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# ewton's Laws — Sample Questions and Review Problems

1. A push or pull is an example of a(an) force.
2. The type of force measured by a grocery store spring scale is weight.
3. The sum of all the forces acting on an object is called the net force.
4. If the forces acting on an object produce a net force of zero, the forces are called balanced.
5. The force that opposes the motion of objects that touch as they move pass each other is called friction.
6. It usually takes more force to start an object sliding than it does to keep an object sliding because static friction is usually greater than sliding friction.
7. The two forces acting on a falling object are gravity and air resistance.
8. When a falling object reaches terminal velocity, the net force acting on it is zero / balanced.
9. The drag force acting on an falling sky diver is also known as air resistance / fluid friction
10. The path of motion of a thrown javelin is an example of projectile motion.
11. The tendency of an object to resist any change in its motion is called inertia.
12. During a head-on auto collision, inertia causes a passenger in the front seat to continue moving forward.
13. The acceleration of an object is equal to the net force acting on the object divided by the object's mass.
14. The force of gravity acting on an object is the object's weight.
15. If a golf ball and bowling ball are rolling at the same speed, the bowling ball ball has greater momentum.
16. When you push on a wall, the wall pushes back on you.
17. In a closed system, the loss of momentum of one object equals the gain in momentum of another object.
18. The observation that a charged object can attract or repel other charged objects led scientists to conclude that there are 2 types of charges.
19. The universal force that is most effective over the longest distances is gravity.
20. The centripetal force acting on the moon continuously changes the direction of the moon's motion.
21. How can an arrow be used to represent the size and direction of a force?

    Vary size and direction it is pointing
22. What happens to the magnitude of the fluid friction acting on a submarine as the submarine's speed increases?

    As sub speeds up the fluid friction increases.
23. What is the direction of the net force on a falling sky diver before she reaches terminal velocity? After she is falling at terminal velocity?

    Before = net force is downward b/c gravity is stronger
    After = zero (balanced in terminal velocity)
24. How can you double the acceleration of an object if you cannot alter the object's mass?

    If $m = F/a$; To keep m the same ... if double a, the mass must be doubled also!

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25. During a collision, a seat belt slows the speed of a crash-test dummy. What is the direction of the net force exerted by the seat belt compared to the direction of the dummy's motion?

the direction of the net force is opposite the direction of the dummy's motion.

26. How are the size and direction of action-reaction forces are related?

Equal in SIZE
OPPOSITE in DIRECTION

27. Why don't action-reaction forces cancel each other?

They act on different objects so cannot cancel each other out.

28 What law states that if no net force acts on a system, then the total momentum of the system does not change?

Law of Conservation of MOMENTUM

29. A billiard ball with a momentum of 20 kg·m/s strikes a second ball at rest and comes to a complete stop. What is the change in momentum of the second ball?

2nd ball's new momentum is 20 kg·m/s

30. Compare the speed of a moving golf ball with the speed of a moving bowling ball if both balls have the same amount of momentum.

Golf ball is much greater speed

31. Electric force and magnetic force are the only forces that can both do what?

attract and REPEL

32. One end of a bar magnet attracts one end of a second bar magnet. What will happen if the second bar magnet is reversed?

they will repel each other

33. Which of the universal forces acts only on protons and neutrons in the nucleus of an atom?

strong nuclear force

34. What is the primary cause of Earth's ocean tides?

gravitational pull of the moon.

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**JRCE and MOMENTUM Problems - Show *FORMULA, ALL WORK and UNITS***

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

$a = F / m$

$= -65 / 0.145$

$= -448.28\ m/s^2$

2. The whale shark is the largest of all fish and can have the mass of three adult elephants. Suppose that a crane is lifting a whale shark into a tank for delivery to an aquarium. The crane must exert a force of 250,000N to lift the shark from rest. If the shark's acceleration is 1.25 $m/s^2$, what is the shark's **mass**?

$m = F/a$

$= 250{,}000 / 1.25$

$= 200{,}000\ kg$

3. In drag racing, acceleration is more important than speed, and therefore drag racers are designed to provide high accelerations. Suppose a drag racer has a mass of 1250 kg and accelerates at a constant rate of 16.5 $m/s^2$. How large is **the force** acting on the racer?

$F = m \cdot a$

$= 1250 \times 16.5$

$= 20{,}625\ N$

4. The gravitational force that Earth exerts on the moon equals $2.03 \times 10^{20}$ N. The moon's mass equals $7.35 \times 10^{22}$ kg. What is the **acceleration** of the moon due to Earth's gravitational pull?

$a = F/m$

$= 2.03 \times 10^{20} / 7.35 \times 10^{22}$

$= 2.76 \times 10^{-3}$

5. The force that ~~stops a jet plane as it~~ lands on the flight desk of an aircraft carrier is provided by a series of arresting cables. These cables act like extremely stiff rubber bands, stretching enough to keep from slowing the plane down too suddenly. A Hornet jet with a mass of 13,000 kg lands with an acceleration of -27.6 $m/s^2$. How large is **the force** that the arresting cables exert on the plane?

$F = m \cdot a$

$= 13{,}000 \cdot -27.6$

$= 358{,}800\ N$

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6. A house is lifted from its foundation onto a truck for relocation. The force lifting the house is 2850 N. This force causes the house to move from rest to an upward speed of 0.15 m/s in 5.0 s. What is the **mass** of the house? (Hint: You must first calculate the acceleration using the formula ~~from last chapter.~~)

$m = \frac{F}{a} = \frac{2850}{\frac{.15}{5}} = \frac{2850}{.03} =$ 95,000 kg

7. The mass of a newborn baby is 4.2 kg. What is the baby's **weight** on earth?

$W = m \cdot g \quad 4.2 \times 9.8 =$ 41.16 N

8. If acceleration due to gravity is 100 $m/s^2$ on the planet Zork and the mass of a Zimble is 25 kg, what is the **weight** of a Zimble on Zork?

$W = m \cdot g$
$= 25 \times 100 =$ 2500 N

9. If a truck traveling at 35 m/s has a mass of 2000 kg, what is its **momentum**?

$p = m \cdot v$
$= 35 \times 2000 =$ 70,000 kg·m/s

10. If a car traveling at 35 m/s has a mass of 1000 kg, what is its **momentum**?

$p = m \cdot v$
$= 35 \times 1000 =$ 35,000 kg m/s

11. A 0.14 kg baseball is thrown in a straight ~~line at a velocity of 30 m/s.~~ What is the **momentum** of the baseball?

$p = m \cdot v$
$0.14 \times 30 =$ 4.2 kg m/s

12. An 8 kg bowling ball is rolling in a straight line toward you. If its momentum is 16 kg*m/s, **how fast** is it traveling?

$v = p/m = 16/8 =$ 2 m/s

13. A beach ball is rolling in a straight line toward you at a speed of 0.5 m/s. Its momentum is 0.25 kg*m/s. What is the **mass** of the beach ball?

$m = p/v = 0.25/.5 =$ 0.5 kg

14. The momentum of a car traveling in a straight line at 20m/s is 24,500 kg*m/s. What is the car's **mass**?

$m = p/v = \frac{24500}{20} =$ 1225 kg