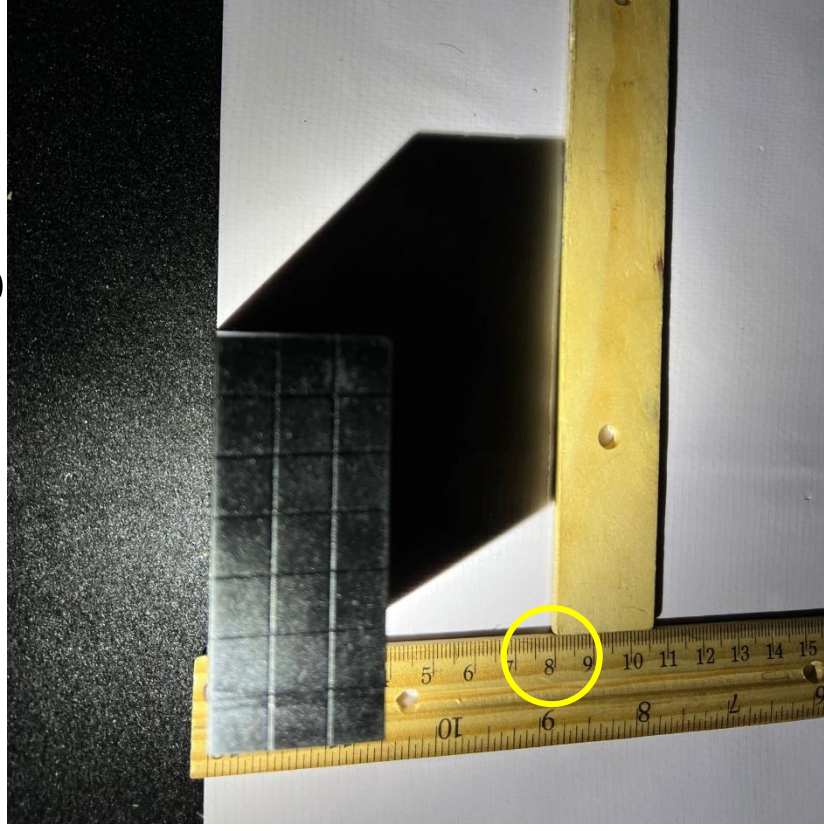


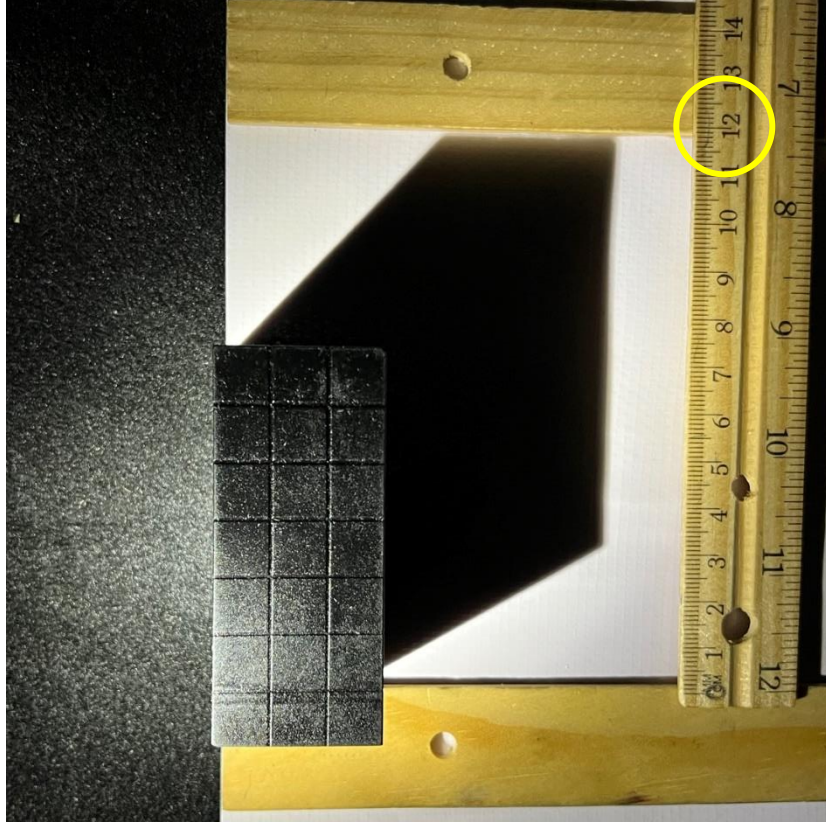
How to Measure Shadows

Shadow Length

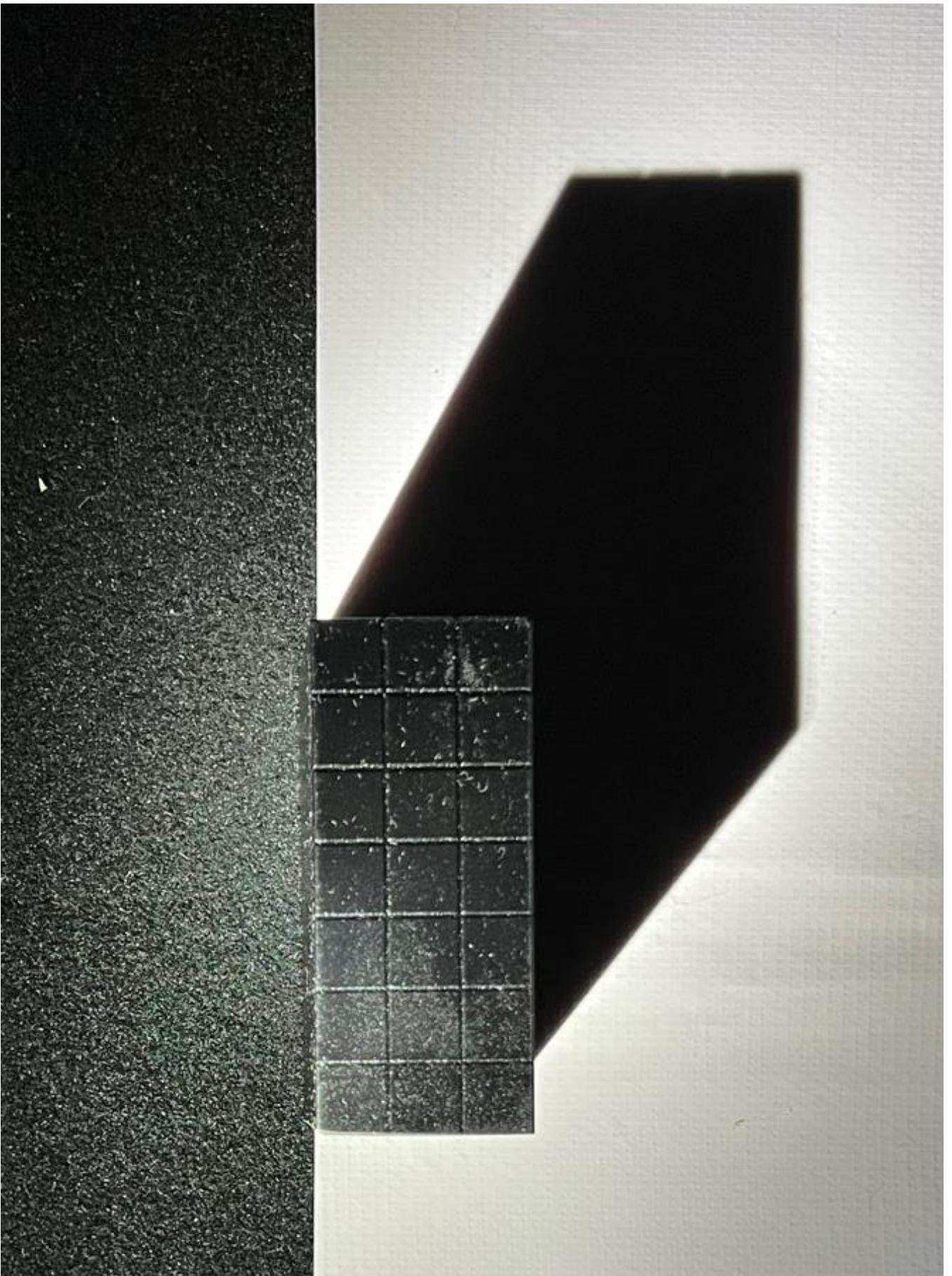


1. Line up the 0 cm mark of a ruler with the front of the block (front of the white plastic).
2. Place another ruler (numbers side down) at the edge of the shadow. This will result in the rulers making an “L”.
3. The shadow length will be the measurement from the front of the block to the upside-down ruler. (8 cm)

Shadow Width



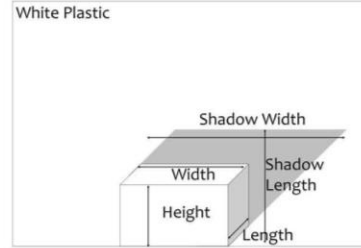
1. Place two rulers (numbers side down) perpendicular to the white plastic on either side of the shadow.
2. Line the 0 cm mark of a third ruler with the inside edge of one of the upside-down rulers. This will result in the rulers making an “H.”
3. The shadow width will be the measurement between the two number side down rulers. (12 cm)



RESULTS

Table

Fill out the table for each of your trials. For the variables that remain constant, write the value in *Trial A*. Then, draw an arrow through each box indicating the variable is a control.



Underline controls, circle changing variables, and box information about data collection.

| Variables | Trial A | Trial B | Trial C | Trial D |
|---|----------------|----------------|----------------|----------------|
| <u>Light Color:</u> | White | → | | |
| Block Height: | 5 cm | 10 cm | 3 cm | 7 cm |
| <u>Block Width:</u> | 7 cm | → | | |
| <u>Block Length:</u> | 3 cm | → | | |
| Light Distance: | 10 cm | 60 cm | 45 cm | 25 cm |
| <u>Light Height:</u> | 25 cm | → | | |
| <u>Light Angle:</u> | 30° | → | | |
| <u>Surface</u> <small>Other Variable</small> | White Plastic | → | | |
| <u>Block Material</u> <small>Other Variable</small> | Plastic | → | | |
| Predictions | Trial A | Trial B | Trial C | Trial D |
| Put an "S" in the trial that will give the smallest shadow length/width and a "B" in the trial that will give the biggest shadow length/width. | S | B | | |
| Data | Trial A | Trial B | Trial C | Trial D |
| Measurements: <div style="border: 1px solid black; padding: 5px; display: inline-block;"> Shadow Length Or Width <small>(Circle one)</small> </div> | 5 cm | 30 cm | 7 cm | 10 cm |

The independent variable(s) is(are) the changing variable(s) and the dependent variable is the measurement.

NOTES ON PRESENTATIONS

What variables affect shadows?

Subgroup 1

| | | | | |
|--|--|--|--|--|
| Changing Variable: | | | | |
| Shadow Length Width (cm): <small>Circle One</small> | | | | |

Summary: _____

Subgroup 2

| | | | | |
|--|--|--|--|--|
| Changing Variable: | | | | |
| Shadow Length Width (cm): <small>Circle One</small> | | | | |

Summary: _____

Subgroup 3

| | | | | |
|--|--|--|--|--|
| Changing Variable: | | | | |
| Shadow Length Width (cm): <small>Circle One</small> | | | | |

Summary: _____

Subgroup 4

| | | | | |
|--|--|--|--|--|
| Changing Variable: | | | | |
| Shadow Length Width (cm): <small>Circle One</small> | | | | |

Summary: _____

Subgroup 5

| | | | | |
|--|--|--|--|--|
| Changing Variable: | | | | |
| Shadow Length Width (cm): <small>Circle One</small> | | | | |

Summary: _____

Subgroup 6

| | | | | |
|--|--|--|--|--|
| Changing Variable: | | | | |
| Shadow Length Width (cm): <small>Circle One</small> | | | | |

Summary: _____

Subgroup 7

| | | | | |
|--|--|--|--|--|
| Changing Variable: | | | | |
| Shadow Length Width (cm): <small>Circle One</small> | | | | |

Summary: _____

Subgroup 8

| | | | | |
|--|--|--|--|--|
| Changing Variable: | | | | |
| Shadow Length Width (cm): <small>Circle One</small> | | | | |

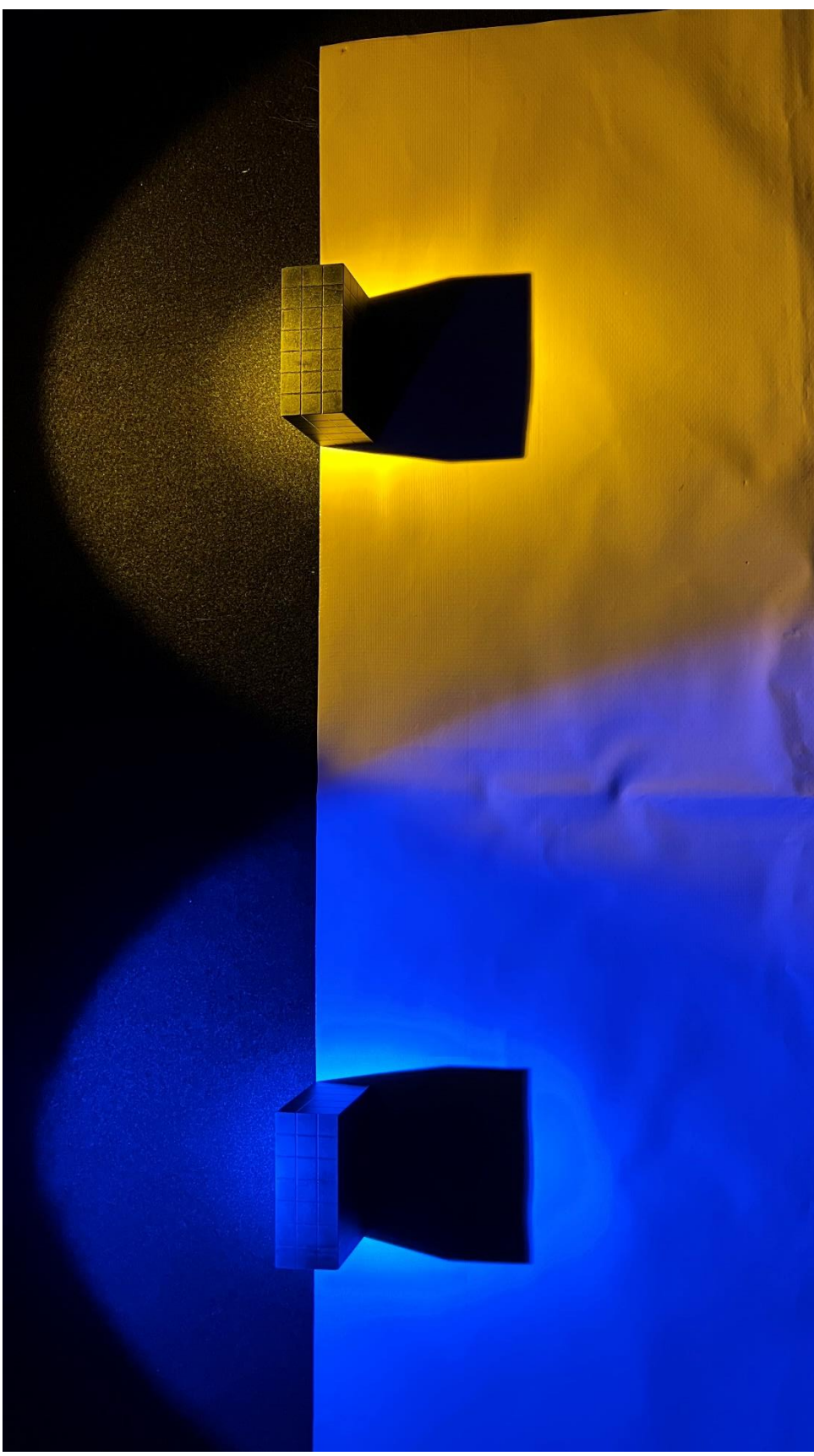
Summary: _____

Subgroup 9

| | | | | |
|--|--|--|--|--|
| Changing Variable: | | | | |
| Shadow Length Width (cm): <small>Circle One</small> | | | | |

Summary: _____

Experiment 1: Effects of Changing Light Color



Light Color: Blue

Light Height: 20 cm

Light Distance: 10 cm

Light Angle: 90°

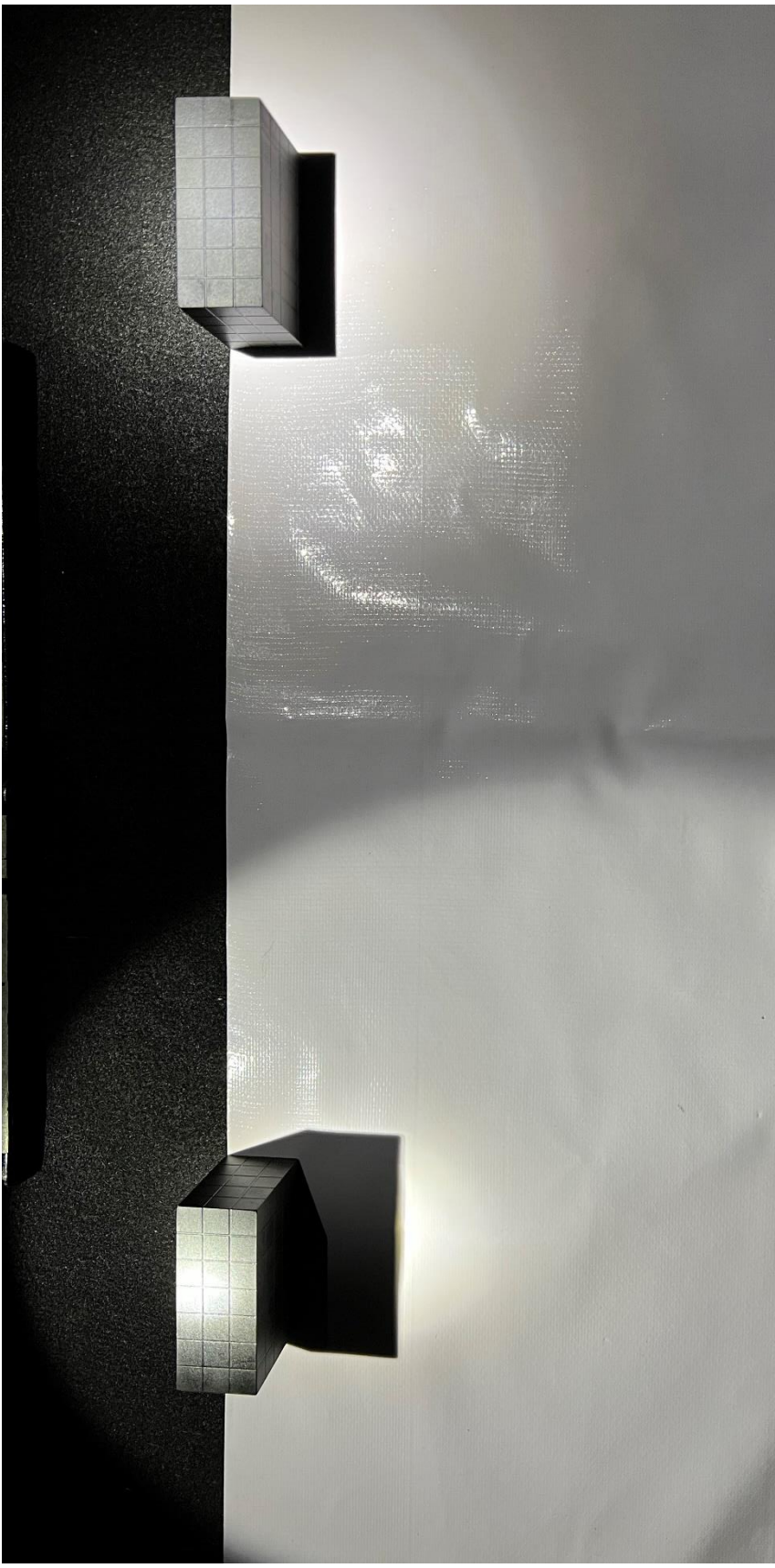
Light Color: Orange

Light Height: 20 cm

Light Distance: 10 cm

Light Angle: 90°

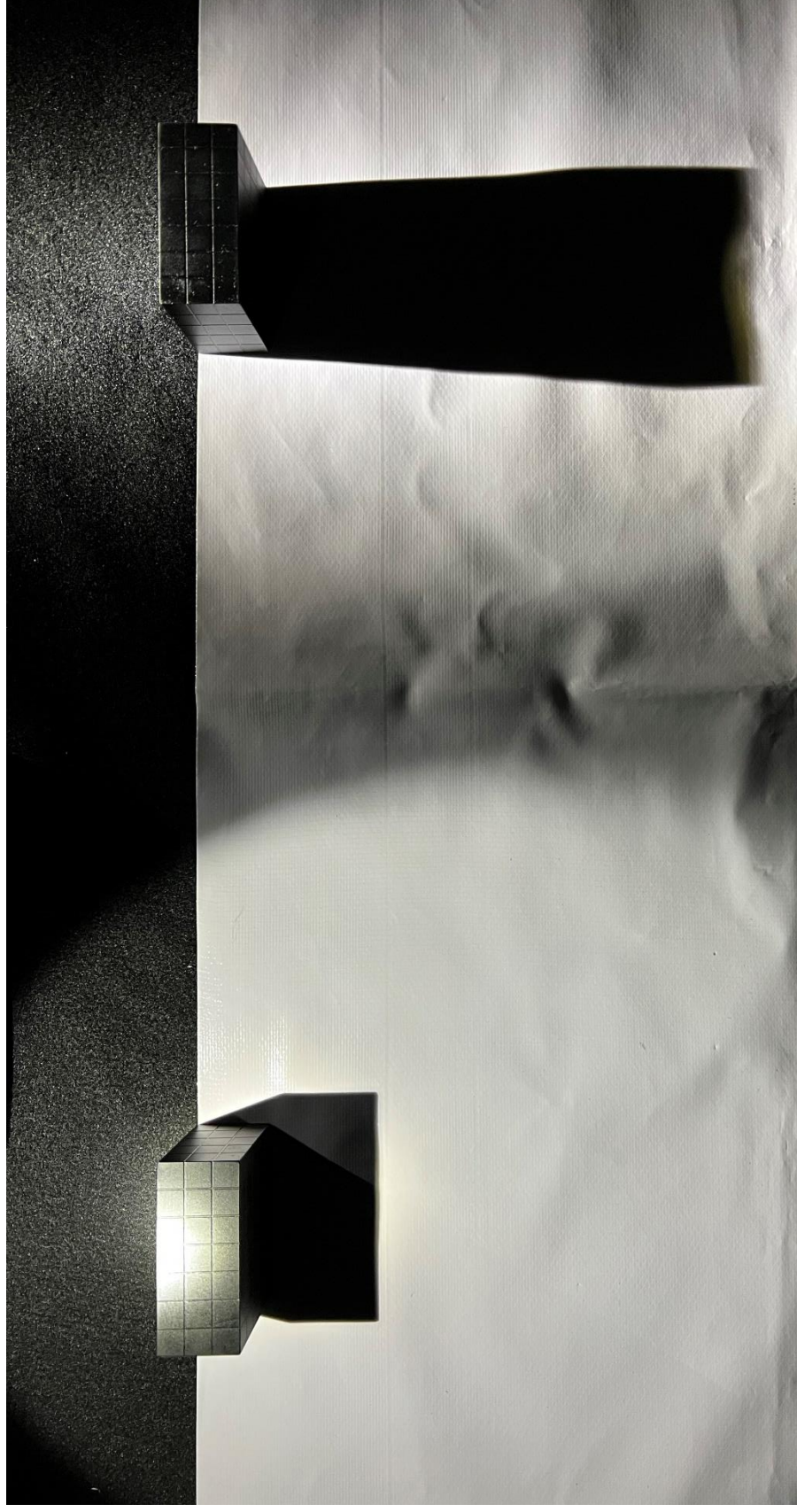
Experiment 2: Effects of Changing Light Height



Light Color: White
Light Height: 20 cm
Light Distance: 10 cm
Light Angle: 90°

Light Color: White
Light Height: 60 cm
Light Distance: 10 cm
Light Angle: 90°

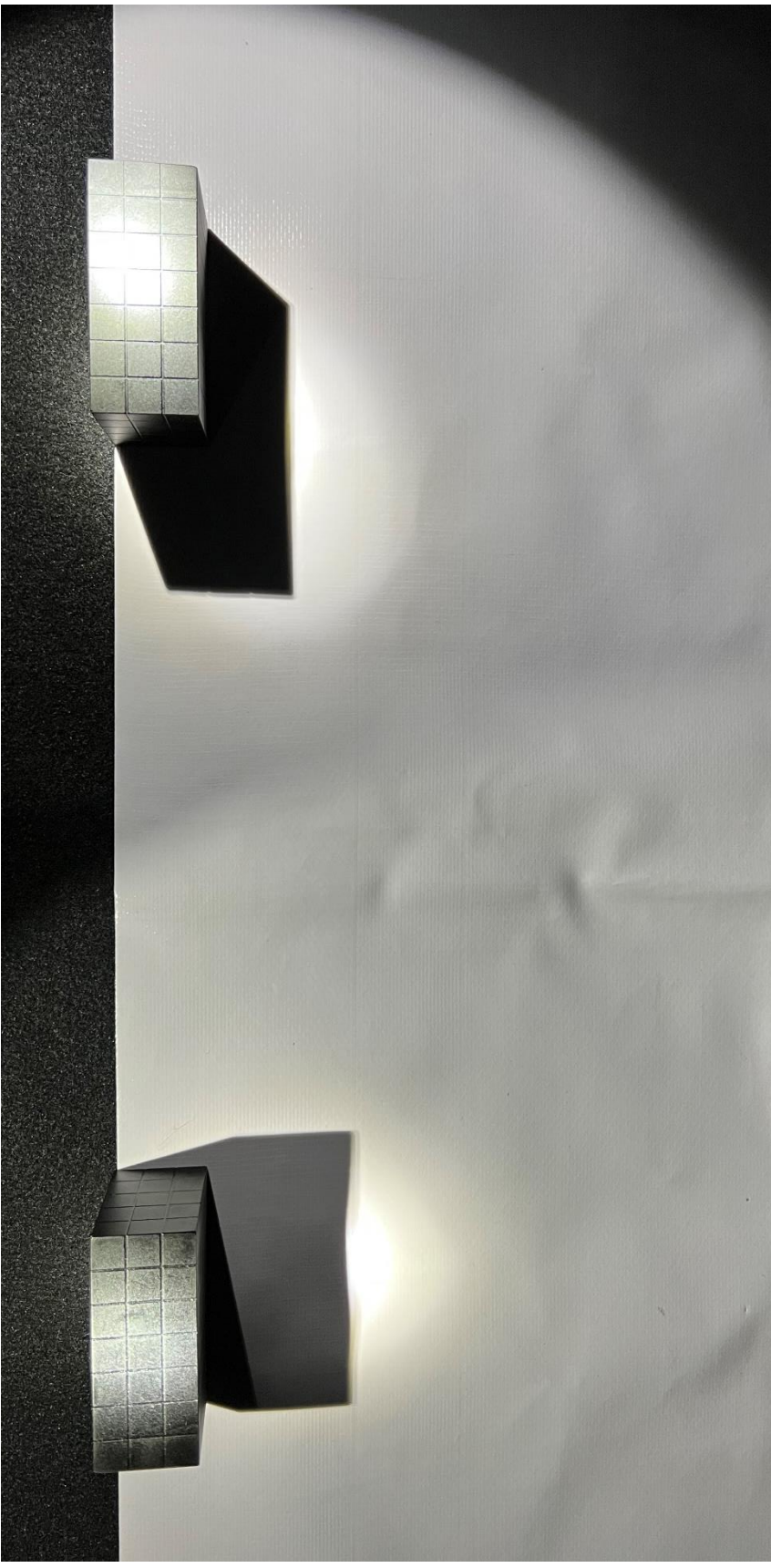
Experiment 3: Effects of Changing Light Distance



Light Color: White
Light Height: 20 cm
Light Distance: 10 cm
Light Angle: 90°

Light Color: White
Light Height: 20 cm
Light Distance: 60 cm
Light Angle: 90°

Experiment 4: Effects of Changing Light Angle



Light Color: White
Light Height: 20 cm
Light Distance: 10 cm
Light Angle: 90°

Light Color: White
Light Height: 20 cm
Light Distance: 10 cm
Light Angle: 150°

How Shadow Length Varies in the Winter

| Time | Shadow Length |
|----------|---------------|
| 12:00 am | 0 |
| 2:00 am | 0 |
| 4:00 am | 0 |
| 6:00 am | 0 |
| 7:00 am | 5 |
| 8:00 am | 2 |
| 10:00 am | 0.5 |
| 12:00 pm | 0 |
| 2:00 pm | 0.5 |
| 4:00 pm | 2 |
| 5:00 pm | 5 |
| 6:00 pm | 0 |
| 8:00 pm | 0 |
| 10:00 pm | 0 |
| 12:00pm | 0 |

How Shadow Length Varies in the Summer

| | Shadow Length |
|----------|---------------|
| 12:00 am | 0 |
| 2:00 am | 0 |
| 4:00 am | 0 |
| 6:00 am | 5 |
| 8:00 am | 2 |
| 10:00 am | 1 |
| 12:00 pm | 0.5 |
| 1:00 pm | 0 |
| 2:00 pm | 0.5 |
| 4:00 pm | 1 |
| 6:00 pm | 2 |
| 8:00 pm | 5 |
| 10:00 pm | 0 |
| 12:00pm | 0 |