Alpha School

Physics Lab

Practice Worksheet

Aligned with Experiments 1-11: motion, friction, energy, density, sound, circuits, and magnetism. Show units in every calculation.

Name: _____ Date: _____

Grade: _____ Score: _____ / _____

1. SAFETY. Multiple choice. A glass beaker breaks on the bench. You should:
A) Pick up the pieces with bare hands B) Tell the teacher and use a dustpan/brush C) Leave it for someone else D) Sweep it into the sink

2. HYPOTHESIS. A student wonders whether a longer pendulum string swings more slowly. Write a hypothesis in "If... then... because..." form.

3. VARIABLES. In the paper-airplane experiment, one student changes the wing size and measures how far each plane flies. Name the independent variable, the dependent variable, and TWO variables to keep the same (controls).

4. DATA. A pendulum is timed for 10 swings. Compute the period (time for ONE swing) for each length: period = total time / 10.

String len		
20	9.0	
40	12.6	
60	15.5	
80	17.9	

5. GRAPH. A distance-time graph for a rolling ball is a straight line going up. What does the straight line tell you about the ball's speed? What would a flat (horizontal) line mean?

6. FRICTION. A block slides down a ramp onto three surfaces: smooth wood, carpet, sandpaper. Predict the order from farthest slide to shortest slide, and explain why.

7. ENERGY. A bouncing ball drops from 100 cm and bounces back to 70 cm. Where did the missing energy go? Name two places it went.

8. DENSITY. An object has mass 60 g. Placed in water, the water level rises by 25 mL (so volume = 25 cm^3). Compute density = mass / volume. Will it float or sink in water (density 1 g/cm^3)?

9. NEWTON'S THIRD LAW. A balloon rocket zooms across the room as air rushes out the back. Explain the action and the reaction in this experiment.

10. MOMENTUM. A moving marble hits a still marble of the same mass head-on. Predict what happens to each marble, and name the law this shows.

11. SOUND. A ruler sticks out over a desk edge. Flicking it makes a note. If you shorten the part sticking out, does the pitch get higher or lower? Explain.

12. SOUND. In the string-telephone experiment, why does the telephone work much better when the string is pulled tight than when it hangs loose?

13. CIRCUITS. A circuit has a battery, a bulb, and a switch in a loop. (a) What happens when the switch is open? (b) Name one thing that could make the bulb brighter.

14. MAGNETISM. A homemade compass needle points north. Explain why, in your own words, using Earth's magnetic field.

15. MEASUREMENT. A student measures a pencil as 15.2 cm with a ruler marked every 0.1 cm. How many significant figures should be reported, and why can't the student claim 15.234 cm?

16. DESIGN. Design a fair test: does ramp height change how far a toy car rolls? Write your question, hypothesis, variables, and 3 steps.

17. DATA ANALYSIS. A toy car rolls these distances from different ramp heights: 10 cm -> 40 cm; 20 cm -> 78 cm; 30 cm -> 121 cm. Describe the trend in one sentence, and predict the distance for a 40 cm ramp.

18. Explain in your own words: what makes an experiment a FAIR TEST? Give one example of an unfair test and how to fix it.

ANSWER KEY -- For Teacher/Parent Use

1. B) Tell the teacher and use a dustpan/brush. Never pick up broken glass with bare hands.

2. Example: If the string is longer, then the period will be longer, because the pendulum has farther to swing on each trip. Accept any well-formed If/then/because hypothesis.

3. Independent: wing size. Dependent: distance flown. Controls (any two): same paper, same throw force, same thrower, same launch height, no wind.

4. Periods: 0.90 s, 1.26 s, 1.55 s, 1.79 s. Longer string -> longer period.

5. Straight rising line: constant (steady) speed -- equal distance in equal time. Flat line: the object is stopped (distance not changing).

6. Farthest: smooth wood; then carpet; shortest: sandpaper. More friction/roughness grips the block and slows it sooner.

7. Energy is not lost; it changes form -- into heat (warming the ball and floor), sound, and slight squashing/deformation of the ball.

8. Density = 60 / 25 = 2.4 g/cm^3. Greater than water's 1 g/cm^3, so it sinks.

9. Action: air rushes out the back of the balloon. Reaction: the balloon (rocket) is pushed forward. Equal and opposite forces.

10. The moving marble nearly stops; the still marble moves off at about the first marble's speed. This shows conservation of momentum.

11. Higher pitch. A shorter vibrating length vibrates faster (higher frequency), and higher frequency means higher pitch.

12. A tight string carries vibrations well from cup to cup; a loose string absorbs/damps the vibrations so little sound reaches the other end.

13. (a) Open switch breaks the loop, so no current flows and the bulb stays off. (b) A stronger battery (more voltage), fewer bulbs, or shorter/thicker wires.

14. Earth acts like a giant magnet. The needle is a small magnet, and its north-seeking end is pulled toward Earth's magnetic south near the geographic North Pole, so it lines up north-south.

15. 3 significant figures (15.2 cm). The ruler only reads to 0.1 cm, so the thousandths digits are guesses, not measurements.

16. Rubric: clear question; hypothesis in If/then form; IV = ramp height, DV = roll distance, controls = same car, same ramp surface, same release method; steps describe changing only height and measuring distance fairly (e.g. 3 trials each).

17. Trend: as ramp height increases, roll distance increases (roughly proportionally). Prediction for 40 cm: about 160 cm (accept 150-170 cm with reasoning from the pattern).

18. Rubric: a fair test changes only ONE variable and keeps everything else the same, with repeats. Example of unfair: changing both ramp height and car at once -- fix by changing only one at a time.