Free Fall

Kinematic Problems

Solve the following free fall problems. Remember to show ALL work if you wish to receive credit.

1. While standing at the edge of a tall cliff, Stockton decides to use his newly acquired physics knowledge and determine just how high the cliff is. He drops a rock and notices that it takes 4.5 seconds to hit the ground below. How high is the cliff?

2. While performing the above experiment, Stockton gets a text and finds out his girlfriend has chosen to go see the new NOVA science show with his best friend. In a fit of frustration, he picks up a rock and throws it down with a speed of 20 m/s, how fast is the rock going when it hits the side of the cliff 3.5 seconds later?

3. Brock, trying to impress a young lady, throws a tennis ball into the air with an unrealistic speed of 85 m/s. How long will it take the ball to reach its maximum height? (How fast is the ball going when it gets as high as it is going to go?)

4. Knowing how long Brock's tennis ball is in the air, how high does the tennis ball go?

5. In 1997, a Ski Doo 700 snowmobile reached a speed of 57.2 m/s (128 mph) in 10.08 seconds. What was the acceleration of the snowmobile?

6. If instead of using the snowmobiles engine for an acceleration, suppose the snowmobile was dropped off the edge of a cliff. How fast would the snowmobile be going after 10.08 seconds?

7. A robot probe drops a camera off the rim of a 239 m high cliff on Mars, where the free-fall acceleration is 3.7 m/s^2 downward. How long does it take for the camera to hit the ground?

8. What would be the speed of the camera in problem 7 just before it hits the ground?

9. While digging a spiked volleyball, Nicole hits a volleyball straight up in the air with a speed of +7.5 m/s. What is the maximum height the ball will go from where it was hit?

Review Problems

10. A car traveling in a straight line has a velocity of 5.0 m/s. After an acceleration of 0.75 m/s^2, the car's velocity is 8.0 m/s, How long did this take to happen?

11. A ball initially at rest rolls down a hill with an acceleration of 3.3 m/s^2. If it accelerates for 7.5 s, how far will it move?

12. While standing on Angels Landing in Zion's National Park, a rock is dropped off the edge of the cliff. If the rock falls for 10 seconds on the way down, how tall is the rock formation?