Section 1: The Nature of Force

1. In science, a force is a Push or Pull on an object
2. When one object pushes or pulls on another object, the first object is exerting a force on the second object.
3. Circle the letters of the two ways that forces are described:
   (a.) direction b. velocity (c.) strength d. acceleration
4. When two forces act in the same direction, they Add together.
5. Adding a force acting in one direction to a force acting in another direction is the same as adding a(n) Positive number and a(n) negative number.
6. Look at Figure 1 on page 313. What does the width of the arrows tell you about the forces they represent? Strength
7. The overall force on an object after all forces are added together is called the Net force.
8. Unbalanced forces can cause an object to do three things. What are they?
   ① Speed up ② Slow down ③ Change Direction
9. Is the following sentence true or false? Unbalanced forces acting on an object will change the object's motion. True
10. Circle the letter of each sentence that is true about unbalanced forces:
    (a) When two forces act in opposite directions, the net force is the difference between the two forces.
    b. When two forces act in the same direction, the net force is the difference between the two forces.
    c. When two forces act in opposite directions, the net force is equal to the greater force.
    (d) When two forces act in the same direction, the net force is the sum of the two individual forces.
11. Equal forces acting on an object in opposite directions are called Balanced forces.
12. Is the following sentence true or false? Balanced forces acting on an object will change the object's motion. false
13. When you add equal forces exerted in opposite directions, the net force is Zero.
14. Is the following sentence true or false? Once an object is in its natural resting place, it cannot move by itself. true
15. What is inertia? Tendency of an object to resist change in motion
16. Is the following sentence true or false? Inertia affects stationary objects. true

17. What is Newton's first law of motion? An object in motion will remain in motion
18. Newton's first law of motion is also called the law of inertia.
19. What explains why you continue moving forward if you are in a car that suddenly stops? inertia
20. What is mass? the amount of matter in an object
21. What is the SI unit of mass? gram (Kilogram)
22. The amount of inertia an object has depends on its mass.
23. How can mass be defined in terms of inertia? greater mass = greater Inertia

Section 2: Force, Mass, and Acceleration

1. What is Newton's second law of motion? Connects force, mass, & Acceleration in the equation & Force = mass times acceleration
2. What is the equation that describes the relationship among quantities of force, mass, and acceleration? F=ma
3. Circle the letters of the two answers below that are different names for the same unit of measure.

   a. m/s^2 (b.) N (c.) $kg \cdot m/s^2$ d. 1 kg

4. What equation for Newton's second law can you use to find acceleration? $A = \frac{F}{m}$
5. How does an increase of force affect acceleration? increasing acceleration F=ma ↗
6. What are two ways you can increase the acceleration of an object? increasing force or decrease mass
7. How does an increase in mass affect acceleration? acceleration decrease F=m

✖ Is the following sentence true or false? One way to increase the force used to pull a wagon is to decrease the mass in the wagon. _____

Section 3: Friction and Gravity

Name Key
Period_____ Date_____

Section 3: Friction and Gravity

1. Is the following sentence true or false? When two surfaces rub, the irregularities of one surface get caught on those of the other surface. True
2. What is friction? force that opposes motion between 2 surfaces that are touching each other
3. Friction acts in a direction opposite to the object's direction of motion.
4. The strength of the force of friction depends on what two factors? Texture of surface, force holding surfaces together
5. How is friction useful in helping you walk? allows you to push off
6. How does friction help an automobile move? tires grip road
7. Complete the following table about the different kinds of friction:

Kinds of Friction	
Kind of Friction	**Friction Occurs When...**
Fluid	An object moves through a fluid
Sliding	Solid surfaces slide over each other.
Rolling	An object rolls over a surface.

8. Which kind of friction requires more force to overcome, rolling friction or sliding friction? Sliding
9. What kind of friction occurs when moving parts have ball bearings? Rolling
10. How does oil between machine parts reduce friction? Oil keeps the surfaces from making direct contact and thus reduces friction
11. The force that pulls objects toward Earth is called gravity.
12. When is an object said to be in free fall? When the only force acting on a falling object is gravity
13. Near the surface of Earth, what is the acceleration of an object due to the force of gravity? $9.8\ m/s^2$

14. An object that is thrown (or shot) is called a(n) Projectile.
15. Is the following sentence true or false? An object that is dropped will hit the ground before an object that is thrown horizontally. false
16. Objects falling through air experience a type of a fluid friction called Air Resistance.
17. Is the following sentence true or false? The greater the surface area of an object, the greater the air resistance. true
18. The greatest velocity a falling object reaches is called terminal velocity.
19. What is weight? a measure of the pull of gravity on an object
20. How is weight different than mass? mass is a measure of amount of matter, weight includes affect of gravity on matter
21. Weight is usually measured in Newtons (N).
22. State the universal law of gravitation: all objects in the universe exert an attractive force on all other objects
23. The force of attraction between two objects varies with what two factors? Distance between mass

Section 4: Action and Reaction

1. What is Newton's third law of motion? If one object exerts a force on another object, then the second object exerts
2. What did Newton call the force exerted by the first object on a second object? action force
3. What did Newton call the force exerted by the second object back on the first object? reaction force
4. The action and reaction forces in any situation will always be Equal and opposite.
5. Explain why the equal action and reaction forces do not cancel each other when one person hits a ball.
   * they happen at different times
   * they act on different objects
6. The product of an object's mass and velocity is its momentum.

6. The product of an object's mass and velocity is its momentum.
7. What is the equation you use to determine the momentum of an object?
P=mv
8. What is the unit of measurement for momentum? Kg·m/s
9. State the law of conservation of momentum: The total momentum of the objects that interact doesn't change
10. Suppose a train car is moving down a track at 10 m/s hits another train car that is not moving. Explain how momentum is conserved after the collision. the 1st car will stop and the 2nd will move at 10m/s

Section 5: How Do Rockets Lift Off?

1. Which of Newton's laws explains the lifting of a rocket into space? 3rd law of motion
2. When a rocket rises, what causes the action force? gases push on the ground
3. When a rocket rises, what causes the reaction force? ground pushing on gases
4. Any object that travels around another object in space is a(n) satellite.
5. What is the force called that causes an object to move in a circle? Centripetal force
6. What force continually changes a satellite's direction? gravity
7. A satellite is a projectile that falls ground Earth rather than into Earth.
8. For a satellite, what is the centripetal force that causes it to move in a circle? gravity
9. Is the following sentence true or false? Satellites in orbit around Earth continually fall toward Earth.
true
10. Why doesn't a satellite need fuel to keep orbiting? inertia keeps it moving
11. An object traveling in a circle is accelerating because it is constantly changing direction.