Scouting America

Test Lab - Physics Merit Badge Workbook

SCOUTMASTER BUCKY

Test Lab – Physics Patches are 1-1/2 inch in size and are available for $3.25 each (plus shipping) through Scoutmaster Bucky. Email for information: ScoutmasterBucky@yahoo.com

Scouts participating in a Scoutmaster Bucky Scouts BSA Test Lab merit badge opportunity, whether online or in person, should consider using the Physics Test Lab class preparation pages for clarifications, insights, and expectations.

https://scoutmasterbucky.com/merit-badges/physics-tl/physics-tl-cpp.pdf

THE TEST LAB FOR THE AUCTIONEERING MERIT BADGE IS EFFECTIVE UNTIL OCTOBER 2026. AT THAT TIME, THESE REQUIREMENTS WILL DISAPPEAR AND THE SURVEYS WILL BE CLOSED. CLICK HERE TO GO TO SURVEY

REQUIREMENT 7 REQUIRES COUNSELOR APPROVAL.

REQUIREMENT 8a REQUIRES PARENT / GUARDIAN PERMISSION.

REQUIREMENT 1: Before conducting any experiments, explain to your counselor the safety precautions and personal protective equipment necessary for working with physics-related equipment.

Notes:

REQUIREMENT 2:	Define physics in your own words.
Notes:	

REQUIREMENT 2:	Discuss with your counselor various areas of physics.
Notes:	

REQUIREMENT 3:	Explain these key physics concepts: force, motion, energy, and waves. Provide real-world examples demonstrating each principle.
FORCE:	
Principle Defined:	
Example of this Principle:	

MOTION:
Principle Defined:
Example of this Principle:
ENERGY:
Principle Defined:
Example of this Principle:
WAVES:
Principle Defined:
Example of this Principle:

REQUIREMENT 4:	Conduct THREE physics experiments, selecting from the following options. Each experiment must include: a hypothesis, materials used, safety precautions, observations, and conclusions based on results. Explain how each experiment demonstrates key physics principles. For each experiment, be sure to try variations/variables to test your hypothesis. **Option A: Newton's Laws in Action: Balloon-Powered Car.** Make and test a balloon-powered car to show how force and motion interact. **Option B: Momentum: Stacked Ball Drop.** Drop different-sized stacked balls to show momentum. **Option C: Centrifugal Force.** Make spinning toys to demonstrate centrifugal force. **Option D: Centripetal Force.** Swing a water bucket or tray filled with water glasses to demonstrate centripetal force. **Option E: Balance.** Explore center of gravity, inertia, and harmonic motion using a Tweety Bopper. **Option F: Visualize Sound.** Visualize Chladni patterns using a tonoscope. **Option G: Cartesian Diver.** Demonstrate buoyancy and the ideal gas law with Cartesian divers. **Option H: Air Pressure: Bernoulli's principle and the Coandă Effect.** Balance different objects in a stream of air. **Option I: Electromagnet.** Make an electromagnet and explore how to increase its strength.

PHYSICS EXCPERIMENT #1:

Notes:

PHYSICS EXCPERIMENT #2:
Notes:

PHYSICS EXCPERIMENT #3:
Notes:

REQUIREMENT 5a:	**Physics in Everyday Life.** Describe FIVE ways physics is applied in daily life, such as in transportation, sports, or household appliances.
WAY #1:	
Notes:	
WAY #2:	
Notes:	
WAY #3:	
Notes:	
WAY #4:	
Notes:	

WAY #5:
Notes:

REQUIREMENT 5b:	**Physics in Space Exploration.** Describe how physics is used in space travel, satellite technology, or planetary exploration.

Space Travel:
Satellite Technology:
Planetary Exploration:

REQUIREMENT 5c:	**Physics in the Environment.** Explain how physics contributes to renewable energy, climate science, or environmental conservation.

Renewable Energy:

Climate Science:

Environmental Conservation:

REQUIREMENT 5d:	**Physics in Scouting.** Explain how physics is found in Scouting, such as knot tying, fire building, cooking, or pioneering.
Knot Tying:	
Fire Building:	
Cooking:	
Pioneering:	

REQUIREMENT 6:	**The Future of Physics.** Physicists try to explain the universe and apply these concepts to novel technologies. Discuss one option with your counselor: **Option A: Unsolved Mysteries of Physics.** Discuss the following with your counselor: a. **Dark Matter & Dark Energy.** Scientists know it exists—but what is it? b. **Black Holes & Wormholes.** Can we harness their energy or travel through them? **Option B: Quantum Mechanics & Computing.** Discuss the following with your counselor: a. **Quantum Computers.** How can super fast computers be made of atoms instead of microchips? b. **Quantum Entanglement.** Can we communicate instantly across space? **Option C: Space Exploration & Astrophysics.** Discuss the following with your counselor: a. **Colonizing Mars.** How can physics help humans live on other planets? b. **Interstellar Travel.** Can we reach other stars with warp drives or solar sails? **Option D: Advanced Theories & Future Discoveries.** Discuss the following with your counselor: a. **Time Travel.** Is it possible under extreme conditions? b. **Artificial Gravity.** Can we create Earth-like gravity in space stations.
Notes:	

REQUIREMENT 7:	**Engineering and Physics Challenge.** Solve a simple engineering problem using physics-based reasoning. Define the problem, allowable materials, and safety constraints. You may enlist friends or family in completing your challenge. All plans must be approved in advance by your counselor. Do ONE of the following options: **Option A: Fastest Pinewood Derby Car.** Build pinewood derby cars using physics principles to get the fastest time on the track. **Option B: Rube Goldberg Machine.** Build a machine using household materials to perform a simple task. You can use examples of tasks from the annual Rube Goldberg competition, or you can create your own task: **Option C: Egg Drop Challenge.** Explore the physics of energy and momentum by building a structure using household materials to prevent an egg from breaking when dropped from a significant height. The location of the egg drop must be approved by your counselor. **Option D: Water Bottle Rockets.** Explore propulsion and Newton's Third Law. The challenge is to land an air pressured rocket, using water as a propellant, exactly at a specific distance (for example, 70 m) from launch point, three times, with extra points for flight duration. **Option E: Design your Own Physics Challenge.** Create a physics challenge with your counselor's approval.

COUNSELOR APPROVAL: IS REQUIRED.

Counselor's Name	Phone or Email
Counselor's Signature	Date ☐ *approved*

Notes:

DO ONE OF THE FOLLOWING (8A or 8B) FOR REQUIREMENT 8

REQUIREMENT 8a:	Explore careers related to this badge. Research one career to learn about the training and education needed, costs, job prospects, salary, job duties, and career advancement. Your research methods may include — with your parent or guardian's permission — an internet or library search, an interview with a professional in the field, or a visit to a location where people in this career work.

PARENT/GUARDIAN PERMISSION: IS REQUIRED.

Parent's / Guardian's Name _____ Phone or Email _____

Parent's / Guardian's Signature _____ Date _____ ☐ *permission*

Selected Career Opportunity:

Training Requirements:

Education Requirements:

Cost Requirements:

Job Prospects:
Salary:
Job Duties:
Career Advancement:
REQUIREMENT 8a: Discuss with your counselor what about this profession might make it an interesting career.
Notes:

REQUIREMENT 8b:	Explore how you could use knowledge and skills from this badge to pursue a hobby or healthy lifestyle.
Notes:	
REQUIREMENT 8b:	Research any training needed, expenses, and organizations that promote or support it.
Training:	
Expenses:	
Organizations:	
REQUIREMENT 8b:	Discuss with your counselor what short-term and long-term goals you might have if you pursued this.
Notes:	
REQUIREMENT 9:	Complete the survey to complete the test lab requirements. Click here

You will need to complete the survey and follow its instructions in order to gain credit for completing this Test Lab Merit Badge