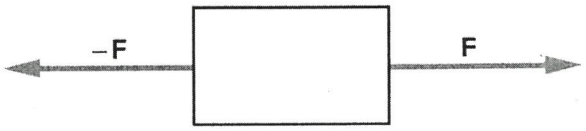
PHYS 101 **Exam 2** **Name** KEY

1. Is it possible that the box is moving, since the forces are equal in size but opposite in direction? **Explain**

a) Yes, it is possible for the object to be moving.

b) No, it is impossible for the object to be moving.



yes with a constant velocity

$F_{NF} = 0 \Rightarrow ma = 0$

$\Rightarrow a = 0$

constant velocity

$a = \frac{\Delta v}{\Delta t} = \frac{v_f - v_i}{\Delta t}$

$v_f = v_i$

10

2. A force of 200 N is exerted on an object of mass 40 kg that is located on a sheet of perfectly smooth ice.

a. Calculate the acceleration of the object.

$a = \frac{F}{m} = \frac{200\,N}{40\,kg} = 5\,m/s^2$ (10)

b. If a second object identical to the first object is placed on top of the first object, what acceleration would the 200 N force produce?

$a = \frac{F}{m} = \frac{200N}{80kg} = 2.5\,m/s^2$ (10)

Note that the acceleration is one half of the previous acceleration when the mass is doubled

3. Just before opening her parachute a skydiver of mass 50 kg reaches terminal velocity. Calculate the force of air resistance.

$W = mg = (50\,kg)(9.8\,m/s^2) = 490\,N$ (downward)

$R = W = 490\,N$ upward

10

4. For a person who has a mass 60 kg, calculate the weight in newtons

$m = 60\,kg$

$W = (60\,kg)(9.8\,m/s^2) = 588\,N$

10

5. An object of mass 300 kg is observed to accelerate at the rate of 4 m/s^2. Calculate the force required to produce this acceleration.

$F = ma = (300\,kg)(4\,m/s^2) = 1200\,N$

10

6. If no force is acting on an object, the object is

A. at rest.
B. slowing down.
C. moving with a constant velocity.
D. at rest or moving with a constant velocity.

10

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7. The Earth has a mass of 5.98 x 10^{24} kg, the Moon has a mass of 7.34 x 10^{22} kg, and the distance from the center of the Earth to the center of the Moon is 3.8 x 10^{5} km. Calculate the gravitational attractive force between the Earth and the Moon.

$$F = \frac{G m_1 m_2}{r^2} = \frac{(6.67\times10^{-11}\ N m^2/kg^2)(5.98\times10^{24}\ kg)(7.34\times10^{22}\ kg)}{(3.8\times10^{8}\ m)^2}$$

$$= 2.08\times10^{20}\ N$$

10

8. A force of 70 N is applied to a crate parallel to the surface on which the crate rests. If the force moves the crate 6.0 m calculate the work done by the force.

$$W = Fd = (70\ N)(6.0\ m) = 420\ J$$

10

9. An object of mass 3.0 kg has a velocity of 8.0 m / s. What is the object's kinetic energy?

$$KE = \frac{1}{2} m v^2 = \frac{1}{2}(3.0\ kg)(8.0\ m/s)^2 = 96\ J$$

10

10. A monkey carries a coconut of mass 2.0 kg to a height of 10 m. Calculate the potential energy of the coconut and the work done by the monkey in getting the coconut to that height.

$m = 2.0\ kg$ $h = 10\ m$

$$PE = mgh = (2.0\ kg)\left(9.8\ \frac{m}{s^2}\right)(10\ m)$$

10

$$PE = 196\ J$$

The work done = PE = 196 J