NEWTON'S LAWS OF MOTION MOVIE TRANSCRIPT

The opening scene shows a robot's feet having wheels pop out of them to form roller blades.

TIM: Thanks, Moby!

The scene changes to show a young man, Tim, and a robot, Moby. Moby rolls by giving Tim a piece of paper.

‹Crash!›

Tim then looks over at Moby crashing into something and closes his eyes.

TIM: Hey Tim and Moby, Can you tell me about Isaac Newton's three laws? From Jerome.

The camera focuses on the letter that Tim is reading.

TIM: Well, Isaac Newton was a scientist who lived in the 17th century.

Tim addresses the camera while standing next to a portrait of Isaac Newton. He has long, gray hair and a white scarf.

TIM: We have a whole movie about him so you should check it out. Anyway, Newton came up with three laws of motion that can be used to explain how and why stuff moves.

Tim addresses the camera.

MOBY: --Beep.

Moby rolls up to Tim. Moby is holding onto his head. The crash caused him to dent his forehead.

TIM: Well, yeah, these laws are still in use today, so I'd say he was pretty smart. Newton's first law states that "an object in motion will stay in motion, and an object at rest will stay at rest unless an unbalanced force acts on it."

A slide labeled "newton's first law" is shown. The Newton's first law is stated on the screen.

TIM: You probably don't think about it this way, but when a car is moving, everything in it and on it is moving along at the same speed.

The scene shows Tim sitting in the passenger seat of a moving car. A woman is driving.

TIM: If the car has to stop suddenly, the objects in and on the car will continue moving forward.

An animation shows the movement of the car from Tim's point of view, through the windshield.

TIM: I guess we should have tied those on tighter.

The scene shows a side view of the car as it drives. Skis are tied to the roof. The driver makes a sudden stop due to a UpperWord U F O flying overhead. The skis become untied and fall of the top of the car.

TIM: An object's forward motion will continue until an unbalanced force acts in the opposite direction to stop it.

An animation shows a circle moving in horizontal direction. An arrow passes through the circle going in the opposite direction, causing the circle to slow down and stop.

TIM: So, our seat belts provided the unbalanced force that stopped our bodies from moving forward.

The upper half of the screen shows the two parts of the seatbelt being connected.

TIM: But those ropes didn't provide enough force to balance out the skis' forward motion.

The lower half of the screen shows the pair of skis falling off the top of the car once it comes to a sudden stop.

MOBY: --Beep?

The scene changes to show Moby standing in front of a table with a small rock lying on it. Moby flicks the rock with his finger, making it slide for a short distance.

TIM: Why didn't it keep going? Well, in this case, the force acting on the rock was friction.

The camera zooms in on Tim while he is addressing Moby. The word "friction" appears at the top of the screen.

TIM: Friction is the resistance caused by any two objects in contact, and it always acts in the opposite direction of the motion.

The scene changes to show the rock and the surface of the table closer. Several semicircles are drawn on the surface of the rock and the surface of the table where the two come in contact with each other. An arrow above the rock shows the direction of rock's movement along the table. An arrow below the rock is added. It points in the direction opposite the direction of rock's movement.

TIM: Newton's second law says "an object that has an unbalanced force acting on it will accelerate in the direction of that force."

A slide labeled "newton's second law" is shown. Newton's second law is stated on the screen.

TIM: When you're just sitting there, two forces are acting on you all the time.

The scene changes to show Tim and Moby sitting back to back on a sled. The ground is covered in snow and Tim is wearing a hat, a scarf, mittens, and a warm jacket.

TIM: Right now, gravity is pulling our mass toward the center of the earth . . . and the upward normal force of the ground is pushing up against gravity.

A simple diagram shows the two of them in a sled on top of a steep hill. An animation adds an arrow pointing downward. The second arrow is added and points upward.

TIM: We could sit here all day and go nowhere, because these two forces cancel out.

Tim addresses the camera while still sitting in a sled on top of the hill.

TIM: This hill is a different story!

Moby uses his legs to move the sled and the sled starts sliding down the hill.

TIM: At this angle, gravity and the normal force are not canceling each other out.

An animation shows them moving down the hill and adds three arrows to represent the forces acting on them. The first arrow points downward, the second arrow points upward, perpendicular to the face of the hill, and the third arrow runs along the face of the hill and points in the direction of the sled's movement.

TIM: Gravity wins and we accelerate. The net force that's acting on us and making us accelerate is a combination of the normal force and gravity!

The scene changes to show Tim. They are still going down the hill and Moby is flailing his arms to balance the sled.

TIM: Look! Friction!

The sled crashes into a snowbank and only Tim's and Moby's legs, sticking out of the snow, are visible.

TIM: Newton's third law is this: "forces always occur in equal and opposite pairs."

A slide labeled "newton's third law" is shown. Newton's third law is stated on the screen.

TIM: When I pushed that door, it pushed right back at me with equal force.

Tim addresses the camera and pushes a door open with his hand.

TIM: The door was the one that moved because friction between my feet and the floor combined my mass with the building's mass.

A simple diagram of a building is shown. A human is standing on the second floor pushing a door open with his hand. The person's feet and the portion of the floor where they stand are circled in red. Two arrows of different length are added. The longer arrow points from the person toward the door and runs along the person's arm. The shorter arrow points from the door towards the person.

TIM: The door is on hinges, which decrease friction, so it accelerates open.

An animation shows a door open.

TIM: Maybe if you took off your roller skates.

The scene changes to show Tim and Moby standing on different sides of a door. Moby pushes the door with both hands, it barely opens and then closes again and Moby rolls away backwards.

MOBY: --Beep!

TIM: Or not.

The scene changes to show Moby getting a running start and rolling towards the door. The camera then faces the door as Moby rolls toward it. At the last second Moby veers to the right and misses the door.

TIM: Oops! Well, that's about it for Isaac Newton's laws of motion. I'm gonna get Moby an ice pack.

Tim addresses the camera. The wall next to the door cracks as Moby hits it from the other side.