

Cars Speed Lab and HotWheels Motion Lab

(ANSWERS)

CARS LAB – POST LAB QUESTIONS:

1. At what pullback distance did your car have the **greatest average speed**? What was the average speed? **The greatest average speed was at 80 cm. Answers will vary, but should be between 100 cm/s and 200 cm/s.**
2. At what pullback distance did your car have the **smallest average speed**? What was the average speed? **The smallest average speed was at 20 cm. Answers will vary, but should be between 20 cm/s and 100 cm/s.**
3. Name **four** things you could do to increase the average speed of your car. **You could pull it back further, go down a hill, make the ground smoother, remove outside forces (rocks, dirt, rules, etc.) make the car lighter, add a bigger spring, or a rocket on it.**
4. Was your car ever going faster or slower than your avg. speed? Explain how you know. **YES. It was going slower when it started to stop at the end of the run, it was going zero when we first let it go then it accelerated up to its top speed.**
5. Name three reference points or frames of reference you could use to determine motion. **The ground, the meter sticks, the rules, the plastic container, our shoes, rocks or dirt on the ground, our notebook, the portables, the grass, or one of the people in our group.**

Hot Wheels Motion Lab – POST LAB QUESTIONS:

1. List three things that are causing the car to accelerate? (**Hint**: acceleration is **change in velocity**) **Gravity, the launcher, friction with track or table, you hands, the book or wall it hits.**
2. Where was the acceleration of the car the greatest? (**Think** about what is causing it to accelerate) **Right as it is being launched from the launcher or at the end of the track if it hits something and stops instantly.**
3. Is the **speed of the car constant** or does it **changes** as it goes down the track? Explain how you know. **The speed is changing. It started at 0 cm/s and then was launched to over 200 cm/s. At the end of the track it slows down when it hits the finish line or it falls off the track or**
4. Are the **velocity** and the **speed** of the car the **same** in this experiment? Explain your answer in a complete sentence. **Yes and No. They are the same in terms of magnitude (example: 50 cm/s would be the speed and the velocity). The difference where they are not the same is that the velocity would be 50 cm/s north or south or east or west. Velocity also has information about the direction the car is moving.**
5. What force is causing the car to accelerate down the track in Challenge 2? **Gravity**
6. What two things could you do to increase the momentum of the car? **Add more mass or more speed (velocity).**
7. List 3 things you could have used as a reference point (frame of reference) for this lab? **The table, track other car, launcher, books, ruler, partner, finish line, etc.**

BONUS QUESTION: In the 1996 Olympics, gold medal winner Michael Johnson had a **faster average speed** in his **200-meter (10.35 m/s and a time of 19 sec)** race compared to his **100-meter race (10.01 m/s and 10 sec)**. Why? Draw a **Speed vs. time graph** for the 100 and 200 meter races to help you explain this question. Draw the graph with a curve from the start and accelerating up to a top speed of 12 m/s after 3 sec.

Michael Johnson was at top speed (12 m/s) for 70 % of his race (from 3 to 10 seconds) for the 100 meter dash (black line). He was at top speed for 84% of his race (from 3 to 19 seconds) for the 200 meter dash (blue line). . He was at top speed for a great portion of the race in the longer race. This caused his average speed to be greater even though the race was longer.

