Name: **Date:** **Class:**

Insulator Design Challenge Worksheet Answer Key

Your task is to design and build an insulator with a paper cup and other materials to prevent your ice cube from melting and keep your water colder than the other groups in your class!

Introduction and Design	
1.	Which stops or prevents heat from being transferred? Circle one: Conductor OR Insulator
2.	What do you need to do to prevent the ice from melting and keep your water colder? (Word bank: heat, outside, inside, energy) **Sentence starter: To stop the ice from melting and to keep the water cold, we need…** To stop the ice from melting and to keep the water cold, we need to stop heat from coming into our cup because once the heat enters our cup it will be added to the ice cube or water and increase the temperature.
3.	How will we measure which group's insulator is the most successful? (Word bank: temperature, thermometer, cold, hot) **Sentence starter: We will know which group has the best insulator by…** We will know which group has the best insulator by using a thermometer, a timer, and our sense of sight. The longer the ice cube takes to melt, the longer the water stays cold, and the more successful our insulator is. Whichever group's ice cube stays the most frozen or whose water temperature is the lowest has the most successful insulator.
4.	What materials will your group use to build your paper cup insulator? **Sentence starter: To build our paper cup insulator, our group will use…** Answers will vary.
5.	Design (draw a diagram) to plan your paper cup insulator below. Label in which direction the heat would flow and which materials you plan to use. Drawings will vary.
6.	Why did you design your insulator like this, and with these materials? Explain. Answers will vary.

Name: **Date:** **Class:**

Testing
Trial 1: Initial water temperature (°F):_____ Final water temperature (°F): _____ Time passed: _____ At this time, how much of your ice cube is left? _____(g)
Trial 2: Initial water temperature (°F):_____ Final water temperature (°F): _____ Time passed: _____ At this time, how much of your ice cube is left? _____(g)

Troubleshooting and Redesign Notes
After testing our insulator, one problem that we found is… Answers will vary. To try to solve this problem, we changed … Answers will vary.

Challenge Results
My group members: _____ Time passed: _____ At this time, how much of your ice cube is left? _____(g) Initial water temperature (°F):_____ Final water temperature (°F): _____ Materials used: Answers will vary.
Members of one other group: _____ Time passed: _____ At this time, how much of your ice cube is left? _____(g) Initial water temperature (°F):_____ Final water temperature (°F): _____ Materials used: Answers will vary.

Name: **Date:** **Class:**

Conclusion

How did the **winning group** keep their ice cube frozen and water colder the longest?
Word bank: (conductor, insulator, heat, materials, outside, inside, transfer)

The winning group's insulator was built with Answers will vary.

My group's insulator was different because Answers will vary.

Reflection

Answer three of the five following questions to guide you in writing a reflection about your experience during this engineering project.

1. If we had more time, **how would you continue to change** or test your insulator?
2. **How was your experience** doing engineering in this project?
3. What did you **like** and/or what did you **dislike**?
4. What is **something you learned about engineering or yourself** in this project?
5. How was it **working with your lab partner** on this project?

Sentence starters:

1. If we had more time we would …
2. My experience doing this project was…
3. What I liked and disliked was …
4. One thing I learned about engineering was …
5. Working with my lab partner was …

My Answer: Answers will vary.