PHYSICS WORKS! ARCADE

Simulator Guide · November 2026

Cumulative manual · five interactive experiments · online and offline use

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General instructions

Open each HTML file in a modern browser, even without an internet connection. Select IT or EN in the header; no additional download is needed. Explore freely, predict an outcome, then measure and compare. The license is available from the footer even offline. Distributed files may contain obfuscated JavaScript, which does not guarantee protection against source recovery. Permission is required for redistribution or republication.

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1. PARABOLIC! — v19

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Projectile motion in an apparatus inspired by the PSSC laboratory.

Exploration procedure

1. Set the release height and place the moving screen at x = 0 cm.
2. Press LAUNCH for the first calibration impact: the Cartesian origin is established.
3. Move the screen and launch again; the log records distance, vertical displacement and times from photogates A and B.
4. Compare the ideal model with simulated losses and enable the trajectory or theory only when needed.
5. Export measurements as CSV for further analysis.

Questions to investigate

How does release height affect the outcome? How does the vertical drop depend on screen distance?

Note: this is an educational model, not a physical apparatus. Interpret data and modelling assumptions carefully.

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2. PENDULUM! — v9

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Simple-pendulum oscillations with timing measurements and synchronized graphs.

Exploration procedure

1. Set string length, release angle, mass and gravitational acceleration.
2. Press START; crossings through the centre in the same direction are used to estimate the mean period.
3. Record measurements while varying one parameter at a time.
4. Choose angle, angular velocity, angular acceleration, normalized comparison or three synchronized graphs.
5. Use the time cursor to review earlier positions without interrupting the ongoing motion calculation.

Questions to investigate

Which variables have the strongest effect on the period? What changes at large angles or with damping?

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3. LASER! — v5

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A virtual optical bench for diffraction and interference.

Exploration procedure

1. Choose a single- or double-slit aperture.
2. Adjust wavelength, slit width, separation, laser intensity and screen distance.
3. Observe the light pattern and intensity profile.
4. Move the pointer over the graph to read position and relative intensity; FREEZE allows comparisons.
5. The apparatus uses an ideal coherent-light model in the Fraunhofer approximation.

Questions to investigate

Which parameter controls the envelope width? What changes the spacing of interference maxima?

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4. MILLIKAN! — v11

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An oil-drop investigation into electric-charge quantization.

Exploration procedure

1. Start with the electric field off and observe the droplet using the calibrated microscope eyepiece.
2. Mark positions A and B at different times to measure mean velocity during descent.
3. Record terminal falling velocity and use Stokes’ model to infer the radius.
4. Adjust voltage to achieve equilibrium and record the corresponding potential difference.
5. Repeat with multiple droplets, comparing measured charges to identify a common fundamental value.

Questions to investigate

How can a hidden property be inferred from observable measurements? Why use multiple droplets?

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5. ROTAIA! — v4.1

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Virtual laboratory for kinematics, dynamics, collisions and experimental measurements.

Exploration procedure

1. Open COMPLETE to display all controls, or MODULES to choose Kinematics, Dynamics or Collisions.
2. Set track length, slope, mass, initial speed, and air, magnetic or conventional support.
3. For dynamics, connect the string, pulley and hanging mass; adjust tabletop height, weight height and hatch.
4. For collisions, enable the second cart, select the interaction type and optionally attach flag B.
5. Move photogates F1 and F2, record beam-interruption times and interpret the measurements.
6. Use graphs and frame-by-frame controls. In the advanced lab, repeat measurements, set instrument resolution, study uncertainty and export CSV files.

Questions to investigate

How are beam-interruption times related to speed? How do momentum and kinetic energy compare before and after a collision? How does instrument resolution affect measurement?

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