

**Dynamic Design:
Launch and Propulsion**

Pop Goes Newton

STUDENT ACTIVITY

BACKGROUND INFORMATION

Read the Student Text "[Newton's Laws of Motion and Rockets](#)" before beginning this activity. A summary of information from that text follows. You may refer to this when completing the procedure.

1. Newton's First Law of Motion:
 - a. Objects at rest tend to stay at rest unless acted on by an unbalanced force.
 - b. Objects in motion tend to stay in motion in a straight line unless acted on by an unbalanced force.
2. Newton's Second Law of Motion:
 - a. Force equals mass times acceleration.
3. Newton's Third Law of Motion:
 - a. For every action by a force, there is an equal and opposite reaction by another force.

$$\text{acceleration} = \frac{\text{force}}{\text{mass}}$$



PROCEDURE

For each of the following events from the Pop Rocket experiment, write a detailed description of the event followed by the appropriate law that applies, followed by a detailed explanation. The first one is done for you.

1. Event: The empty film canister is sitting on the lab table.

Description: The translucent film canister is sitting on the table with the cap securely fastened on top of it. There is nothing in the canister except air and it is sitting on the table.

Law: 1. a) Objects at rest tend to stay at rest unless acted on by an unbalanced force.

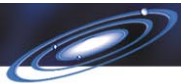
Explanation: The film canister is not moving since the forces acting on it are balanced. The force of gravity pulling on the film canister is equal to the force the table is pushing on the film canister.

2. Event: A certain amount of water and antacid tablet is placed into the film canister.

Description:

Law:

Explanation:



3. Event: The canister is placed on the table, and the rocket lifts off.

Description:

$$\frac{\text{force}}{\text{mass}}$$

Law:

Explanation:

4. Event: The rocket travels upward with a force caused when the lid blows off by the gas formed in the canister.

Description:

Law:

Explanation:

5. Event: The acceleration is directly proportional to the force and inversely proportional to the mass of the propellant.

Description:

Law:

Explanation:

6. Event: The canister stops upward motion.

Description:

Law:

Explanation:



7. Event: The canister falls back to the ground.

Description:

Law:

Explanation:

8. The canister is found lying on the ground.

Description:

Law:

Explanation: