Physical Science: Physics

Name _____ Date _____

SESSION 1

Two force curves, one change in motion

A padded cart and a rigid cart carry the same mass and strike identical barriers at the same speed. For a simplified comparison, force pulses are rectangular: 120 N for 0.06 s and 240 N for 0.03 s. Compare impulses and peak forces. Explain what this model predicts about padding.

Pulse	Force (N)	Time (s)
Long	120	0.06
Short	240	0.03

Start here if you were away. Calculate the area under each force-time pulse.

SESSION 2

Where the energy went

A cart starts with 4 J of gravitational potential energy and zero kinetic energy. At the bottom it has 3.2 J of kinetic energy and zero gravitational potential energy using that reference. Account for the difference and propose a measurement that would test your explanation.

Start here if you were away. Draw an energy account before and after. Include the track and surroundings.

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SESSION 3

Use evidence from a wave

Two sound pulses travel through the same air. Pulse A has frequency 500 Hz and pulse B has 1000 Hz. Take sound speed as 340 m/s. Compare wavelengths. If B is louder, what extra measurement is needed to connect loudness to its wave?

Start here if you were away. Write v = fλ and keep the speed fixed.

SESSION 4

Test a lens claim

A converging lens makes a sharp real image of a 4 cm arrow on a screen. Object distance is 30 cm and image distance 15 cm. Calculate magnification magnitude and image height. State its orientation and one observation that distinguishes a real image from a virtual one.

Start here if you were away. Use magnification magnitude = image distance / object distance.

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SESSION 5

Read electrical power as evidence

A device operates at 6 V drawing 0.50 A for 20 s. A revised design uses 6 V and 0.35 A for the same time. Calculate the energy delivered to each. Can you conclude that the revision is more efficient? Explain what else to measure.

Start here if you were away. Find power VI, then multiply by time.

SESSION 6

Choose a design under two constraints

Two landing-pad models must keep peak force below 200 N and stop a cart within 0.08 s. A has a triangular force pulse, peak 180 N and duration 0.08 s. B has a triangular pulse, peak 240 N and duration 0.06 s. Each trial requires a 7.2 N·s impulse. Which design meets all constraints? Identify a needed repeat trial.

Start here if you were away. For a triangular pulse, area is one-half times base times height.