

Homework 1, solutions

E.4 Newton's 1 law: Inertia. "In the absence of external forces, an object in motion remains at motions (and object at rest remains at rest)". So, the water in the toothbrush is moving, and when the toothbrush suddenly stops, the water keeps on moving.

E.5 Any collision in which the car accelerates forward, such as when the car is hit from behind by a faster moving car.

E. 6 Newton's 1 law: Inertia. "In the absence of external forces, an object in motion remains at motions (and object at rest remains at rest)". The driver and the car are moving forward; when the car suddenly stops, the driver keeps moving forward and hits the 'stopped steering wheel'.

E.7 As it turns left, the car accelerates left. The loose objects remain behind and end up on the right side of the dashboard.

E.8 Velocity is a vector and has a magnitude (speed) and direction. When you go in a circle (on a carousel) you continuously change the direction of your velocity.

E.9 Backward, in the direction opposite your forward velocity.

E.13 The pad's inertia tends to keep it in place. If you pull the paper away too quickly, the pad won't be able to accelerate with the paper.

E.15 Regardless of their horizontal components of velocity, all objects fall at the same rate. The ball and bullet descend together.

P.1 $\vec{F} = m \cdot \vec{a}$
 $\vec{F} = 800\text{kg} \cdot 4 \frac{\text{m}}{\text{s}^2}$
 $\vec{F} = 3200\text{N}$

P.2 $v = v_0 + a \cdot t$; $v_0 = 0$, $a = 4 \frac{\text{m}}{\text{s}^2}$

$\rightarrow t = \frac{v}{a}$ (use SI units)
 $t = \frac{24.6 \frac{\text{m}}{\text{s}}}{4 \frac{\text{m}}{\text{s}^2}}$
 $t = 6.15 \text{ s}$
