

$$F_c = ma_c$$

$$a_c = \frac{v^2}{r}$$

$$\Sigma F = F_c$$

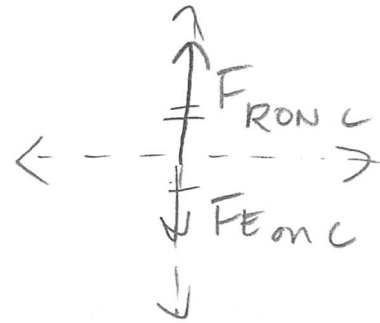
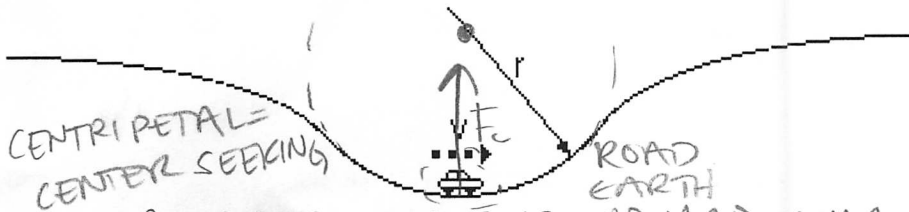
Name KEY

Date \_\_\_\_\_ Pd \_\_\_\_\_

## Unit V: Practice Quest

Assume that the car shown below is going at a constant speed

1. Construct force diagram for the car.



CENTRIPETAL FORCE IS UPWARD TOWARD CENTER OF CIRCLE

2. In what direction is the car experiencing an acceleration? Explain how you know.

ACCELERATION & NET FORCE ARE IN SAME DIRECTION, UPWARDS TOWARD CENTER OF CIRCLE.

3. Suppose the speed of the car is 11.1 m/s ( $\approx 25$  mph), its mass is 20000 kg and the radius of curvature ( $r$ ) is 35 m; What is the acceleration of the car?

$$a_c = \frac{v^2}{r} = \frac{(11.1 \text{ m/s})^2}{35 \text{ m}} = \frac{123 \text{ m}^2/\text{s}^2}{35 \text{ m}} = \boxed{3.5 \text{ m/s}^2}$$

4. What is the centripetal force acting on the car?

$$F_c = ma_c = (20,000 \text{ kg})(3.5 \text{ m/s}^2) = \boxed{70,406 \text{ N}}$$

5. How much force does the road exert on the car? Show your work!!

$$\Sigma F_y = F_{E on C} + F_{RON C}$$

$$70,406 \text{ N} = -19,6000 + F_{RON C}$$

$$\boxed{F_{RON C} = 266,406 \text{ N}}$$

$$F_{E on C} = (-9.8 \text{ N/kg})(\text{mass})$$

$$= (-9.8 \text{ N/kg})(20,000)$$

$$F_{E on C} = -196,000 \text{ N}$$

6. You receive soap on a rope as a holiday gift. While you are showering, you begin swinging it in a circle over your head. Explain what happens to centripetal force and how you know for each of the scenarios.

- a. You increase the speed you are spinning the soap

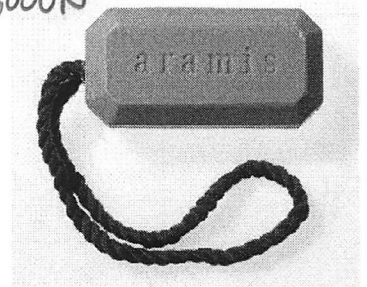
AS  $v \uparrow$ , THE  $F_c \uparrow$

- b. You decrease the mass of the soap

AS  $m \downarrow$ , THE  $F_c \downarrow$

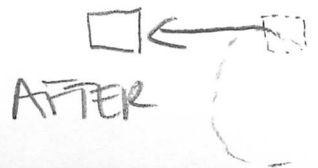
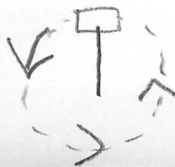
- c. You decrease the length of the string

AS  $r \downarrow$ ,  $F_c \uparrow$



7. All of a sudden the rope slips out of your hand. Draw a picture showing the path the soap would take with respect to its previous circular path.

OVERHEAD VIEW  
BEFORE  
COUNTER-CLOCKWISE



SOAP GOES  
IN A STRAIGHT  
LINE TANGENT  
TO CIRCLE