Lab 2 – Graphs of linear motion

Sketch graphs of ***velocity vs time*** and ***displacement vs time*** for the motion described in each problem.

1. A bottle rolls across a level surface at constant speed.

 **Assign the direction in which the bottle rolls as positive direction.**

time

0

(+)

velocity

time

0

(+)

displacement

 **While the bottle rolls:**

 motion: \_\_\_ speeds up \_\_\_ slows down \_\_\_ moves at constant speed

 velocity: \_\_\_ positive \_\_\_ negative \_\_\_ zero

 acceleration: \_\_\_ positive \_\_\_ negative \_\_\_ zero

2. A heavier weight and a lighter weight are connected over a pulley by a string. The weights are

 hanging above the floor. The system is released from rest and the lighter weight moves upward.

 (a) Sketch the graphs for the motion of the ***lighter*** weight. **Assign upward as positive direction.**

time

0

(+)

velocity

time

0

(+)

displacement

 **While the *lighter* weight moves upward:**

 motion: \_\_\_ speeds up \_\_\_ slows down \_\_\_ moves at constant speed

 velocity: \_\_\_ positive \_\_\_ negative \_\_\_ zero

 acceleration: \_\_\_ positive \_\_\_ negative \_\_\_ zero

 (b) Sketch the graphs for the motion of the ***heavier*** weight. **Assign upward as positive direction.**

time

0

( - )

velocity

time

0

( - )

displacement

 **While the *heavier* weight moves downward:**

 motion: \_\_\_ speeds up \_\_\_ slows down \_\_\_ moves at constant speed

 velocity: \_\_\_ positive \_\_\_ negative \_\_\_ zero

 acceleration: \_\_\_ positive \_\_\_ negative \_\_\_ zero

3. A bottle rolls from rest down an incline. **Assign UP the incline as positive direction.**

time

0

( - )

velocity

time

0

( - )

displacement

 **While the bottle rolls down the ramp:**

 motion: \_\_\_ speeds up \_\_\_ slows down \_\_\_ moves at constant speed

 velocity: \_\_\_ positive \_\_\_ negative \_\_\_ zero

 acceleration: \_\_\_ positive \_\_\_ negative \_\_\_ zero

4. A cart that is rolling across a level surface slows to a stop.

 **Assign the direction in which the cart rolls as positive direction.**

time

0

(+)

velocity

time

0

(+)

displacement

stops

stops

 **While the cart rolls across the surface:**

 motion: \_\_\_ speeds up \_\_\_ slows down \_\_\_ moves at constant speed

 velocity: \_\_\_ positive \_\_\_ negative \_\_\_ zero

 acceleration: \_\_\_ positive \_\_\_ negative \_\_\_ zero

 **After the cart stops:**

 motion: \_\_\_ speeds up \_\_\_ slows down \_\_\_ moves at constant speed

 velocity: \_\_\_ positive \_\_\_ negative \_\_\_ zero

 acceleration: \_\_\_ positive \_\_\_ negative \_\_\_ zero

5. A cart is rolling up a ramp. The cart rolls up the ramp and then back down the ramp to its

 starting point. **Assign up the ramp as positive direction.**

velocity

time

0

(+)

(-)

time at highest point up ramp

time

0

(+)

(-)

displacement

time at highest point up ramp

 **While the cart is rolling up the ramp:**

 motion: \_\_\_ speeds up \_\_\_ slows down \_\_\_ moves at constant speed

 velocity: \_\_\_ positive \_\_\_ negative \_\_\_ zero

 acceleration: \_\_\_ positive \_\_\_ negative \_\_\_ zero

 **While the cart is rolling down the ramp:**

 motion: \_\_\_ speeds up \_\_\_ slows down \_\_\_ moves at constant speed

 velocity: \_\_\_ positive \_\_\_ negative \_\_\_ zero

 acceleration: \_\_\_ positive \_\_\_ negative \_\_\_ zero

6. An object has the ***velocity vs time*** graph shown below.

 Tell the average velocity, average acceleration, and displacement of the object for the indicated time interval.

 (a) *t = 0* to *t = 4 s*

***0***

***2***

***4***

***6***

***8***

***10***

***12***

***14***

***0***

***4***

***8***

***12***

***16***

***velocity***

***in m/s***

***time in s***

**(+)**

**(+)**

(b) *t = 4 s* to *t = 10 s*

 (c) *t = 10 s* to *t = 12 s*

 Sketch the displacement vs time

 graph for this object during the

 12 seconds shown above.