What Are Melting, Boiling, and Sublimation?

Worksheet

Melting is solid liquid at melting point. Boiling is liquid gas at boiling point. Sublimation is solid gas without melting. All three are endothermic and occur at fixed temperatures for each substance.

Questions

1. When does sublimation occur?

A) Liquid to solid
B) Solid to liquid
C) Solid to gas
D) Gas to liquid

2. Which requires more energy: melting ice or boiling water?

A) Melting (334 kJ/kg)
B) Boiling (2256 kJ/kg for water)
C) They require equal energy
D) It depends on the vessel

3. Can water boil at 50C?

A) No, only at 100C
B) Yes, at lower pressure
C) Only in a vacuum
D) Only at high pressure

4. What is an example of sublimation?

A) Ice melting
B) Water boiling
C) Dry ice disappearing
D) Steam condensing

5. Ice melts at 0C. How much energy is released when 1 kg refreezes?

6. Water boils at 100C at sea level. Is it possible to boil water at 50C?

7. Dry ice (solid CO) sublimes. Why doesn't it melt first?

8. Define: What is melting?

9. Define: What is boiling?

10. Define: What is sublimation?

Answer Key

1. C) Solid to gas - Sublimation is solid gas directly, skipping the liquid phase.

2. B) Boiling (2256 kJ/kg for water) - Boiling requires ~6.8 times more energy than melting for water.

3. B) Yes, at lower pressure - Boiling point depends on atmospheric pressure. Lower pressure lower boiling point.

4. C) Dry ice disappearing - Dry ice (solid CO) sublimes - it converts directly to CO gas without melting.

5. Melting is solid liquid (absorbs heat). Refreezing is liquid solid (releases heat). Latent heat of fusion for ice 334 kJ/kg. Energy released = 1 kg 334 kJ/kg = 334 kJ

6. At lower atmospheric pressure, water boils at lower temperatures. In a vacuum or high altitude, water boils below 100C. So yes, it's possible if pressure decreases.

7. CO's triple point is at 56.6C and 5.1 atm. At normal pressure (1 atm), solid CO cannot be liquid. So it bypasses the liquid stage and sublimates directly to gas.

8. Melting is the phase change from solid to liquid at the melting point, absorbing heat energy.

9. Boiling is the phase change from liquid to gas at the boiling point, forming bubbles throughout the liquid.

10. Sublimation is the direct phase change from solid to gas without a liquid intermediate.