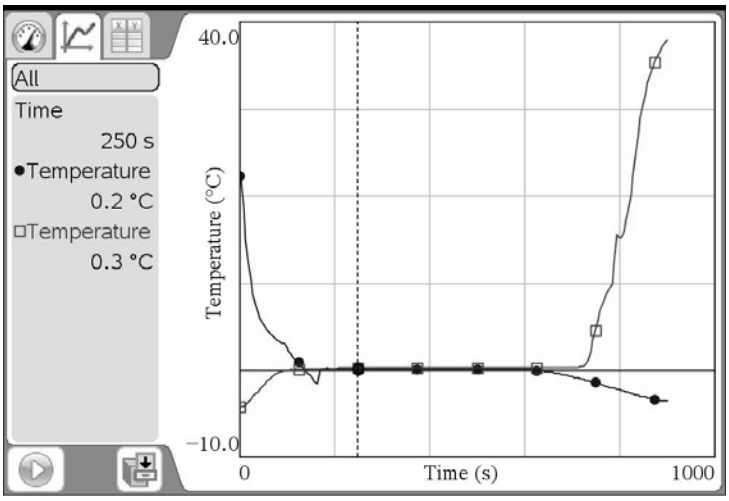
TEACHER INFORMATION

Freezing and Melting of Water

1. Editable Microsoft Word versions of the student pages and pre-configured TI-Nspire files can be found on the CD that accompanies this book. See *Appendix A* for more information.
2. This entire experiment requires a full 45–50 minute period.
3. The freezing and melting temperatures of water should be within 0°C ± 0.2°C using sensors.
4. Test tubes size 20 × 150 mm work well. Sizes 25 × 150 mm and 18 × 150 mm work, too.
5. A water sample size of 5 mL works well. Larger samples will take more time than is recommended in this procedure.
6. As shown in the first graph in the Sample Results, many of the samples will supercool. Stirring will bring the super-cooled water to the melting temperature plateau.

SAMPLE RESULTS



Typical graph for freezing (●) *and melting* (□) *of water.*

Freezing temperature of water (°C)	0.02°C
Melting temperature of water (°C)	0.03°C

ANSWERS TO QUESTIONS

1. The water temperature stayed constant near 0°C during freezing and melting.

2. The expected value is 0°C for both the freezing and melting temperatures, but answers may vary slightly.

3. The freezing temperature of water and melting temperature of ice are about the same.

4. a. Average kinetic energy decreases with the temperature decrease at the beginning and end of Part I.
   b. Since there is no temperature change during freezing, average kinetic energy remains constant.
   c. Average kinetic energy increases with the temperature increase at the beginning and end of Part II.
   d. Since there is no temperature change during melting, average kinetic energy is constant.

5. Potential energy decreased during freezing. Potential energy increased during melting.