Name _____ Date _____

A New Angle on PV Efficiency

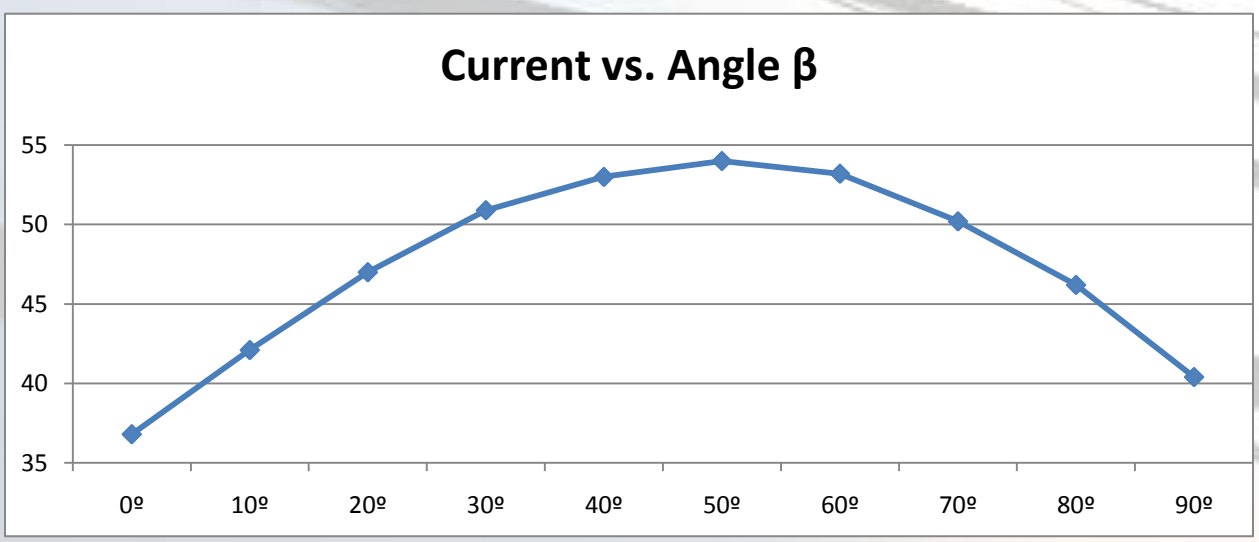
Investigation Worksheet Answers

Experiment 1: Vary the Collector Slope Beta, β

Start with the PV panel flat (0º). Record the current produced with the multimeter every 10º. Record the measurements in the table. Be sure that your base does not move at any point during the experiment.

Solar angles:	θz=50º	γ=0º							
β	**0º**	**10º**	**20º**	**30º**	**40º**	**50º**	**60º**	**70º**	**80º**	**90º**
Isc (mA)	**36.8**	**42.1**	**47**	**50.9**	**53**	**54**	**53.2**	**50.2**	**46.2**	**40.4**

Plot the current measured at each angle on the graph below. Draw a curve connecting the points.



Investigating Questions (Note: Values may be different, depending on experimental setup.)

1. At what angle did the PV panel create the highest current? Why?

   50º; When the panel is tilted up 50º from the horizontal, then it is perpendicular to the sun and this maximizes solar input.

2. What happens as a result of tilting the PV panel away from the sun?

   The current output of the panel drops by an increasing amount.

3. If you were to build a home at this location, how would you design the roof to optimize PV efficiency, with minimal installation equipment?

   (You may draw a picture to Illustrate.) The roof angle should match the latitude of the location so the average solar input for the year is maximized. But if I wanted more energy in the summer to power an air conditioner, then I would tilt the roof and panels back by 5 or 10º.

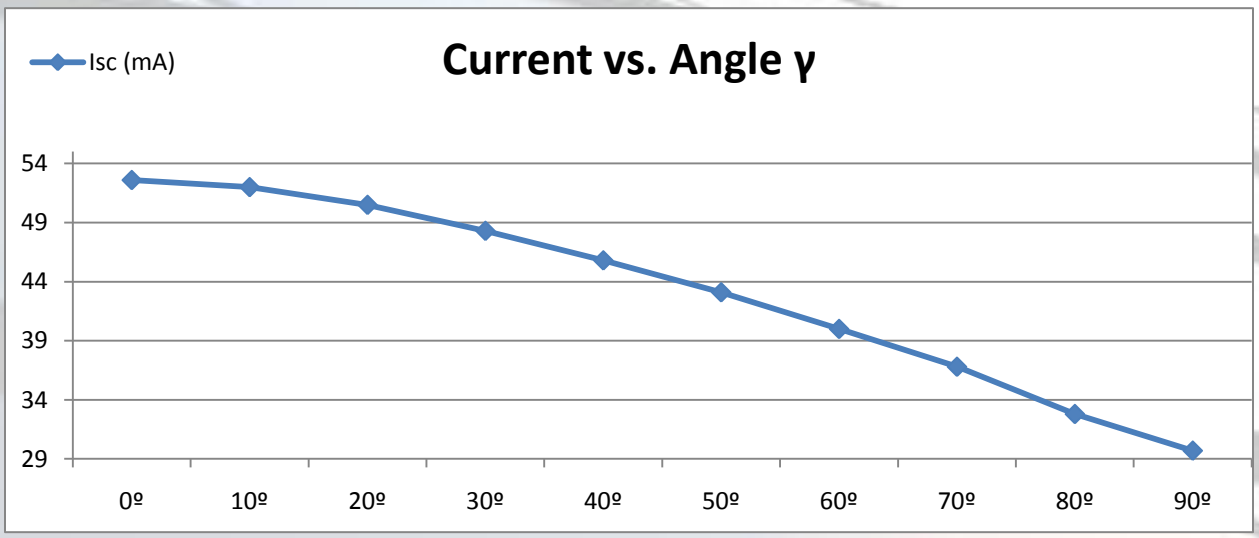
Name _____ Date _____

Experiment 2: Vary the Azimuth Angle of the Panel, γ:

Set the PV panel to the most efficient angle from Experiment 1. Start with the PV panel facing directly at the sun, 0º. (This should yield the highest reading.) Rotate the base and panel away from the sun, and record the current produced with the multimeter every 10º. Record the measurements in the table below.

Solar angles:	θz=50º	β=50º							
γ	**0º**	**10º**	**20º**	**30º**	**40º**	**50º**	**60º**	**70º**	**80º**	**90º**
Isc (mA)	**52.6**	**52**	**50.5**	**48.3**	**45.8**	**43.1**	**40**	**36.8**	**32.8**	**29.7**

Plot the current measured at each angle on the graph below. Draw a curve connecting the points.



Investigating Questions

1. Describe the effect on the current of rotating the panel away from the sun.

   The current decreases as the panel rotates away from the sun.

2. If this PV panel is mounted facing south, how efficient is it just after sunrise or before sunset compared to the efficiency at noon?

   It is about half as efficient (29.7/52.6 = .56) in the early morning and late in the evening.

3. What direction would you point your panel if you only needed to power a computer to do your homework at 4:30pm every day?

   I would point it towards the west about 30º. The best angle changes depending on the time of year, but this would be better than pointing it south if I only need energy at 4:30.

4. What could you do to increase the efficiency of the PV panel over the course of a day?

   Design a mount that slowly rotates the panel so it is always pointing directly at the sun, which makes its power output more efficient.