Physics 512 Name KEY

Final Exam Review - Forces and Newton's Laws of Motion

1. Newton's First Law, the Law of Inertia, states that an object will maintain constant velocity unless acted upon by a net (unbalanced force).

2. Newton's Second Law states that the acceleration is directly proportional to F_{net} and inversely proportionally to mass.

3. Newton's Third Law states that if Object A exerts a force of 40 N to the right on Object B, Object B will exert a force with a magnitude of 40N to the left on Object A.

4. The amount of inertia an object has is directly related to its mass.

5. The units of force are Newton [N].

6. The units of acceleration are m/s^2.

7. Force and acceleration are both vectors because they have magnitude and direction.

8. Compared to the direction of the net force vector, the direction of the acceleration vector is the same (forces cause the acceleration)

9. When an object is in equilibrium, the F_{net} + acceleration is zero.

10. The amount of air resistance an object experiences depends on its surface area and speed.

11. When an object is at terminal velocity, its acceleration is $0 m/s^2$. This is because the air resistance is equal + opposite the weight. Two ways to decrease the terminal velocity of an object are to increase the surface area and decrease the weight (mass).

1. Which of the following carts has the greatest inertia?

1) a 1-kilogram cart traveling at a speed of 4 m/s
2) a 2-kilogram cart traveling at a speed of 3 m/s
3) a 3-kilogram cart traveling at a speed of 2 m/s
4) a 4-kilogram cart traveling at a speed of 1 m/s

2. Compared to its mass on Earth, the mass of a 10 kg object on the moon is

1) more. 2) the same. 3) less.

3. Compared to its weight on Earth, the weight of a 10 kg object on the moon is

1) more. 2) the same. 3) less.

4. An object in equilibrium

1) Must be at rest
2) Must have a constant, ~~non-zero~~ velocity
3) Must have a constant, non-zero acceleration
4) Must not have any forces acting on it

mistake!, no correct answer

could have a zero velocity

5. A book is at rest on a table. We know $F_N = -F_g$ because of

1) Newton's 1st Law
2) Newton's 2nd Law
3) Newton's 3rd Law
4) F_N does not equal $-F_g$

6. If the net force on an object triples, its acceleration will

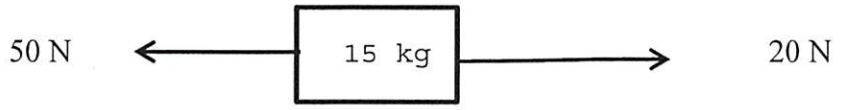
1) Remain the same
2) Double
3) Triple
4) Quadruple

7. Which of the following would increase the terminal velocity of a falling object?

1) Increase the mass
2) Increase the surface area
3) Throw it downward
4) Throw it upward

+

1. A 15 kg mass is shown below with two forces acting on it.



a) Calculate net force acting on the mass.

$\Sigma F_{net} = F_1 + F_2 = +50N - 20N = +30N$

or

30N left

b) Calculate the acceleration of the mass.

$\Sigma F = ma$

$30N = (15kg)(a)$

$a = +2m/s^2$ or $2m/s^2$ left

c) What third force (magnitude and direction) would have to act on the mass to bring it to equilibrium.

$\Sigma F = F_1 + F_2 + F_3$

$0 = +50N - 20N + F_3$

$F_3 = -30N$ or 30N right

2. If you were going to design a parachute so that an object falls as slowly as possible, what would you have to do?

Increase front facing surface area and make the whole object as light as possible. Releasing from rest is also better than throwing down.