AP-C

Mechanics
Kinematics
Inertial Mass Lab

Name _____

Teacher _____

Period _____

Background

1. What is mass?

2. How are mass and inertia related?

3. How many oscillations/vibrations are there between points A and B on the graph to the right?

A car drives at a constant speed of 60 mph.

4. Write a general relationship between distance and time. A general equation is one that expresses a relationship using only variables in the box to the right.

General Relationship

5. Derive an empirical relationship between distance and time. An empirical equation is one that uses variables and numerical constants

Empirical Relationship

Do not write below this line.

Purpose – Determine the mass of an unknown object using an inertial balance.

Materials – computer, Logger Pro, motion detector, inertial balance and mass set

Background – http://hyperphysics.phy-astr.gsu.edu/hbase/mass.html#mas

Procedure – Calculate the period of oscillation for 10 known masses. Masses range in value between zero (empty tray) and 500 grams.

Data – Record data in a self-generated Excel spreadsheet.

Analysis – Either generate an Excel graph or use the one available on GravityKills to determine a relationship between period and mass.

Record your general and empirical equations in the boxes below.

General Equation A mathematical formula that expresses all constants and variables symbolicly.	Empirical Equation Replace the constants in the general equation with values specific to the collected data.

Self Check – Test your relationship by measuring the mass of unknown objects: keys, phone, wallet, etc.

Performance Assessment

Each lab member will have 10 minutes to measure the mass of an unknown object. You may use this lab print out (workbook), self-generated graphs and a four-function (non graphing) calculator to assist you in completing the assessment. All materials used while completing the assessment will be collected. Your teacher will provide you with a four-function calculator if needed.

Do not write below this line until the time of your performance assessment.

Score Card

Name _____

Period _____

Unknown Sample Number _____

Time Penalty – YES / NO
(10 point deduction)

Mass (experimental)
(round to the ones place)

Percent Difference
- 0-2% = 100 points
- 2%-5% = 90 points
- 5%-10% = 80 points
- 10%-15% = 70 points
- >15% = 50 points

SCORE

Inertial Mass
TEKS/Objectives

Introduction TEKS

(1) Physics. In Physics, students conduct laboratory and field investigations, use scientific methods during investigations, and make informed decisions using critical thinking and scientific problem solving. Students study a variety of topics that include: laws of motion; changes within physical systems and conservation of energy and momentum; forces; thermodynamics; characteristics and behavior of waves; and atomic, nuclear, and quantum physics. Students who successfully complete Physics will acquire factual knowledge within a conceptual framework, practice experimental design and interpretation, work collaboratively with colleagues, and develop critical thinking skills.

Knowledge and Skills TEKS

(1) Scientific processes. The student conducts investigations, for at least 40% of instructional time, using safe, environmentally appropriate, and ethical practices. These investigations must involve actively obtaining and analyzing data with physical equipment, but may also involve experimentation in a simulated environment as well as field observations that extend beyond the classroom. The student is expected to:
  (A) demonstrate safe practices during laboratory and field investigations; and
  (B) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.

(2) Scientific processes. The student uses a systematic approach to answer scientific laboratory and field investigative questions. The student is expected to:
  (E) design and implement investigative procedures, including making observations, asking well-defined questions, formulating testable hypotheses, identifying variables, selecting appropriate equipment and technology, and evaluating numerical answers for reasonableness;
  (K) communicate valid conclusions supported by the data through various methods such as ~~lab reports, labeled drawings, graphic organizers, journals, summaries~~, oral reports, and technology-based reports; and

(3) Scientific processes. The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to
  (A) in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;

(4) Science concepts. The student knows and applies the laws governing motion in a variety of situations. The student is expected to:
  (D) ~~calculate the effect of forces on objects~~, including the law of inertia, ~~the relationship between force and acceleration, and the nature of force pairs between objects;~~