

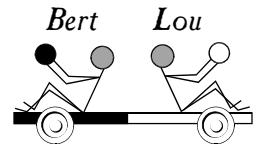
"RADIOMETER"

A DEMONSTRATION OF THERMAL ABSORPTION AND EMISSION

Name: _____ Per: _____ Date: _____

THE PUSH-CART STRONG MAN CONTEST

Two strong men, Bert and Lou, sit back to back on a cart as shown. Each is given a 7-kg bowling ball. At the count of three, each man throws his bowling ball as hard as he can. Under what conditions will the cart



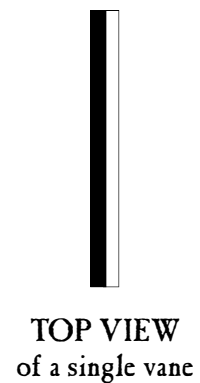
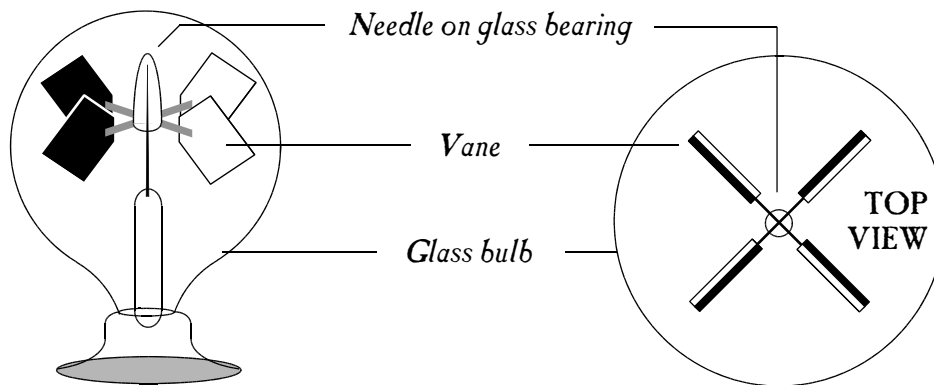
a. remain at rest?

b. roll to the right?

c. roll to the left?

THE RADIOMETER

Four vanes are attached to a freely spinning glass bearing. Each vane has a black side and a white side. The vanes and bearing are enclosed by a glass bulb.



1. What does the radiometer do?

2. How does it work?

a. It rotates as if the ___ black ___ white side were being pushed.

b. What does that side do that the other side doesn't do as well?

c. What actually pushes that side forward?

d. Sketch that interaction on the diagram of the single vane (shown on end) above.

3. What *really* powers the radiometer? Describe the results of each of the experiments.

a. A 40W incandescent showcase bulb illuminates the radiometer.

b. A “40W” compact fluorescent bulb illuminates the radiometer.

c. A transparent filter is placed between the original bulb and the radiometer.

d. An opaque filter is placed between the bulb and the radiometer.

e. What *really* powers the radiometer and how do the demonstrations above support this conclusion?

f. The so-called “radiometer” is not sensitive to radio waves and does not provide a quantitative measurement of anything. What would be a more appropriate name for this device?

4. Suppose the radiometer were illuminated while its vanes were held in place. If the radiometer were then placed in a cool environment and the vanes were released, which way will the vanes spin—if they spin at all—and why?

a. Possibilities. List at least three distinct possibilities and explain the conditions under which each could occur.

POSSIBILITY	CONDITION UNDER WHICH IT WOULD OCCUR
-------------	--------------------------------------

i.

ii.

iii.

b. Prediction. Which one do you think will happen?

c. Observations. What *actually* happened?

5. a. Which side of the vane is the better absorber (gets hotter faster while absorbing light)?

b. Which side of the vane is the better emitter (gets colder faster while radiating)?

6. Baked Radiometer. Suppose the radiometer were placed in a conventional oven and the oven were turned on (to, say, a temperature of 350°F). What would be the behavior of the radiometer in the oven? Why?