Vasquez High School -- Physics -- Quest #3 -- Chapter 4 -- 65 points

On each problem, be neat, organized and complete. You have to convince the reader that you know how to solve the problem. Write all pertinent equations. SHOW ALL YOUR WORK. (Danny!)

1) The president of the Atwood Elevator Company approached you, his chief engineer, one day and asked you to design a two-elevator system, one in which has massless cables and a massless frictionless pulley. He said that car 1 would have a mass of 2400 kg and car 2 would have a mass of 1600 kg. For ten points, he wanted you to:

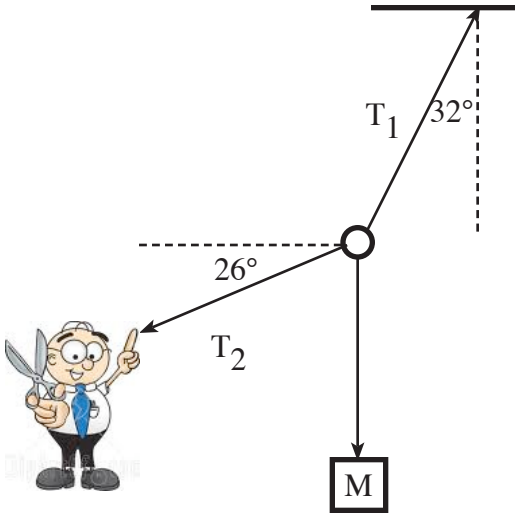
   a) Draw the system at the right w/coordinates
   b) Draw a free-body diagram for each car
   c) Derive an expression for the acceleration of the system (in general terms)
   d) Determine the specific acceleration of car 1

2) The Bulgarian strongman, Kanye Whakamole, could pick up a mass of 1950 kg with his massive arms. Suppose our strongman can hold exactly four times that mass on a 35° slope using the same force. What is the coefficient of static friction between the load and the slope? (Seven points)

3) A newly discovered giant squid having a mass of 2250 kg has just washed up on the Malibu shore. A team of marine biologists attempt to haul the monster out to sea by attaching a cable to the squid. They pull on it at an angle 15° above the horizontal with a force of 3200 N. There is a frictional force, from the sand, opposing their pull equal to 18.0% of the squid's weight. Calculate the acceleration of the squid's net acceleration during the pull. (Seven points)

4) A cement block of mass 300 kg sits on a wooden inclined plane raised at an angle of 27°. It is held motionless in place by a rope. When the rope is cut, the block accelerates down the incline at a rate of 1.84 m/s/s. What is the coefficient of friction between the cement block and the wooden plane? Draw a complete diagram. Draw a free-body diagram of the block. Ten points.

5) Examine the diagram at the right. If the ring in the middle is completely motionless, draw a free-body diagram of all the forces on it. Seven points. Three extra credit points if you can determine the tension T_1 given that M = 100 kg.



Multiple Choice. Circle the best choice for each example. Three points each.

6) You are in your car driving at about 35 miles per hour. As you make a left turn, your tires begin to squeal, meaning they are pulling off the road a bit. The coefficient of friction between your tires and the highway is most likely about

a) -1 b) 0 c) 0.1 d) 0.6 e) 1.2 f) infinite

7) Each man of an eleven man football team can pu11 a rope with a force of 1200 N. If six men are on the left side of a tug-of-war, and five line up on the right side, and everyone starts pulling, the flag in the middle feels a net force of

a) 7200 N b) 6000 N c) 13200 N d) 100 N e) 1200 N f) zero

8) Which one of these is not a force?

a) friction b) tension c) gravity d) m • a e) air resistance

9) Which of Newton's laws best explains why motorists should buckle up their seatbelts?

a) 1st Law b) 2nd Law c) 3rd Law d) Law of Gravity

10) If you blow up a balloon, then release it, it will fly away...best explained by which of Newton's Laws?

a) 1st Law b) 2nd Law c) 3rd Law d) Law of Gravity

11) A rocket moves through empty space in a straight line with a constant speed. It is very far from the effects of gravity from any star or planet. Under these conditions, the force that must be applied to the rocket in order to sustain its motion is

a) equal to its weight. b) equal to its mass. c) dependent on how fast it is moving. d) zero.

12) A water skier is being pulled by a motor boat at a constant velocity. Which statement is not true?

a) Her acceleration is exactly zero; net force is zero.

b) The frictional forces are equal but opposite to the pulling forces of the boat.

c) Net force is zero; her velocity is necessarily zero.

d) She is in dynamic equilibrium.

13) A free-body diagram

a) shows all of the forces on the body. b) shows the net force on the body.

c) shows the velocity of the body. d) shows the position of the body.