PHYSICS
NEWTON'S LAWS REVIEW KEY

ANSWER THE FOLLOWING ON YOUR OWN PAPER.

1. ***** *Correction****** Unbalanced Forces cause acceleration. (*Missing blank…*)
2. Define inertia. tendency of an object to maintain its state of motion and resist changes in velocity and acceleration

3. If the acceleration due to gravity is less on another planet, how does the mass of an object compare to the mass on Earth? Mass does not vary How does the weight compare? The weight would be less

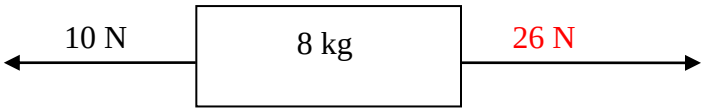
4. If an object is at rest, there is no force acting on it. False
5. If an object is at rest, the net force is 0 N.
6. If an object is traveling at a constant speed in a straight line the net force is 0 N
7. If an object is moving to the right, friction acts to the left.
8. Write the formula for weight. W=mg
9. Which direction does the weight vector point? Down
10. What is the difference between mass and weight? Mass is the amount of matter present in an object and weight is mass interacting with gravity. Which one changes according to location? Weight
11. What are the units of mass? Kilograms What are the units of weight? Newton
12. If an object is sliding along a surface at a constant velocity and the frictional force is 12.5 N to the right, what is the applied force? -12.N (equal and opposite)
13. Acceleration is inversely proportional to mass and directly proportional to the net force.
14. Give an example of an action-reaction pair. bug hits a windshield and the windshield hits the bug.
15. If a= 2 m/s^2 to the right, what is the missing force?

    $m = 8kg$ $a = 2\ m/s^2$ $F_{app} = ?$ $F_f = 10N$

    $F_{net}=ma$

    $F_{net}=(8kg)(2\ m/s^2) = 16\ N$ $F_{net}= F_{app} - F_f$

    $F_{app}= F_{net}+F_f$



16. For an object to be in equilibrium, the net force must be equal to 0 N
17. Can an object be moving if there is no net force acting? Yes at Constant Velocity
18. If an object is on an incline, how in normal force calculated? Fnorm= mgcos(θ)

State Newton's Laws. For Newton's 2nd Law, also write the formula that comes from that law.
The acceleration of an object as produced by a net force is directly proportional to

the magnitude of the net force, in the same direction as the net force, and inversely proportional to the mass of the object.

F = ma

19. For an action-reaction pair, how do the forces on each object compare? Equal and opposite

Free-body diagrams:
Draw the following free-body diagrams showing all forces acting on the object on your own paper.

1. An object moving at a constant velocity on a horizontal surface with the applied force parallel to the surface.
2. An object falling through the air and accelerating downward (consider air resistance).
3. An object being pulled across a horizontal surface at a constant velocity with the applied force at an angle with the horizontal.
4. An object being pushed across a horizontal surface at a constant velocity with the applied force.

Problems: (Answers are given in parentheses)

1. An object is acted upon by the following forces: 125 N to the right, 308 N to the left, 422 N upward, and 155 N downward.
   A. Draw a free-body diagram.
   B. Calculate the net force in the y-direction. (267 N; you state direction)
   C. Calculate the net force in the x-direction. (183 N; you state direction)
   D. Calculate the net force (include angle and direction). (324 N; you state direction)

2. Suppose an empty grocery cart rolls downhill in a parking lot. The cart undergoes a constant increase in speed of 1.0 m/s over a 5.0 s time interval. If the downhill force acting on the cart is 18.0 N and the uphill force due to friction is 15.0 N, what is the cart's mass? (15 kg)

3. A force of 5.00 N to the left causes a 1.35 kg book to have a net acceleration of 0.76 m/s^2 to the left. What is the frictional force acting on the book? (3.97 N)

4. What is the mass of a 754 N person? (76.9 kg)

5. A four way tug-of-war has four ropes attached to a metal ring. The forces on the rings are as follows: $F_1 = 4.00 \times 10^3$ N east, $F_2 = 5.00 \times 10^3$ N north, $F_3 = 7.00 \times 10^3$ N west, and 9.00×10^3 N south. What is the magnitude and direction of the net force?

6. Assume that a catcher in a professional baseball game exerts a force of -65.0 N to stop the ball. If the baseball has a mass of 0.145 kg, what is its net acceleration as being it is being caught?