

Properties of Materials

Metal Processing

Phase Diagrams

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2.7 Queens Building

Preview

Intended Learning Outcomes

Understanding	How phase diagrams reveal information about alloys of use during processing and treatment.
Skills	Predicting the phases present in alloys along with their compositions and fractions.
Values	Recognising the impact of phases on the properties of alloys.

- Introduction
 - This is a multicohort subject
 - Think of yourselves as ENGINEERS, not SPECIALISTS
- Today:
 - Concept of phases, full/partial mixing
 - Reading phase diagrams
 - Intermediate phases

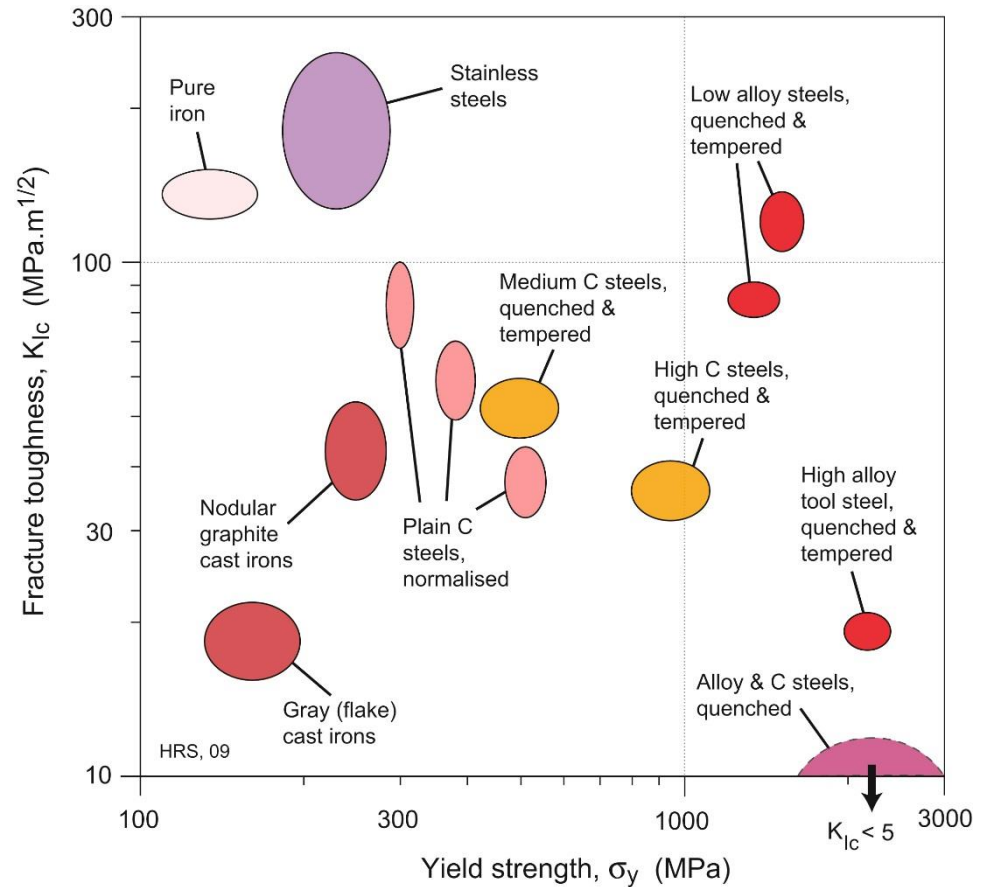
Processing Metals



Processing Metals



HEAT
+
DEFORM

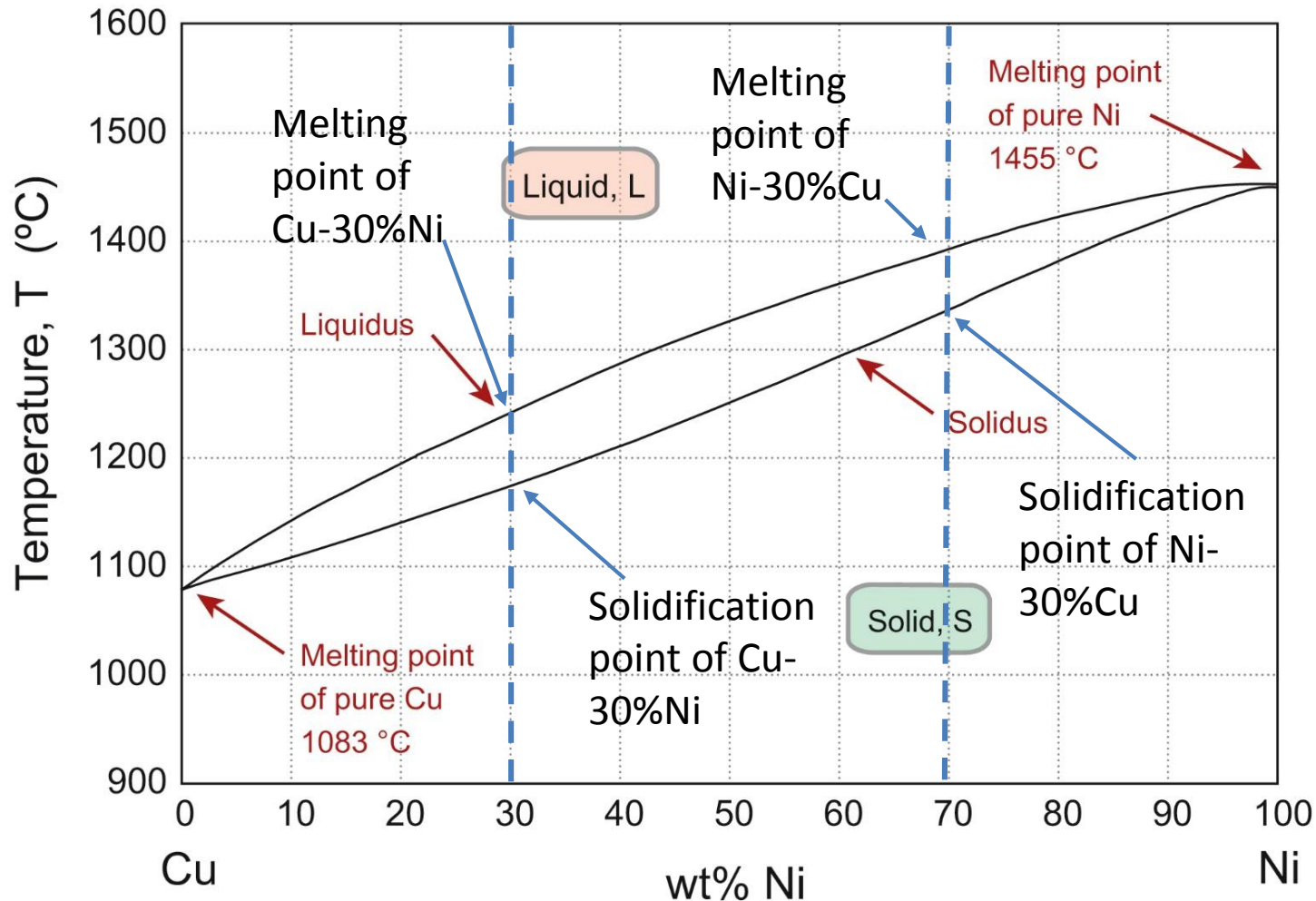


Understanding this diagram needs phase diagrams (thermodynamics) and transformation diagrams (kinetics)

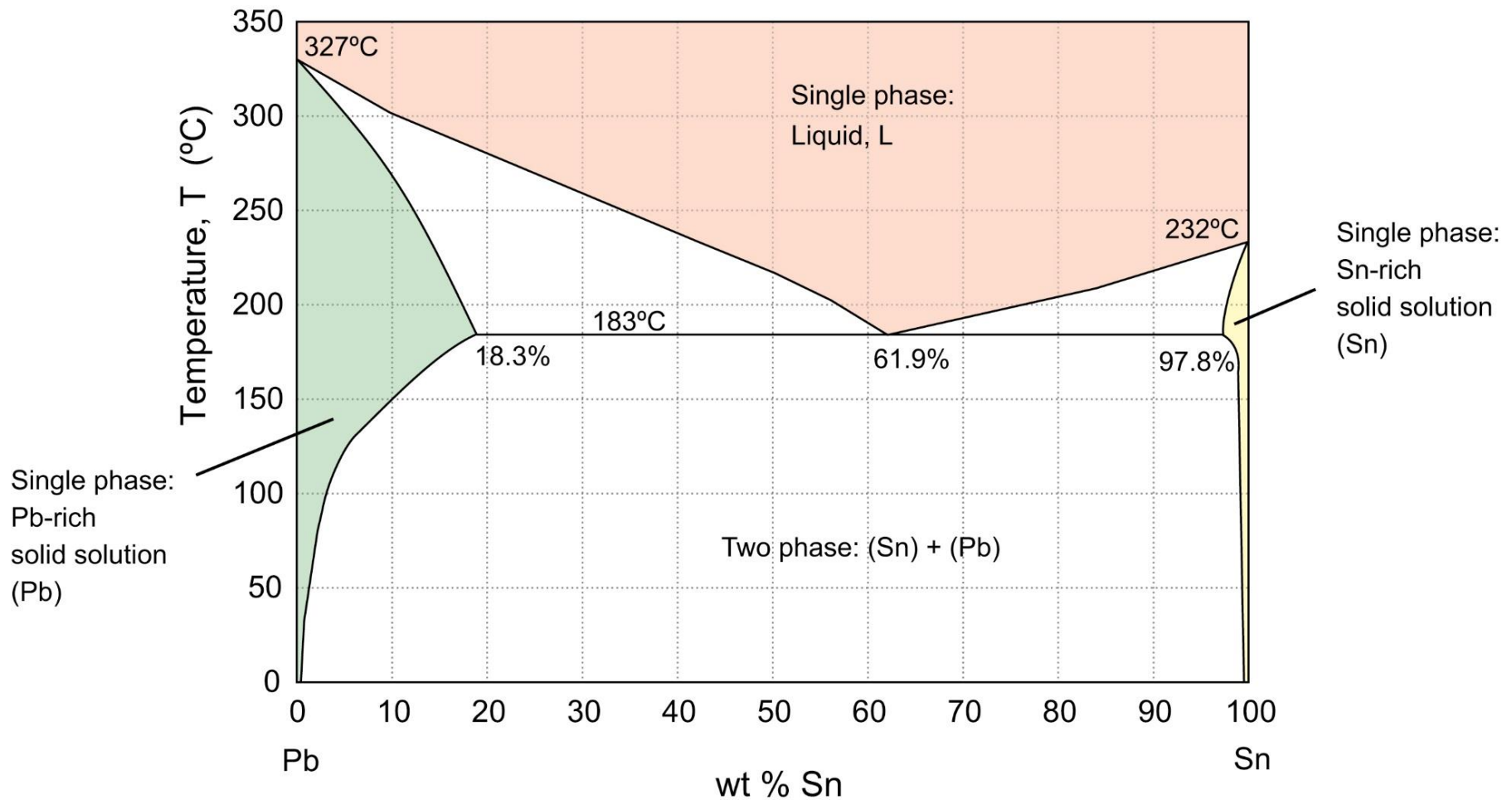
Full Mixing

Phase diagrams are maps of what phase (liquids, solids, mixtures) exist at some

Varies \rightarrow temperature and composition \leftarrow Fixed



Partial Mixing (Solid)





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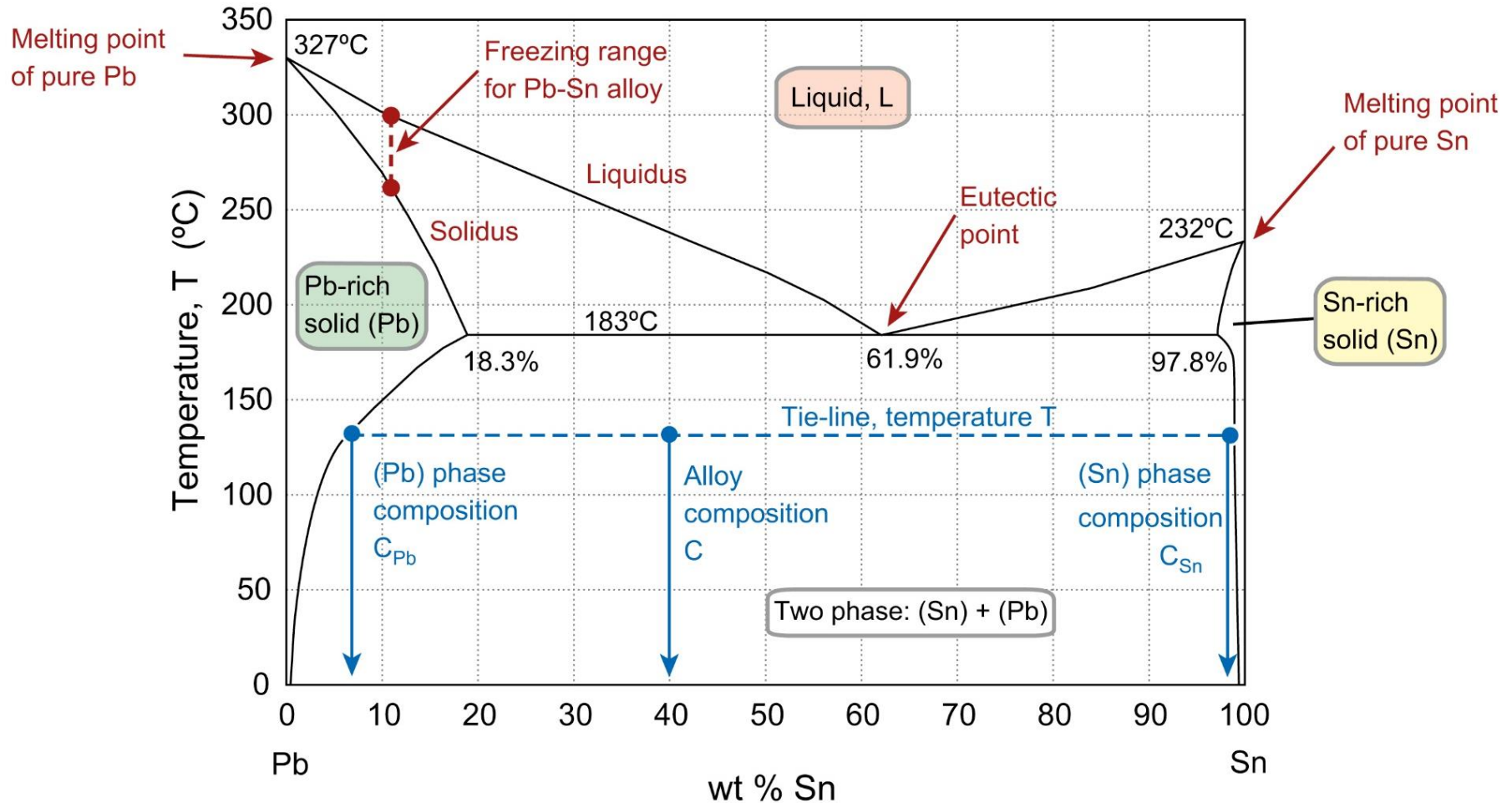
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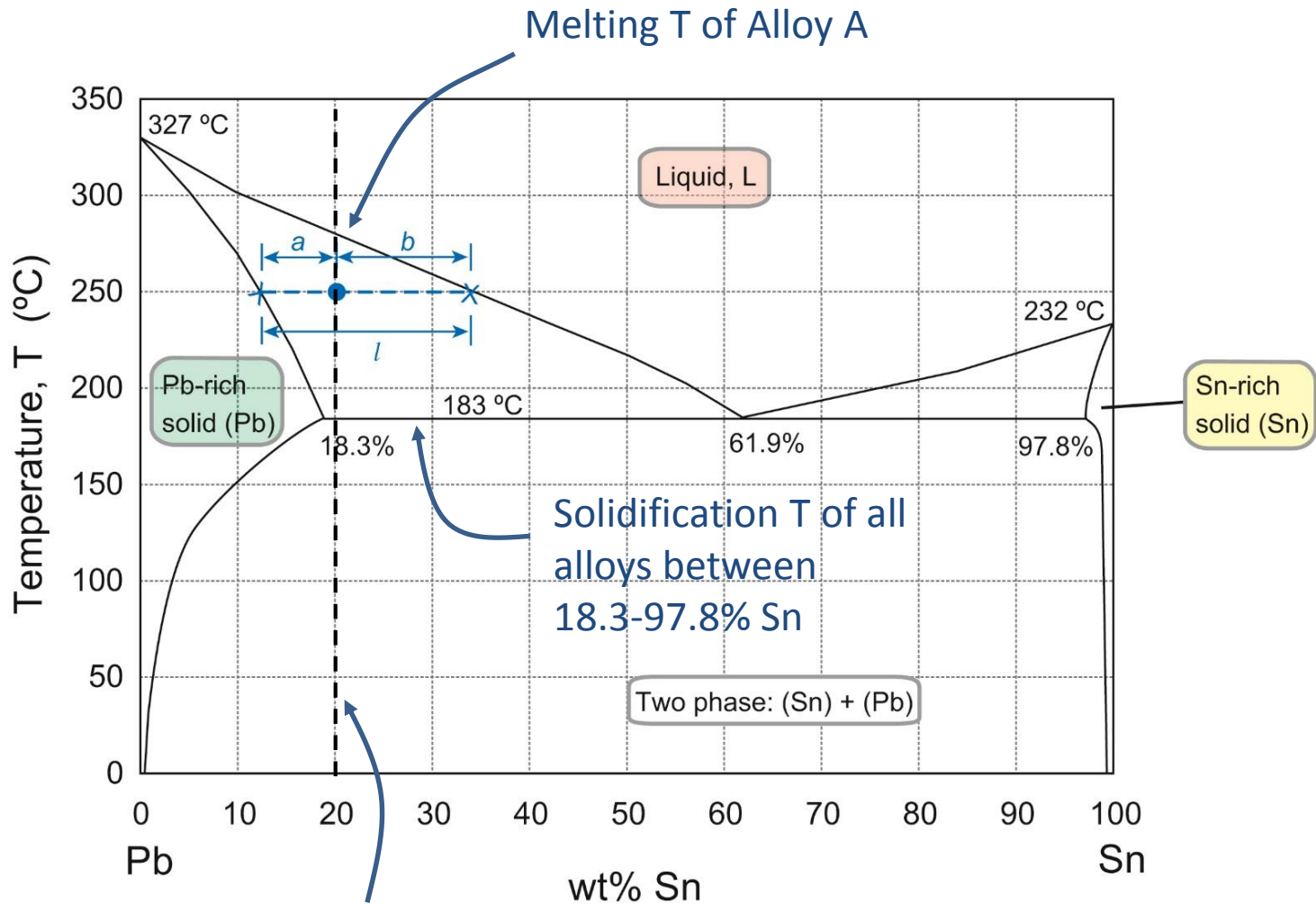
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Reading Phase Diagrams



Reading Phase Diagrams

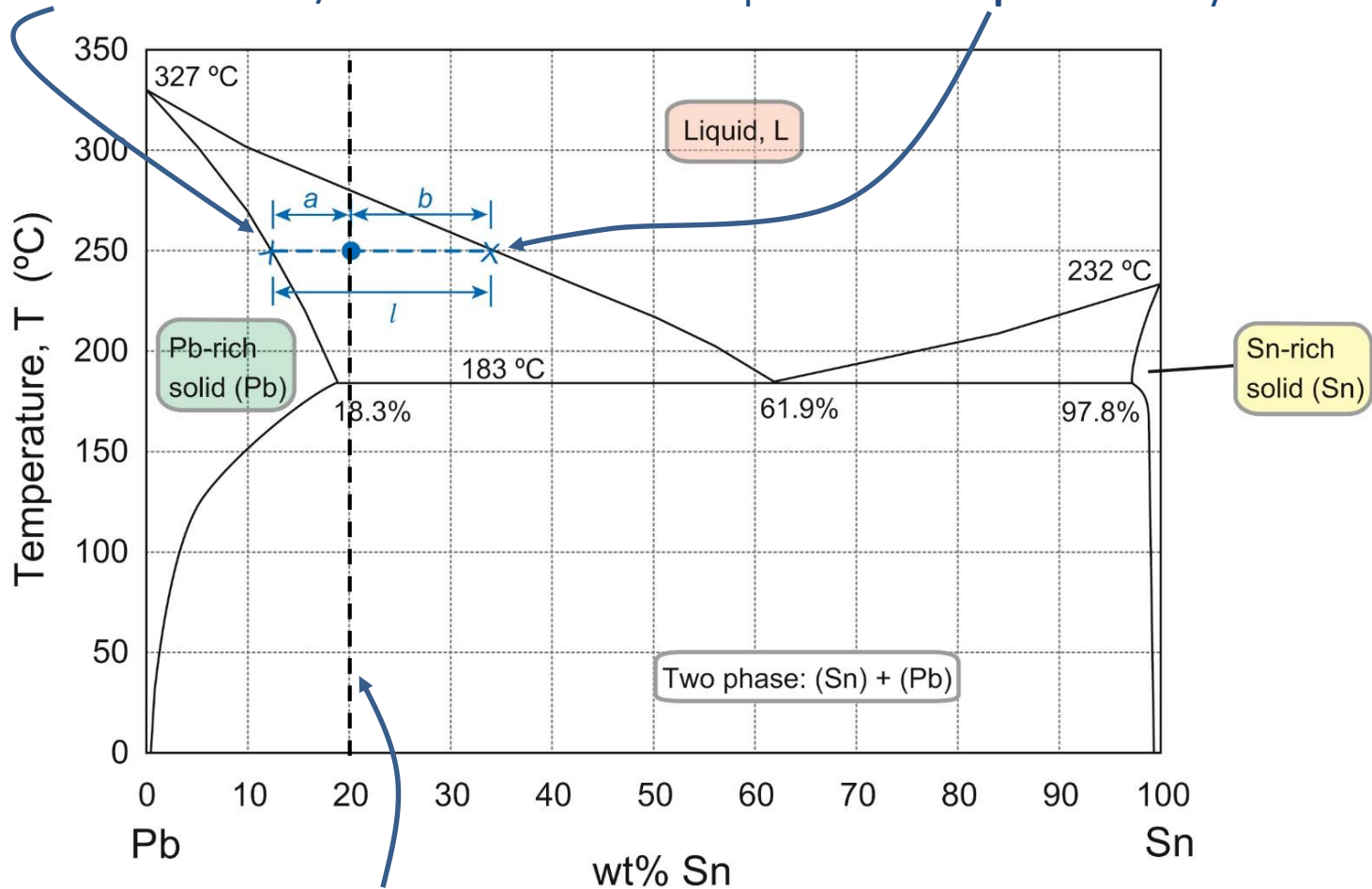


Alloy A composition (Pb-20% Sn)

Reading Phase Diagrams

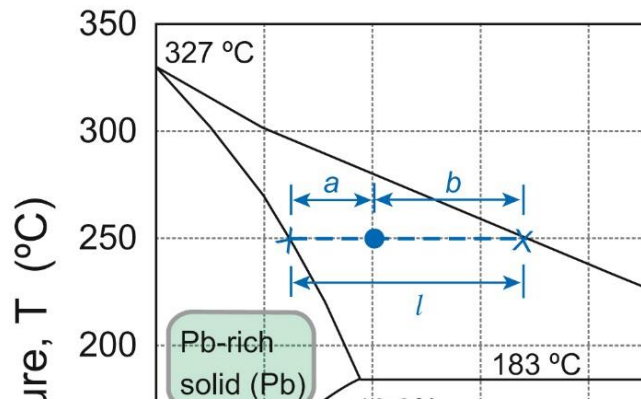
Composition of **Solid** for Alloy A at 250°C

Composition of **Liquid** for Alloy A at 250°C



Alloy A composition (Pb-20% Sn)

Lever Rule



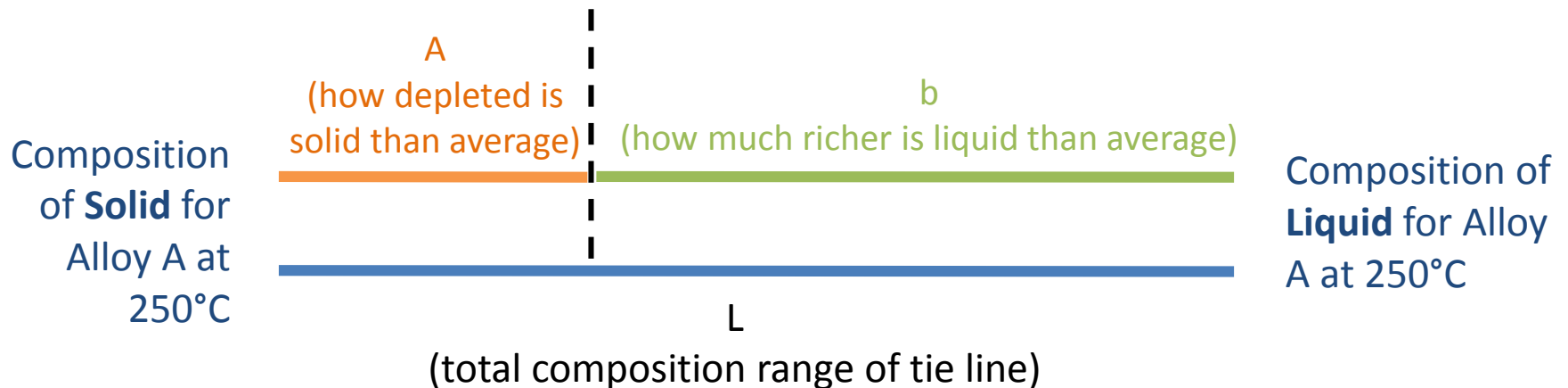
Arises from idea of mass balance

If you have more phase with less of element X

Amount of X in other phase **must** increase.

Average X = composition of alloy

Alloy composition e.g. Pb 20% Sn



a/l = fraction of liquid

b/l = fraction of solid



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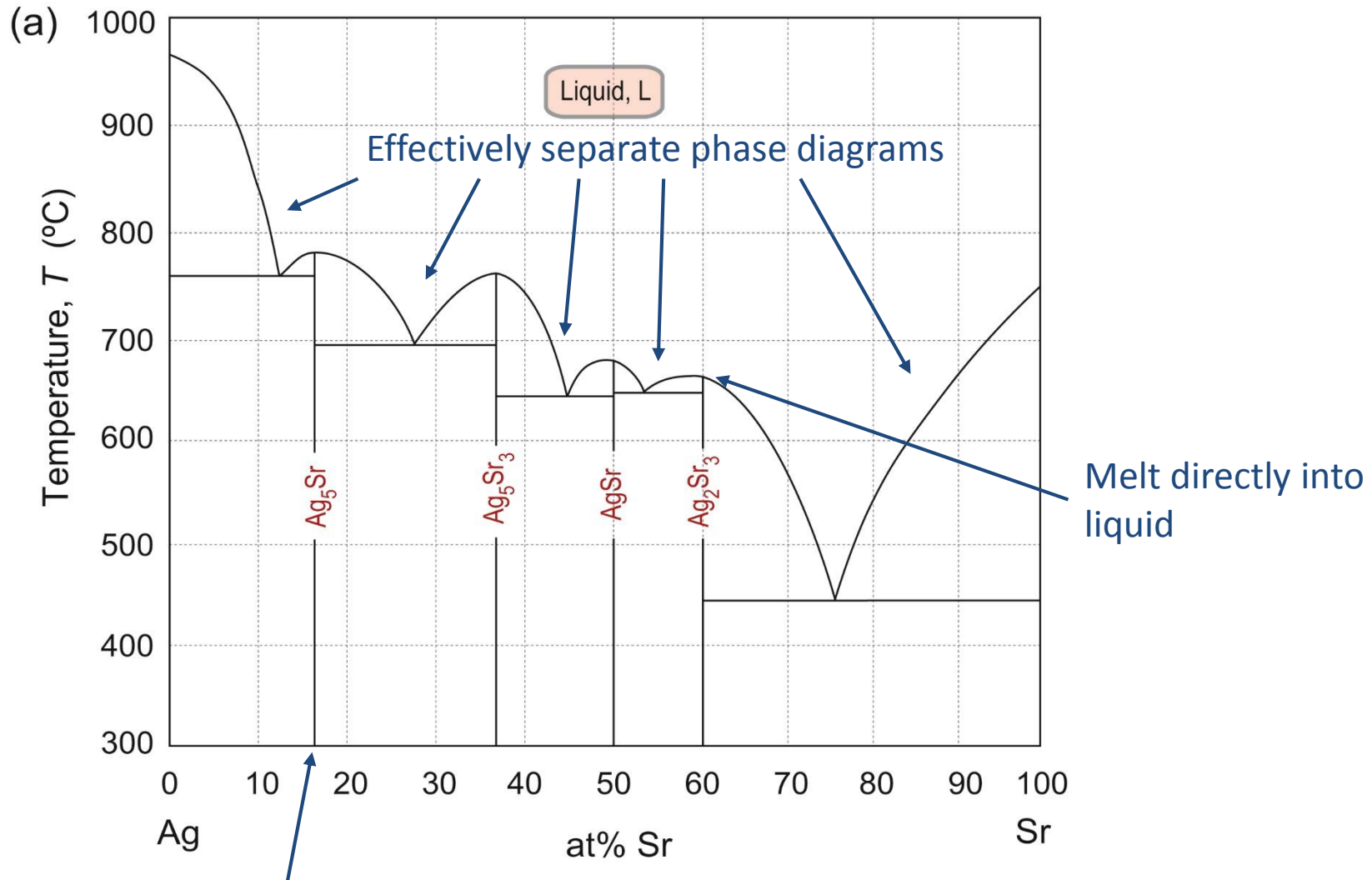
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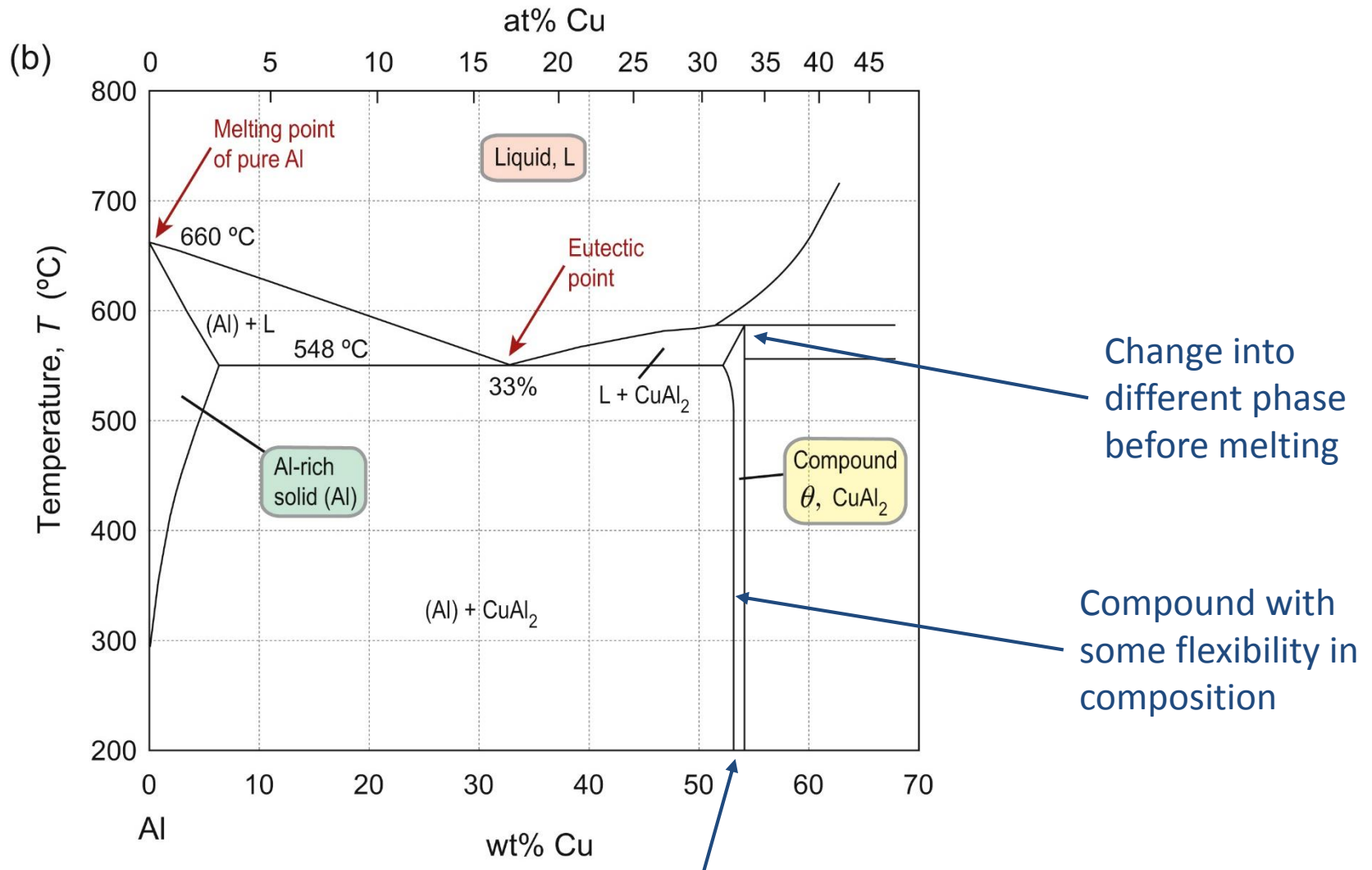


Intermediate Phases



Vertical lines mean compounds with fixed composition

Intermediate Phases



Summary

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- **COMPLETE QUESTIONS 1-3 BY NEXT WEEK**