

Notes – Bill Nye Motion Video

- 1. How can you tell if something is moving?** *Everything in the universe is in motion. Our perception of motion depends on our frame of reference – the viewpoint from which you observe events and objects. For example, a person walking on a moving platform, in the opposite direction but same speed that the platform is moving, will appear to stay still to an outside observer, though the person walking will feel as if they are moving. The difference is the viewpoint. You may feel like you are sitting still on Earth, but in fact, the Earth's spin on its axis, and Earth's orbit around the Sun, and the Sun's orbit around the center of the Milky Way galaxy all create great speed. The perception of being at rest can only exist if the frame of reference is very local – the immediate surroundings of a room, for example.*
- 2. What puts an object into motion?** *For an object's motion to be changed, a force must be applied to it. A force is a push or a pull. An object will not move unless a force starts its motion. An object will not stop moving until some force, like friction, stops its motion.*
- 3. What is inertia?** *Inertia is a property of matter that resists a change in motion. The greater the mass, the greater the inertia an object will have—that is, the harder it will be to get the object to change its motion. As the inertia and mass of an object increases, it takes more force to get that object to move. Inertia keeps the plates on a table when a tablecloth is quickly pulled out from beneath it. Inertia is what causes the occupant of a car to keep moving through the windshield when the car hits a wall (unless the occupant is wearing a seatbelt).*
- 4. What is Newton's First Law of Motion?** *Objects at rest stay at rest, and objects in motion stay in motion, unless acted upon by an outside force. This is also called the law of inertia. On Earth, the force that stops motion is friction.*
- 5. What is Newton's Second Law of Motion?** *To move a mass, you need a force. Force is equal to mass times acceleration (Force = mass x acceleration). As the mass of an object increases, its acceleration will decrease, for a given force. The greater the mass, the greater force is needed to overcome inertia. Increasing the force increases the acceleration, for a given mass.*
- 6. What is Newton's Third Law of Motion?** *For every action, there is an equal but opposite reaction. For example, when a moving railcar hits an unmoving railcar of equal mass, the action of the first car is transferred to the second car, causing it to move, while the lack of motion of the second car is transferred to the first.*
- 7. What is weight and how is it different from mass?** *A spring scale measures the pull of gravity on an object. The mass and inertia of the object does not change whether on Earth or in freefall, but an object in freefall does not have any weight, because the downward motion of freefall equals the pull of gravity.*
- 8. Do Newton's Laws of Motion still work in space?** *The lack of gravity in space does not change the effect of Newton's Laws. In fact, constant unchanging motion can only occur in space where there is no friction or air resistance.*