Study Guide for Newton’s Laws Test

The test for Newton’s Laws will be comprised of material from chapters 3, 4 and 5. There are 20 multiple choice questions, 5 problems (4 column format) and 3 short answers. You will need to review the following topics:

1. Newton’s First Law of Motion:
   1. 1st law=every object continues in its state of rest or motion at constant velocity unless forces cause it to change its state of motion.
   2. Inertia: An object’s resistance to a change in motion.
   3. Mass: measurement of inertia-depends on the amount of matter in an object; does not depend on the object’s location; measured in kilograms
   4. Mass is not the same thing as weight
      1. Weight=the gravitational force on an object-depends on its location; measured in newtons
   5. Mass is not the same thing as volume
      1. Volume=the amount of space an object occupies
   6. Force=Push or a pull
   7. Friction: The force caused by objects that pass over each other; converts motion to heat
2. Newton’s Second Law of Motion:
   1. An object changes velocity when there is a net force acting on it.
      1. The acceleration is directly proportional to the force that acts on it.
         1. Directly proportional (when one doubles, the other doubles, etc)
      2. The acceleration is in the direction of the net force
      3. The acceleration is inversely proportional to the mass of the object
         1. Inversely proportional (when one doubles, the other halves, etc)

F=MA

A=V/t

D=1/2 At2

* 1. The weight is the force of gravity.
     1. F=Mg
  2. If friction is present, the net force is the applied force – friction force
     1. Friction-retarding force caused by the motion of one surface over another.
        1. Depends on the normal force on the object (weight)
        2. Depends on the roughness of the surfaces and how the surfaces interact with each other (coefficient of friction )
           1. Higher the , the more friction between the objects

1. Newton’s Third Law of Motion
   1. An interaction between 2 things produces a pair of forces
      1. Each thing exerts a force
      2. Action and reaction force
      3. Action force and reaction force are equal in strength but opposite in direction.

Be able to explain the following:

* The difference between mass, weight and volume
* Newton’s 3 laws of motion
* Friction, what causes it, and what factors affect the coefficient of friction
* Labs: Newton’s second law lab
* Eureka videos
* Horse/cart problem

Review notes from chapters 3, 4 and 5. Review chapter 3, 4, and 5 quiz.

Problems

1. What is the weight of a 75 kg man?
2. Find the acceleration a 450 kg car undergoes when its engine produces 800 N of force.
3. A 475 kg car traveling 20 m/s comes to a stop in 8 seconds. Find the force applied by the brakes.
4. A bulldozer has a mass of 5000 kg, but its engine can output 3000 Newtons of force. The dozer encounters 2000 newtons of friction. How fast can the bulldozer accelerate?
5. A bowstring pushed on the arrow with 180 Newtons. The arrow accelerates at 400 m/s/s. What is the mass of the arrow?
6. On the moon a 90 kg student would weigh 144 Newtons. How strong is the gravity on the moon?
7. What force is pushing on the 1400 kg car if we see it accelerate at 3.4 m/s/s?