

CONSCIOUS COMMUTING

To Do On The Bus

As you ride to Valleyfair be conscious of some of the PHYSICS on the way!

A. Starting Up

Things to Measure

1. Distance and time on the way to Valleyfair?

Odometer reading at start _____ miles

Odometer reading at Valleyfair _____ miles

Time between odometer readings _____ hours _____ minutes _____ seconds

2. As the bus pulls away from a stop sign, find the time it takes to go from start to 20 miles per hour. You will have to get someone up front to help.

$t =$ _____ sec.

Things to Calculate: (Always Show Equations Used and Substitutions)

1. Calculate the average speed for the trip to Valleyfair.

$v = \Delta d / \Delta t =$ _____ mi/h

2. Calculate the acceleration and related force. Compare this to the force of gravity when you accelerate from 0 to 20 miles per hour.

a) Convert 20 miles per hour to meters per second (1.0 mph = .44 m/s).

$v =$ _____

b) Find the acceleration of the bus.

$a = \Delta v / \Delta t =$ _____

c) Knowing your mass in kilograms and using Newton's Second Law, find the average force on you as the bus starts up.

$F = ma =$ _____

d) How does this compare to the force gravity exerts on you (your weight in Newton's)?

Circle one: More Less

Force calculated

_____ = _____ = _____ g's

Force gravity normally exerts

Things To Notice As You Ride

1. As you start up, which way do you FEEL thrown, forward or backward?

2. From the perspective of observers at the side of the road, which direction would they think you were being pushed?

3. How can you explain the difference between what **you feel** as the bus starts up and what the **observer sees**? (you may want to use the idea of FRAME OF REFERENCE)

B. Going at a Constant Velocity

Things to Notice

1. Describe the sensation of going at a constant speed. Do you feel as if you are moving?
2. Draw a free body force diagram (vector diagram) when **you** are traveling at constant velocity.
3. Explain how the results of your free body force diagram relate to Newton's First Law.

C. Rounding Curves

Things to Notice

1. If your eyes are closed how can you tell when the bus is going around a curve? Try it and report what you notice. (do NOT fall asleep!)

2. As the bus rounds a curve, concentrate on a tree or a building that would have been STRAIGHT AHEAD. See if you can sense that you are TRYING TO GO STRAIGHT but are being pulled into the curve by centripetal force.

What is supplying the force, the friction of the seat, your seat mate, the wall, the arm of the seat, or a combination?

How does this change when the curve is tighter and again if the bus is going faster?

Write a few sentences about this experience. How does it connect to what happens on the rides at Valleyfair?

3. When does the bus act as an **inertial** reference frame?

When does the bus act as a **noninertial** reference frame?

4. BONUS: Devise a method for estimating the centripetal force on you as you round a curve, (One possibility, use keys on a string and . . .)