

Binary Phase Diagram Cheat Sheet

Phase rule, lever rule and the iron-carbon diagram

ENGINEERING
CHEAT SHEET

Key equations

Quantity	Equation	Notes
Gibbs phase rule	$F = C - P + 2$	Degrees of freedom; one component, one phase gives $F = 2$
Lever rule (textbook)	$W_L = (C_\alpha - C_0) / (C_\alpha - C_L)$	Phase fractions on a tie line at constant T
Eutectic (Fe-C)	1147 °C at 4.3% C: liquid → two solids	Article's values
Eutectoid (Fe-C)	723 °C at 0.8% C: solid → two solids	Article's values
Cementite breakdown	$Fe_3C \rightarrow C + 3Fe$	Graphite forms in high-carbon cast iron
Phases	α ferrite (BCC), γ austenite (FCC), δ ferrite (BCC)	Plus cementite and pearlite/ledeburite mixtures

Key takeaways

- A binary diagram plots temperature (vertical) against composition (horizontal) at constant pressure.
- Phase diagrams guide solidification, sintering, purification and crystal growth.
- Article: under about 2.3% carbon is steel, above is cast iron. Its other statement of 2.5% is inconsistent.
- Standard references give eutectoid about 727 °C at 0.76% C and the steel/cast-iron limit about 2.1% C; the article rounds differently, so check the figures.
- Worked cases in the article read from diagram images: 1.5% C at 1400 °C (lever rule), 0.76% C at 800 °C (austenite only).
- Melting points read for alloys 2 and 3: about 1450 °C and 1500 °C.