

Name Key Hour _____

BALLOON CAR LAB and Review for Quiz

Procedure:

1. Working with the materials provided, design and build a single axle car powered by the balloon. (It should look like a chariot)
2. Test and modify your car until it can travel between **1-2 meters in a straight line**.
3. Record data for **time** and **distance** in the data table.
4. Find the **mass** of your car.
5. Return all reusable items to the supply area. (Straws, stick, wheels)

Data and Observations:

Mass of car 14.3 g .0143 kg
Distance car traveled 2 m Time 1.47 seconds

Analysis Questions:

1. What is the **outside force** causing your balloon car to stop its motion? Friction
2. Calculate the **acceleration** of your balloon car using the data you gathered.

$$\Delta x = v_i t + \frac{1}{2} a t^2$$

3. Calculate the **force** (in N) of the air leaving the balloon.

$$F = m \cdot a$$

4. Calculate the **weight** of your balloon car in **Newtons**.

$$W = m \cdot g$$

What I should know right now:

1. **Force information and bucket questions** (multiple choice about these questions)

2. Newton's 3 Laws:

1st Law is the Law of Inertia

What is inertia? property of matter to resist changes in motion

2nd Law is $F = m \cdot a$

1. If you increase the mass, what should happen to acceleration? (force is constant) ↓
2. If you increase the force, what should happen to the acceleration? (mass constant) ↑
3. Force and mass are directly related.
4. Mass and acceleration are inversely related.
5. Force and acceleration are directly related.

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6. A car ($m=1400$ kg) moving initially at a speed of 55.5 mph is brought to a stop in a distance of 25.4 m.
- a. Calculate the time required to stop. (2.05 sec)

$$v_f^2 = v_i^2 + 2a \Delta x$$

- b. Calculate the force acting on the car. (-16950 N) \approx anywhere between 16500 - 17100 depending on how you round v_i .

$$F = m \cdot a$$

- c. Calculate the weight of the car in Newtons. (-13,720 N)

$$w = m \cdot g$$

3rd Law is

action / reaction

1. If I exert a force of 500 N on the floor, how much force does the floor exert on me? 500 N
2. A hammer hits a nail with a force of 20 N.
- a. How much force does the nail hit the hammer with? 20 N
- b. Which one should accelerate at a greater rate and WHY?

nail - smaller mass, same force - so larger acceleration

Weight vs. Mass:

Mass is the amount of matter measured in kg

Weight is the pull of gravity on your mass measured in N

Weight is a FORCE!!!! The equation to solve for weight is $w = m \cdot g$

1. Find your weight in Newtons if you weigh 157 lbs. (-699 N)

① change lb \rightarrow kg

② $w = m \cdot g$

2. Find your weight in lbs if you weigh -788 N. (177 lbs)

① $w = m \cdot g$ to find m in kg

② $kg \times 2.2 = lbs$

Equilibrium:

Equilibrium occurs when there is no change in an object's velocity

What are the 2 times equilibrium occurs?

① at rest

② moving at constant speed

The net force of an object in equilibrium is 0

When an object is in equilibrium, are there any forces acting on it? yes!

What is terminal velocity?

force \downarrow (weight) = force \uparrow (air resistance)