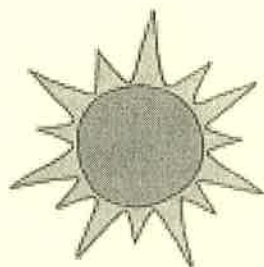Name: ___KEY___ Date: _____

Solar Azimuth and Tilt Lab

Background: Solar panels are most efficient when south facing. However, not all of the parking at City Hall is south facing. In order to accurately estimate the electrical output of the two design options you will need to know how electrical output changes with azimuth *and tilt.*

dependent

Questions: 1) How is the amount of (electricity harvested) from a solar panel affected by the tilt of the solar panel?
indep.

2) How is the amount of electricity harvested from a solar panel affected by the azimuth of the solar panel?

Hypothesis: 1) As the tilt ____ *the amt of* electricity harvested will
____ because ____

2) As the azimuth ____

Materials:

|		
Heat lamp	1 volt solar panel	Protractor
Multimeter	30 /60 triangle	
12" Ruler	45 triangle	

Procedure:

1) Set the heat lamp up so that it is facing directly towards the wall. The heat lamp represents the sun and will be 180 degrees.
2) Place the ruler on the ground perpendicular to the lamp. 0" or 12" should be aligned with the bottom of the lamp.
3) Use the triangles to align the solar panel at the correct tilt. Place the solar panel 12" from the lamp and so that it is directly aligned with the light emanating from the lamp. Repeat this process for each tilt angle (30, 45, 60,and 90 degrees).
4) Maintain the tilt angle. Use the protractor to measure the rotation. Align the appropriate triangle at the azimuths specified in the data table and use the multimeter with setting V ~ 200 to measure the voltage created at each specified tilt and azimuth. Record your data in the table below. Repeat this process for each tilt and azimuth defined in the data table.

Example lab set-up
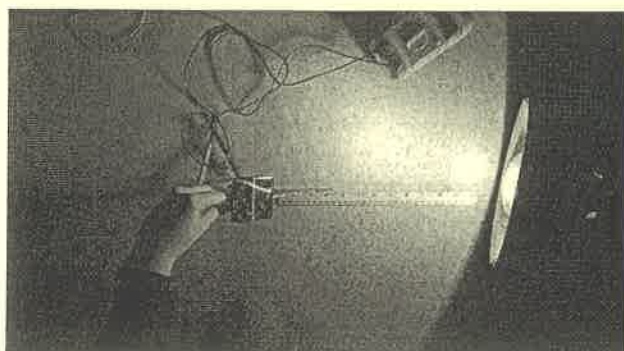
Compass rose
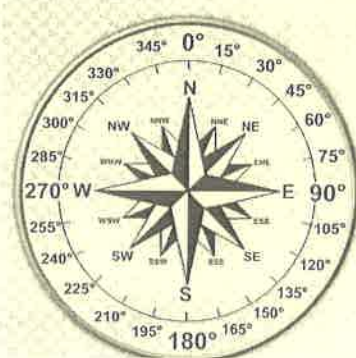
Solar Azimuth and Tilt Lab

16 KW system

Table 4. Annual solar radiation gains from a DC system 16 *(16 circled)*

Notes on the data:

Tilt	Azimuth			
	0	90	180	270
0	4.47	4.47	4.47	4.47
30	2.99	4.24	5.21	4.2
45	2.26	3.98	5.16	3.92
60	-1.65	3.64	4.83	3.58
90	1.17	2.78	3.47	2.72

Add

NE etc.

OR Remove NE etc. from other

Table 5. Percent change of solar radiation with tilt *(tilt circled)*

Notes on the data:

	Azimuth			
	N	E	S	W
Tilt	0	90	180	270
0 - 30	↓33	↓5	↑6.5	↓6
30 - 45	↓32	↓26	0.9↓	↓6.7
45 - 60	↓27	8.5↓	33↓	↓7%
60 - 90	↓29	23.6↓	28.3↓	↓24
90 - 0	↑282	60.8↑	20.8↑	↑64

? Between which tilt is there the greatest % change?

Table 6. Percent change of solar radiation with azimuth

Notes on the data:

Tilt	Azimuth			
	0-90	90-180	180-270	270-0
0	0	0	0	0
30	↑41.8	↑22.8	↓19.39	↑26.8
45	↑76.1	↑29.6	↑24.03	↑42.3
60	↑1.2	↑32.7	↑25.88	↑53.9
90	↑1.38	↑24.8	↑21.6	↑56.9

ADD

NE   SE
NW   SW