Solids, Phase Behavior, and Materials Energetics

g11_u07_w27

Purpose and boundary

Use original fictional phase diagrams and materials tables only. No heating, pressurizing, material handling, device operation, or safety decision is requested.

Targets: I can interpret a stated phase diagram, compare structure-energy models, and limit a materials claim. **Vocabulary:** phase boundary, triple point, critical point, lattice, network solid, metallic solid. **Prerequisites:** particle models, energy transfer, pressure/temperature axes, bonding.

For items 4–12 use fictional diagrams with temperature on the horizontal axis and pressure on the vertical axis. Diagram labels are supplied model conventions, not operating instructions.

1. What does a phase boundary represent on a stated diagram?

2. Why does a diagram point represent stated conditions rather than every property of a material?

3. Distinguish a phase transition from a chemical reaction.

4. A fictional point is labeled in the liquid region. What phase does the model assign?

5. A path crosses a solid-liquid boundary at constant pressure. What model change occurs?

6. A path crosses a liquid-gas boundary at constant temperature by lowering pressure. What model change occurs?

7. Define a triple point in a stated phase-model diagram.

8. Define a critical point in a stated phase-model diagram.

9. Why do axes and units need to be checked before interpreting a phase region?

10. Explain why a phase diagram does not provide a heating procedure.

11. A fictional table labels X as ionic lattice, Y as molecular solid, Z as metallic solid, and W as network solid. Name one dominant model feature for each.

---

12. Which cards can support mobile-electron model reasoning? State the limit.

---

13. Why can a lattice-energy comparison support a trend without providing an exact melting temperature?

---

14. A student says stronger bonding always means a safer material. Correct the unsupported claim.

---

15. Two cards have equal formula mass but different solid-type labels. Name one property model that could differ.

---

16. Explain why defects or packing can matter even when bonding labels match.

---

17. A fictional phase diagram conflicts with a simple intermolecular-force prediction. State a useful next question.

---

18. Identify one uncertainty or missing condition that limits a materials-property comparison.

---

19. Write one supported and one unsupported claim from a network-solid label.

---

20. Write a two-sentence bounded conclusion from a fictional phase/solid-type table.
