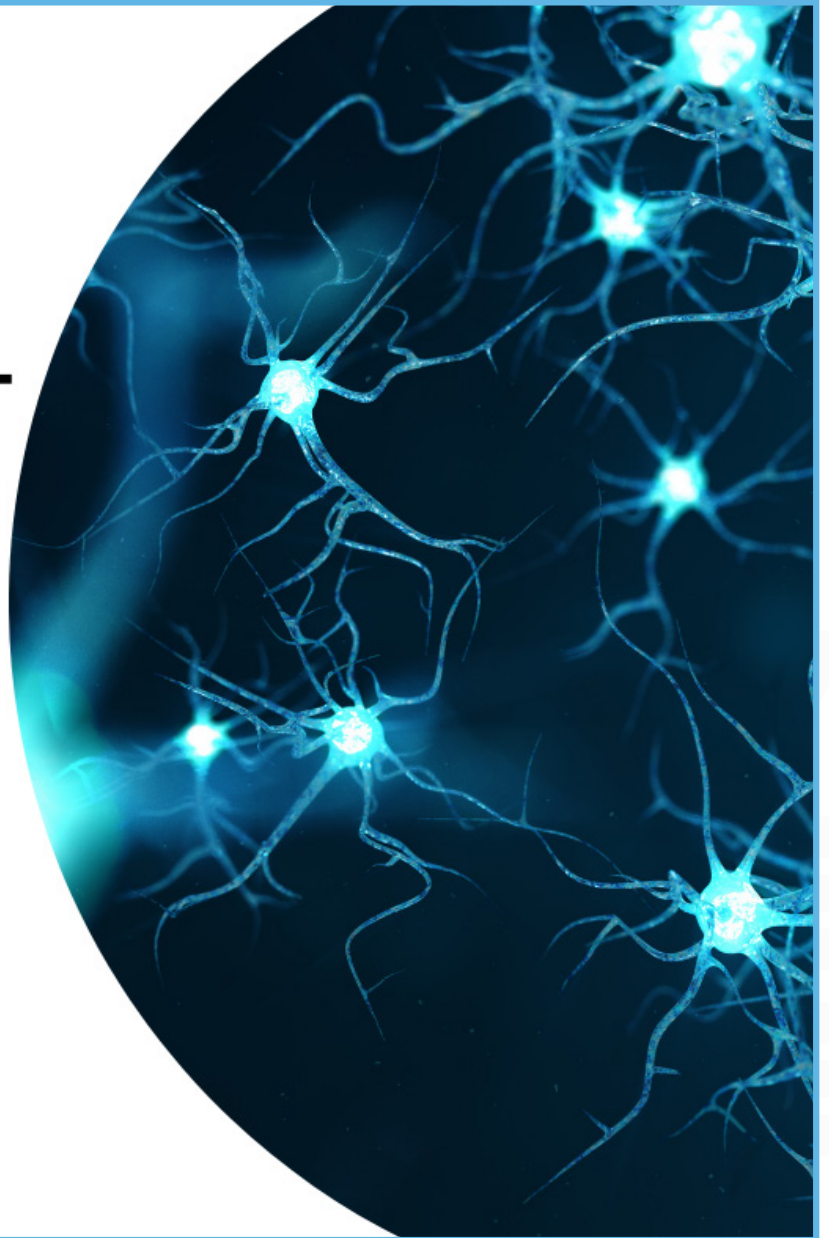
Day 2: Generate family history and load gel electrophoresis

Day 3: Analyze DNA results and draw conclusion for the patient's family

LESSON MATERIALS INCLUDED WITH PACKAGE

- PowerPoint Presentation
- Student Lab Notebook
- Facilitator Guide
- Cholesterol Synthesis Activity

Diagnosing Smith-Lemli- Opitz Syndrome Grades 9-12



MATERIALS REQUIRED

- Electrophoresis Chamber (1 for every 4 students)
- Electrophoresis Power Supply
- 6 Well Combs for gels
- Centrifuge
- Thermocycler (Contains run program for SLOS)
- Vortex
- UV light source
- Micropipettes
- Pipette tips
- PCR microtubes
- Optional: Latex Gloves, Erlenmeyer Flasks, Scale, Hot Plate

REAGENTS REQUIRED

- TAE buffer
- Agarose
- PCR master Mix
- Patient samples 1-5
- GelRed
- DNA ladder

PACKAGED LESSON: **ESCAPE THE CELL ACTIVITY BOX**

GRADE LEVEL: 7-12 LIFE SCIENCE

ABOUT THE LESSON

This activity box includes six boxes that are locked using four different combination locks. There are four puzzles that contain the clues to unlocking the combination locks. The theme of this activity box is cells. It includes information about organelles, cell transport, and cell vocabulary. Each student puzzle box contains a key which will open one padlock on the teacher box. The teacher box can be filled with anything the teacher wants. Once all six student boxes have been solved, the class can open the teacher box and “escape the cell.”

PERFORMANCE EXPECTATION ALIGNMENT

MS-LS1-2 Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.

CLASS TIME REQUIRED

1 - 50 Minute class period

LESSON MATERIALS INCLUDED WITH PACKAGE

- Facilitator Guide
- Answer Key
- 6 Student Puzzles

Escape The Cell Activity Box

Grades 7-12



MATERIALS REQUIRED

- 6 boxes locked with 4 combination locks
- 6 sets of clues with a dry erase marker for solving the puzzles
- Master box with 6 padlocks

