

# Solar Panel Investigation

## Practice Assessment

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### Part I

## The Plan

### 1 Working Title

the working title of the investigation

The Physics of Solar Panels

### 2 Aim

the aim of the investigation

This investigation will

1. Investigate the relationship between light intensity and voltage
2. Investigate the relationship between light intensity and current
3. Deduce the resistance of the solar panel
4. Investigate the effect of light colour and voltage

### 3 Initial Experiments

an outline of the initial experiments

For ease of recording, we want the apparatus to return values that can be accurately and quickly recorded. This means we want the equipment to return values between 0 and 999, and no more than two decimal places

- Find an appropriate initial intensity
  - First, the LCD panel was connected to power and turned on

- Then, the panel was set to maximum brightness, and the light meter attached
- The light meter was then set to a sensitivity of 2000 lux, as that gave integer values between 0 and 999
- Find appropriate voltmeter sensitivity settings
  - With the panel still turned on, the solar cell was affixed to the LCD panel, using blue tack to minimise light leak
  - Then, the panel was set to maximum brightness, and the solar cell was connected to the Multimeter
  - The multimeter was adjusted to 200m for voltage, as this sensitivity returned values between 0 and 999, and no more than two decimal places
- Find appropriate ammeter sensitivity settings
  - The multimeter was then set to  $20\mu$  for current, as this sensitivity returned values between 0 and 999, and no more than two decimal places

### 3.1 Initial Experiment Results

Table 1: Initial Experiment Results

<b>Brightness</b>	<b>Light Level</b>	<b>Ambient</b>	<b>Potential Difference</b>	<b>Current</b>
<i>[arbitrary]</i>	<i>[Lux]</i>	<i>[Lux]</i>	<i>[Millivolt]</i>	<i>[Microamp]</i>
16	248	22	45.2	4.4
0	1	23	0	0

These results show that the sensitivity settings are correct, as the maximum results are within the range of the multimeter, and give results to a suitable decimal place.

## 4 Apparatus

a list of the required apparatus

1. Solar Cell
2. RGB LCD Panel
3. Blue tack
4. Crocodile clips and cables
5. Multimeter
6. Light Meter

## **5 Initial Diagram**

a diagram of the initial experiment

## **6 Risk Assessment**

a risk assessment

## **7 Timeline**

a rough breakdown of how the two-week period of intensive practical work will be spent

## Part II

# The Report

## 8 Aim

a statement of aim

This investigation will

1. Investigate the proportionality of light intensity and voltage
2. Investigate the proportionality of light intensity and current
3. Deduce the resistance of the solar panel
4. Investigate the effect of light colour and voltage

## 9 Results

Table 2: Measuring change in Potential Difference and Current with change in Light Level

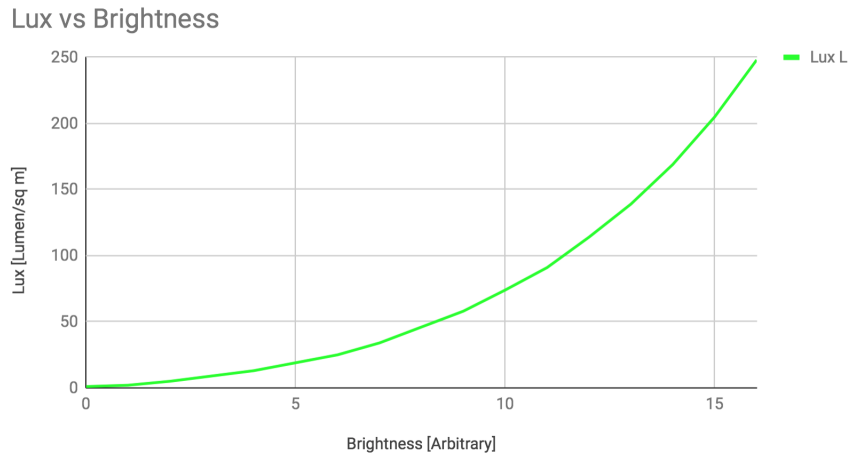
<b>Brightness</b>	<b>Light Level</b>	<b>Ambient</b>	<b>Potential Difference</b>			<b>Current</b>		
<i>[arbitrary]</i>	<i>[Lux]</i>	<i>[Lux]</i>	<i>[Millivolt]</i>			<i>[Microamp]</i>		
16	248	22	45.2	44.7	44.9	4.4	4.43	4.32
15	205	23	38	38.1	38.1	3.69	3.71	3.71
14	169	21	31.7	31.7	31.6	3.08	3.08	3
13	139	22	26.2	26.3	26.6	2.54	2.55	2.56
12	114	23	21.5	21.5	21.4	2.08	2.08	2.09
11	91	23	17.4	17.1	17.2	1.69	1.73	1.72
10	74	22	14.1	13.6	14	1.37	1.3	1.37
9	58	21	11.2	11.3	11.1	1.08	1.08	1.06
8	46	21	8.8	8.8	8.7	0.86	0.87	0.87
7	34	22	6.8	6.9	7	0.66	0.66	0.65
6	25	22	5.1	5.1	5.2	0.5	0.54	0.54
5	19	23	3.9	3.7	3	0.38	0.36	0.3
4	13	24	2.8	2.8	2.7	0.27	0.3	0.28
3	9	21	2	1.9	1.9	0.19	0.2	0.19
2	5	22	1.3	1.3	1.4	0.12	0.12	0.11
1	2	23	0.7	0.7	0.6	0.07	0.07	0.07
0	1	23	0	0	0	0	0	0

Table 3: Measuring change in Potential Difference with change in Wavelength

<b>Wavelength</b>	<b>Brightness</b>	<b>Current</b>	<b>Potential Difference</b>
<i>[nanometers]</i>	<i>[lux]</i>	<i>[microamp]</i>	<i>[millivolt]</i>
400	34	0.88	9
425	50	1.2	12.3
450	55	1.18	12.1
475	120	2.04	21
500	155	2.22	22.8
525	149	2.04	21
550	166	2.51	25.7
575	194	3.26	33.4
600	130	2.56	26.3
625	75	1.62	16.7
650	60	1.62	16.7
675	60	1.62	16.7
700	60	1.62	16.7
725	40	1.06	10.9
750	21	0.61	6.3
775	9	0.29	3

## 10 Data Processing

These results can be plotted as line graphs. First, I plotted Brightness against Light Level from Table 2, to see if the linear unit increase of Brightness corresponds to a linear increase in light level

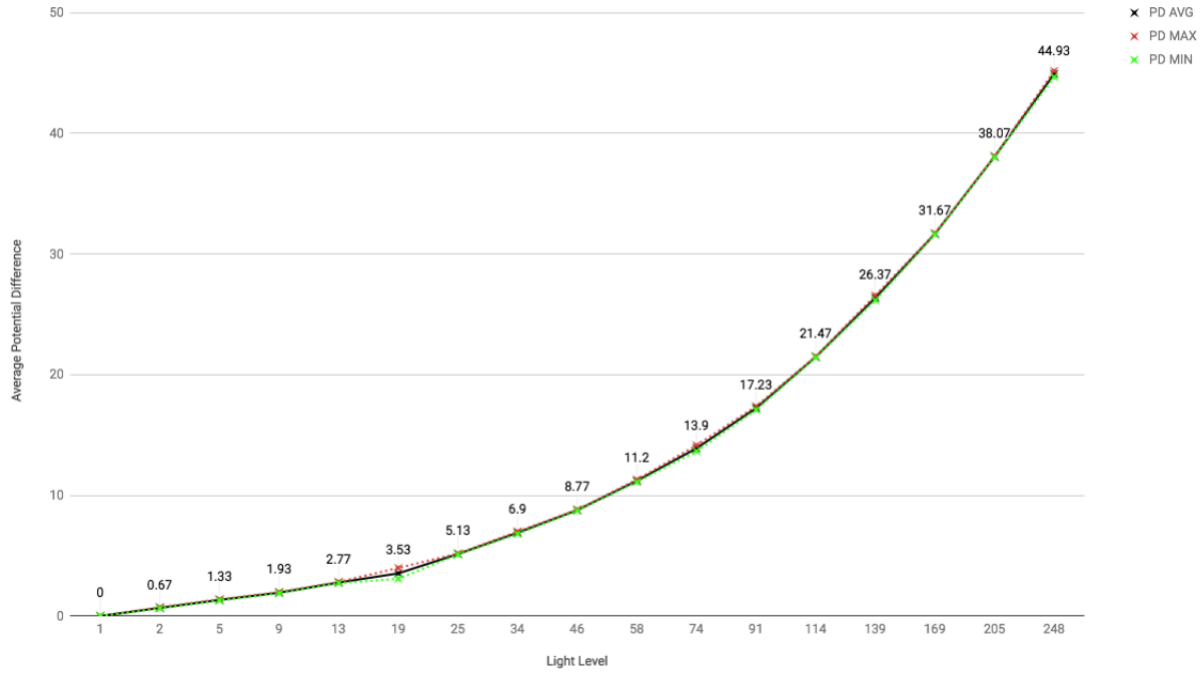


Then, as we have multiple results, I processed them to generate averages, ranges, and error bars

Table 4: Processed data showing the averages and errors

Light level	PD	CUR	PD	CUR	PD	PD	CUR	CUR
	<i>Avg</i>	<i>Avg</i>	<i>Ran</i>	<i>Ran</i>	<i>Max</i>	<i>Min</i>	<i>Max</i>	<i>Min</i>
248	44.93	4.38	0.5	0.11	45.18	44.68	4.44	4.33
205	38.07	3.7	0.1	0.02	38.12	38.02	3.71	3.69
169	31.67	3.05	0.1	0.08	31.72	31.62	3.09	3.01
139	26.37	2.55	0.4	0.02	26.57	26.17	2.56	2.54
114	21.47	2.08	0.1	0.01	21.52	21.42	2.09	2.08
91	17.23	1.71	0.3	0.04	17.38	17.08	1.73	1.69
74	13.9	1.35	0.5	0.07	14.15	13.65	1.39	1.32
58	11.2	1.07	0.2	0.02	11.3	11.1	1.08	1.06
46	8.77	0.87	0.1	0.01	8.82	8.72	0.88	0.87
34	6.9	0.66	0.2	0.01	7	6.8	0.67	0.66
25	5.13	0.53	0.1	0.04	5.18	5.08	0.55	0.51
19	3.53	0.35	0.9	0.08	3.98	3.08	0.39	0.31
13	2.77	0.28	0.1	0.03	2.82	2.72	0.3	0.27
9	1.93	0.19	0.1	0.01	1.98	1.88	0.2	0.19
5	1.33	0.12	0.1	0.01	1.38	1.28	0.13	0.12
2	0.67	0.07	0.1	0	0.72	0.62	0.07	0.07
1	0	0	0	0	0	0	0	0

Average Potential Difference vs Light Level



## 11 Summary

a word-processed summary of approximately 300 words written after completing the project, including an outline of any changes from the original plan