It’s HOT in Here! Whew!

Solar Collector

**Background Information**: Sunlight travels through air, clear glass, and plastic. When it strikes other materials, some is reflected and some is absorbed. The absorbed light energy changes into heat.

**Questions to ponder:** How do different colors absorb different amounts of solar heat? How do insulators reduce the amount of heat materials absorb?

**Materials**:

4 Zip-Lock Baggies gallon sized Graduated cylinder

Brick to act as prop to hold up baggies 4 Thermometers

2 black pieces of paper Sun shield of your choice

1 corrugated cardboard base for insulation

Water Timer

**Procedures**: Design a procedure to test water temperature in 4 bags (shade, full sun, black paper background full sun, black paper background, full sun, insulated) Make sure to label each bag A-D and use the following descriptions for each bag. A-

Write your groups procedures below:

Data Table:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Baggie** | **Start Temp** | **5 min** | **10 min** | **15 min** | **20 min** | **25 min** |
| Bag A |  |  |  |  |  |  |
| Bag B |  |  |  |  |  |  |
| Bag C |  |  |  |  |  |  |
| Bag D |  |  |  |  |  |  |

Calculate the heat gain for all collectors. Heat gain equals the final temperatures minus the starting temperatures, multiplied by 2. This heat gain is in kilocalories.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Baggie | Final temp | - | Start temp | = |  | X2 | \_\_\_\_\_\_\_ Kcal Heat gain |
| Bag A |  | - |  | = |  | 2 |  |
| Bag B |  | - |  | = |  | 2 |  |
| Bag C |  | - |  | = |  | 2 |  |
| Bag D |  | - |  | = |  | 2 |  |

**Conclusion**:

1. Bag A gained heat from the environment. What was the source of this heat?
2. Bag B gained heat from the environment AND from direct sunlight. How much heat did bag B gain from direct sunlight? Explain how you found the answer. (hint: subtract the heat gain from bag A from the heat gain for bag B)
3. Without the black background, how much heat would bags C and D have gained? Explain.
4. How much more heat did the black base help the water gain? Explain how you found the answer using data. (Subtract the heat gain for bag B from the heat gain for bag C)
5. How much more heat was gained because of the insulation? Explain using data. (Subtract the heat gain for bag C from the heat gain for bag D”
6. Which bag gained heat at the fastest rate? Explain.

**Draw Conclusions**:

1. What would happen if you placed your bag of water on aluminum foil painted black (or white or red)?
2. If you were out camping, how could you use the sun to help you take a warm shower?