

THE FROSTY CAN

A. Question: What are the conditions for frost formation?

B. Materials Needed:

1. A tin can (from which the label is taken off).
2. Crushed ice and coarse table salt.
3. A thermometer and stirrer.

C: Procedure:

1. Fill the tin can, from which the label is taken off, with crushed ice and a handful of salt.
2. Place the thermometer in the can and stir with a separate stirrer.
3. Have students read off the temperature every half minute.
4. Have other students observe carefully the outside surface of the can and indicate to those observing the temperature, the moment that they observe frost formation (when the shiny surface gets dull).
5. A further extension of the activity might be the graphing of the data of observed temperature and the time elapsed.

D: Anticipated Results:

Students should observe frost formation outside the tin can.

E: Thought Questions for Class Discussion:

1. What is the purpose of the salt mixed in with the crushed ice?
2. How low does the temperature inside the can have to be in order to form frost on outside?
3. What do you expect the temperature of the ice and salt will do after the moment that frost is formed?
4. After observing the shape of the graph after frost formation, what is the process of frost formation doing: absorbing or giving off heat?
5. Where does the frost come from; what is needed in the air?

F: Explanation:

The salt in the crushed ice makes the ice melt in the beginning, but brings the temperature down below the normal freezing point of water (0°C). The moisture in the air, hitting the cold surface of the can, turns into solid state (frost) without passing the liquid state: **sublimation**. This process, just like condensation, is giving off heat, which is why the graph levels off after frost formation.