

This print-out should have 8 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering.

Car Passing a Train

001 10.0 points

A train is moving parallel and adjacent to a highway with a constant speed of 22 m/s. Initially a car is 38 m behind the train, traveling in the same direction as the train at 35 m/s and accelerating at 4 m/s².

What is the speed of the car just as it passes the train?

Correct answer: 43.7486 m/s.

Braking Car

002 (part 1 of 2) 10.0 points

A motorist is traveling at 10 m/s when he sees a deer in the road 46 m ahead.

If the maximum negative acceleration of the vehicle is -6 m/s^2 , what is the maximum reaction time of the motorist that will allow him to avoid hitting the deer?

Correct answer: 3.76667 s.

003 (part 2 of 2) 10.0 points

If his reaction time is 3.95557 s, how fast will he be traveling when he reaches the deer?

Correct answer: 4.76108 m/s.

Falling Bolt 02

004 10.0 points

Consider a railroad bridge over a highway. A train passing over the bridge dislodges a loose bolt from the bridge, which proceeds to fall straight down and ends up breaking the windshield of a car passing under the bridge. The car was 32 m away from the point of impact when the bolt began to fall down; unfortunately, the driver did not notice it and proceeded at constant speed of 28 m/s.

How high is the bridge? Or more precisely, how high are the railroad tracks above the windshield height? The acceleration of gravity is 9.8 m/s^2 .

Correct answer: 5017.6 m.

Rising Hot Air Balloon

005 (part 1 of 4) 10.0 points

A hot air balloon is traveling vertically upward at a constant speed of 3.3 m/s. When it is 13 m above the ground, a package is released from the balloon.

After it is released, for how long is the package in the air? The acceleration of gravity is 9.8 m/s^2 .

Correct answer: 2 s.

006 (part 2 of 4) 10.0 points

What is its speed just before impact with the ground?

Correct answer: 16.3 m/s.

007 (part 3 of 4) 10.0 points

Now assume the hot air balloon is traveling vertically downward at a constant speed of 3.3 m/s.

After the package is released, how long is it in the air?

Correct answer: 1.32653 s.

008 (part 4 of 4) 10.0 points

What is its speed just before impact with the ground?

Correct answer: 16.3 m/s.