

WA3: 1D Motion Equations (14665947)

Due: Wed, May 15, 2019 12:00 AM EDT

Question

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1. Question Details

OSColPhysAP2016 2.5.P.022. [3604496]

A bullet in a gun is accelerated from the firing chamber to the end of the barrel at an average rate of $5.90 \times 10^5 \text{ m/s}^2$ for $6.80 \times 10^{-4} \text{ s}$. What is its muzzle velocity (in m/s) (that is, its final velocity)? (Enter the magnitude.)

  401 m/s

†

2. Question Details

OSColPhysAP2016 2.5.P.028. [3620077]

A powerful motorcycle can accelerate from rest to 25.8 m/s (58 mi/h) in only 2.90 s .

(a) What is its average acceleration in m/s^2 ?

  8.9 m/s^2

(b) How far does it travel in that time?

  37.4 m

†

3. Question Details

OSColPhysAP2016 2.5.P.031. [3652804]

A swan on a lake gets airborne by flapping its wings and running on top of the water.

(a) If the swan must reach a velocity of 5.60 m/s to take off and it accelerates from rest at an average rate of 0.345 m/s^2 , how far (in m) will it travel before becoming airborne?

  45.4 m

(b) How long (in s) does this take?

  16.2 s

†

4. Question Details

OSColPhysAP2016 2.5.P.038. [3604706]

A bicycle racer sprints at the end of a race to clinch a victory. The racer has an initial velocity of 10.5 m/s and accelerates at the rate of 0.350 m/s^2 for 7.00 s .

- (a) What is his final velocity (in m/s)?

  13 m/s

- (b) The racer continues at this velocity to the finish line. If he was 300 m from the finish line when he started to accelerate, how much time (in s) did he save?

  4.74 s

- (c) One other racer was 5.00 m ahead when the winner started to accelerate, but he was unable to accelerate and traveled at 10.8 m/s until the finish line. How far ahead of him (in meters and in seconds) did the winner finish?

distance  37.7 m

time  3.49 s

+

5. Question Details

OSColPhysAP2016 2.5.P.040. [3652997]

- (a) A world record was set for the men's 100 m dash in the 2008 Olympic Games in Beijing by Usain Bolt of Jamaica. Bolt "coasted" across the finish line with a time of 9.69 s . If we assume that Bolt accelerated for 2.18 s to reach his maximum speed, and maintained that speed for the rest of the race, calculate his maximum speed (in m/s) and his acceleration (in m/s^2).

maximum speed  11.6 m/s

acceleration  5.33 m/s^2

- (b) During the same Olympics, Bolt also set the world record in the 200 m dash with a time of 19.30 s . Using the same assumptions as for the 100 m dash, what was his maximum speed for this race (in m/s)?

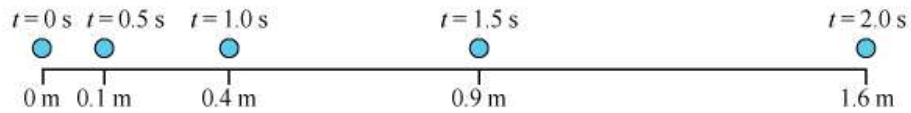
  11 m/s

+

6. Question Details

OSColPhysAP2016 2.5.WA.016.Tutorial. [3570225]

A remote controlled toy car starts from rest and begins to accelerate in a straight line. The figure below represents "snapshots" of the car's position at equal 0.5 s time intervals. (Assume the positive direction is to the right. Indicate the direction with the sign of your answer.)



(a) What is the car's average velocity in the interval between $t = 0.5$ s to $t = 1.0$ s?

 0.6 m/s

(b) Using data from $t = 0.5$ s to $t = 1.5$ s, what is the car's acceleration at $t = 1.0$ s?

 0.8 m/s²

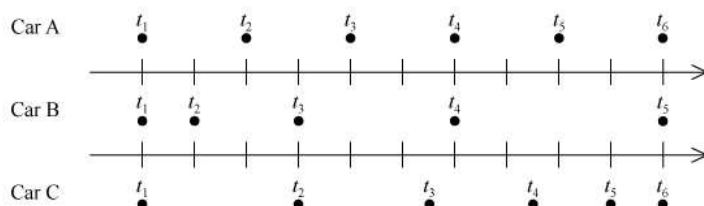
(c) Is the car's speed increasing or decreasing with time?

- ☒ increasing
- ☐ decreasing
- ☐ constant
- ☐ not enough information

7. Question Details

OSColPhysAP2016 2.5.WA.017. [3570072]

Suppose you are looking down from a helicopter at three cars traveling in the same direction along a freeway. The positions of the three cars every 2 seconds are represented by dots on the diagram. The positive direction is to the right.



(a) Which car is traveling at a constant speed?

- ☐  Car A
- ☐ Car B
- ☐ Car C
- ☐ All cars are traveling at a constant speed.
- ☐ None of the cars are traveling at a constant speed.

(b) During which time interval do Car A and Car B have the same average speed?

- ☐ t_1 to t_2
- ☒  t_2 to t_3
- ☐ t_3 to t_4
- ☐ t_4 to t_5

(c) Which car has the greatest average velocity during the time interval t_1 to t_2 ?

- ☐ Car A
- ☐ Car B
- ☒  Car C

(d) Which car has the greatest average velocity during the time interval t_4 to t_5 ?

- ☐ Car A
- ☒  Car B
- ☐ Car C

(e) At which time does Car B catch up with Car A?

- ☐ t_2
- ☐ t_3
- ☒  t_4
- ☐ t_5

(f) During what time interval does Car C pass Car A?

- ☒  t_1 to t_2
- ☐ t_2 to t_3
- ☐ t_3 to t_4
- ☐ t_4 to t_5

(g) At what time does Car A catch Car C?

- ☐ t_2
- ☐ t_3
- ☐ t_4
- ☐ t_5
- ☒  t_6

(h) During what time interval does Car B pass Car C?

- ☐ t_1 to t_2
- ☐ t_2 to t_3
- ☐ t_3 to t_4
- ☒  t_4 to t_5

(i) Which car has an acceleration in the positive direction?

- ☐ Car A
- ☒  Car B
- ☐ Car C

(j) Which car has an acceleration in the negative direction?

- ☐ Car A
- ☐ Car B
- ☒  Car C

8. Question Details

OSColPhysAP2016 2.5.WA.025. [3570260]

A particular airplane will reach liftoff at a speed of 120 km/h.

(a) What minimum constant acceleration does the airplane require for it to liftoff after a takeoff run of 260 m? (Enter the magnitude only.)

 2.14 m/s²

(b) How long does it take the airplane to reach liftoff speed?

 15.6 s

Name (AID): **WA3: 1D Motion Equations (14665947)**
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