3.091 OCW Scholar

## Self-Assessment Exam Solid Solutions Solution Key

State your assumptions and show calculations that support your conclusions.

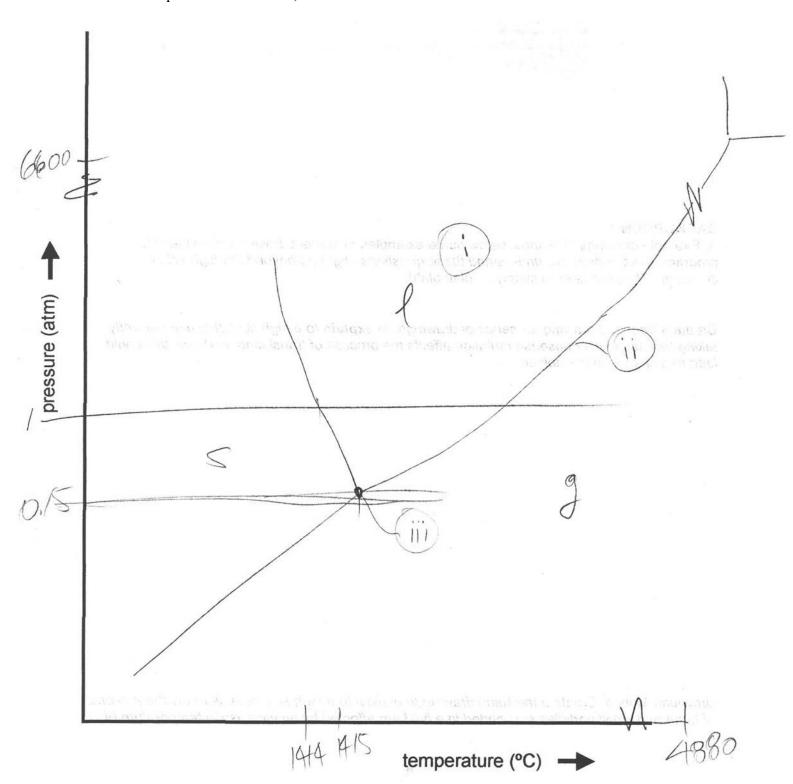
RESOURCES PERMITTED: PERIODIC TABLE OF THE ELEMENTS, TABLE OF CONSTANTS, AN AID SHEET (ONE PAGE  $8\frac{1}{2}$ " × 11"), AND A CALCULATOR.

NO BOOKS OR OTHER NOTES ALLOWED.

## 2009 Final Exam, Problem #7

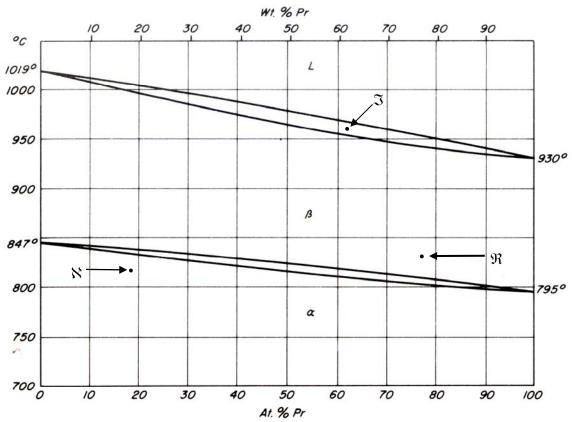
Sketch the unary phase diagram (pressure *vs* temperature) of silicon (Si). Indicate the normal melting point (P = 1 atm), normal boiling point, triple point, and critical point. Label all phase fields. Indicate on the diagram *one example of each*: (i) one-phase stability; (ii) two-phase coexistence; (iii) three-phase coexistence. For clarity, do not draw to scale.

triple point: P = 0.15 atm, T = 1415°C critical point: P = 6600 atm, T = 4880°C



## 2009 Final Exam, Problem #9

The phase diagram of the binary system, neodymium-praseodymium (Nd-Pr) is given below. There are two allotropes:  $\alpha$  which is hexagonal close packed (HCP) and  $\beta$  which is body centered cubic (BCC).



Phase diagram © source unknown. All rights reserved. This content is excluded from our Creative Commons license. For more information, see http://ocw.mit.edu/fairuse.

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| (a) | Explain willy a | i iciiticulai pilasc | diagram is to | be expected for | uns omary system.   |

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(b) At each point (i) identify all phases present at equilibrium, (ii) state the composition of each phase, and (iii) calculate the relative amounts of all phases present.

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3.091SC Introduction to Solid State Chemistry Fall 2009

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