



The Hobby Shop: Rocket Module

Newton's Laws

Instructor MASTER

Name _____ Date _____ Class _____

Directions: Complete the following questions about model rockets and Newton's laws. You may use The Hobby Shop found On-line at www.knowitall.org or other resources to complete the questions.

1. What is Newton's first law? Every object in a state of uniform motion tends to remain in that state of motion unless an external force is applied to it. _____.

(10 points)

2. When is a model rocket at rest? before it is launched and after it falls to the ground _____.

(10 points)

3. What force acts on a model rocket to make it start moving? the engine expels gas which creates an equal and opposite upward pushing force that will overcome the force of gravity.

(10 points)

4. What force occurs that causes a model rocket to change its direction when it begins descending? The upward thrusting force decreases as the force of gravity overcomes, pulling the rocket back to Earth _____ . (10 points)

5. What is Newton's second law? The net force on an object is equal to the product of its acceleration and its mass _____ . (10 points)

6. You can determine the least amount of force needed to make a model rocket launch. We know the rocket must at least overcome the force of gravity. In order to overcome gravity, the acceleration must be greater than that of gravity's acceleration, which is 9.8 m/s^2 . We will use Newton's second law to determine the least amount of force that could be used just to make the rocket rise off of the launch pad.

Choose a rocket from the table and plug in the amount of your mass in order to determine the least amount of force than can make the rocket rise.

- a. $F > m \bullet a$ (10 points)
 $F \text{ (Newtons)} > \underline{\hspace{2cm}} \text{ kg} \bullet 9.8 \text{ m/s}^2$

Rocket number	Mass
#1	.028 kg
#2	.034 kg
#3	.23 kg

- b. Which rocket did you choose to use in this example?
 _____ . (10 points)

- c. What is the least amount of force needed to make your rocket lift off? _____ Newtons (N).
 (10 points)

**This amount of force would only allow the rocket to overcome gravity, the force to launch the rocket to its highest altitude is actually a lot more.

rocket 1: $F > .028 \text{ kg} \times 9.8 \text{ m/s}^2$ force = .2744 Newtons
 rocket 2: $F > .034 \text{ kg} \times 9.8 \text{ m/s}^2$ force = .3332 Newtons
 rocket 3: $F > .23 \text{ kg} \times 9.8 \text{ m/s}^2$ force = 2.254 Newtons

7. What is Newton's third law? For every action there is an equal and opposite reaction
 _____ . (10 points)

8. If there is an action force of gases coming out of the bottom of the rocket, that will push against the Earth, what is the resulting reaction force? the rocket is launched
 _____ . (10 points)