

Year 12 Physics 2012

Motion and Forces Test 1

Name:

Mark: / 56

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Notes to Students:

- You must include **all** working to be awarded full marks for a question.
- Marks will be deducted for incorrect or absent units.
- Answers should be given to 3 significant figures.

1. Fred is driving his car around a bend when he notices that his small dog sitting on the parcel shelf is drifting towards the outside of the corner and the side of his car. Explain what is happening using the laws of motion.

[4]

2. You are sitting on the latest thrill ride which fires you along a straight horizontal track until you reach a velocity of 30.0 ms^{-1} . The track then deviates at right angles to the left with no loss in speed. Include a diagram.

What is your change in velocity?

[4]

3. You have been asked to help coordinate a medieval reenactment involving a catapult attack on a castle. The catapult releases its projectile 8.00 m above ground at a velocity of 28.0 ms^{-1} 60.0° above the horizontal. The projectile is to hit the castle wall on its downward path 28.0 m above the ground.

a) Find the maximum height the projectile reaches in flight.

[3]

b) Calculate the time taken to hit the target.

[3]

c) What distance should the catapult be away from the castle wall when it fires.

[3]

d) What is the velocity of the projectile when it makes contact with the castle wall?

[4]

4. You begin your ride on a roller coaster by being pulled at a speed of 2.00 ms^{-1} to a height of 14.0 m . You are released as you go over the top.

a) Assuming no loss of energy with what speed would you crest the next hill, which has a height of 9.00 m .

[4]

- b) If this hill has a radius of 10.5 m what sensation with regard to your weight do you experience as you go over the crest? Verify your answer with a calculation.

[4]

5. A 200 kg pallet is being unloaded from a truck by sliding it down a ramp, which makes an angle of 25.0° to the horizontal with a frictional force of 10.0 N.

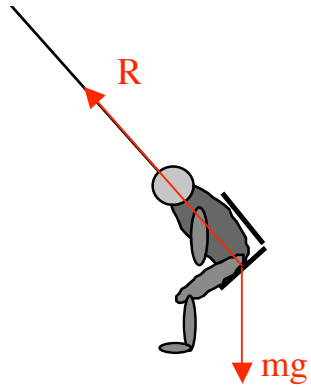
- a) Once the pallet is on the ramp, what is its acceleration down the ramp?

[3]

- b) If the pallet travels 3.20 m down the ramp what is its speed at the end of the ramp?

[3]

6. A swing at the Royal Show comprises a series of chairs attached by chains to a central rotating vertical pylon. As the pylon rotates the chairs swing out radially providing the thrill seeker sitting in the chair with their ride.



If the person in the chair has a mass of 7.00 kg and their radius of rotation is 8.50 m when the rider is rotating around the pylon at a frequency of 0.5 rev s^{-1} ,

- a) calculate the speed of the person

[3]

- b) calculate the centripetal force

[3]

c) calculate the tension in the chain.

[4]

d) State what would happen to the radius of rotation if the rotational speed increased. Explain your reasoning.

[2]

7. You are out fishing with a hand-line, where to cast your bait you swing the line in a vertical circle. If the radius of the circle is 1.50 m and the bait has a mass of 10.0g,

a) Calculate the tension in the line at the top of its rotation when you are maintaining the bait's speed at 9.00 ms^{-1} .

[3]

b) What is its tension at the bottom of its rotation if you keep the speed constant?

[3]

c) What is the baits minimum velocity at the top of its rotation to maintain its circular path if you stop providing the driving force?

[3]