Teacher Answer Key

Case Study

1. They measured higher conductivity and chloride ion levels in the roadside stream compared to the park creek, showing more dissolved ions linked to salt runoff.

2. Salt improves road safety by lowering the freezing point and helping melt ice, but runoff carries ions into streams, where they can stress freshwater organisms and alter water chemistry.

Multiple Choice

1. A

2. B

3. D

Matching

1-B, 2-A, 3-E, 4-C, 5-D

Fill-in-the-Blank

1) ions, 2) depression, 3) conductivity

Short Answer (Sample Responses)

Q1: $CaCl_2$ produces three ions per formula unit (Ca^{2+} and $2Cl^-$), creating more dissolved particles and a stronger freezing point depression, so it remains effective at lower temperatures than NaCl.

Q2: Benefit: safer driving conditions, fewer crashes on icy roads. Drawback: increased salinity in soils and streams, which can harm plants, fish, and other aquatic life or affect drinking water quality.

Q3: Operational: pre-wet salt to create brine, calibrate spreaders, or target high-risk areas instead of blanket coverage. Material: switch some applications to brine with additives (like beet juice) to reduce total salt use, or combine limited salt with sand for traction.