Self-Assessment Exam
Solid Solutions

Name:

Recitation Instructor:

A complete test consists of 6 questions.

Write your answers on these pages.

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 8½" × 11"), AND A CALCULATOR.

NO BOOKS OR OTHER NOTES ALLOWED.

**USE OF WIRELESS COMMUNICATIONS DEVICES STRICTLY FORBIDDEN.**

#1	16%	
#2	16%	
#3	26%	
#4	13%	
#5	9%	
#6	20%	
TOTAL	**100%**	

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.
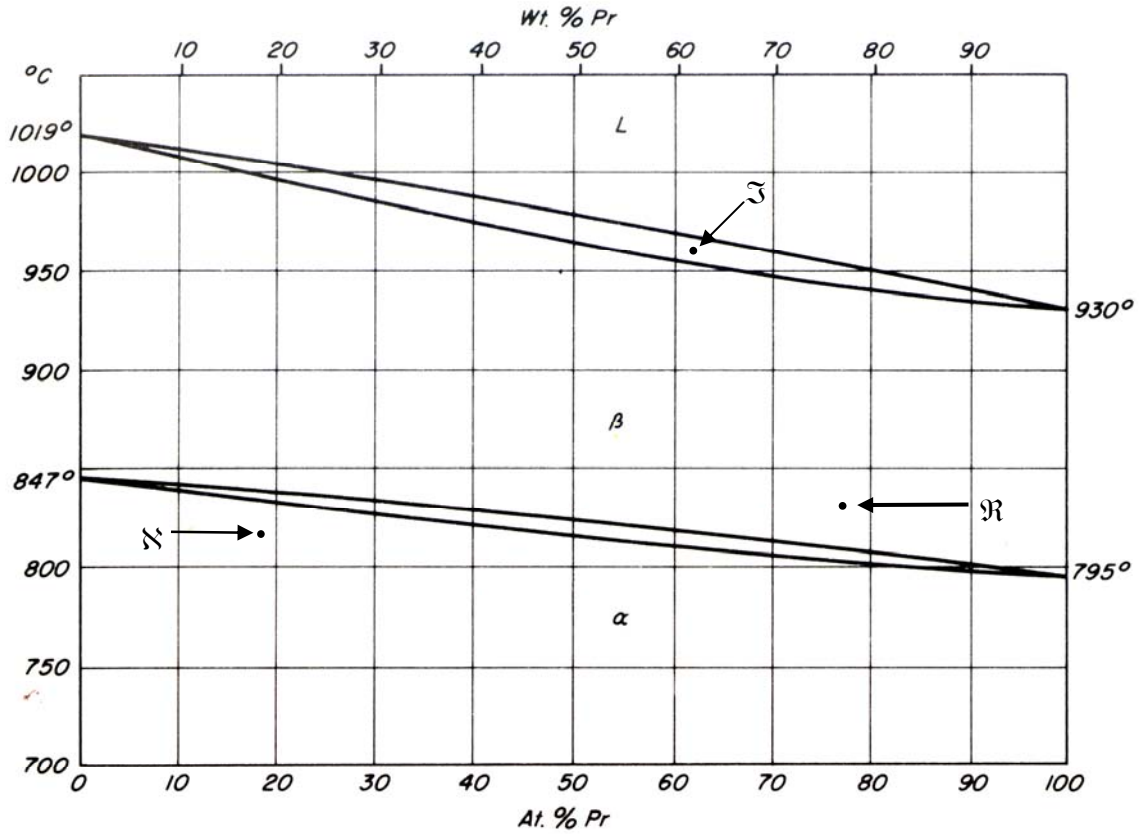
   triple point: P = 0.15 atm, T = 1415ºC

   critical point: P = 6600 atm, T = 4880ºC

pressure (atm) ⟶

temperature (ºC) ⟶
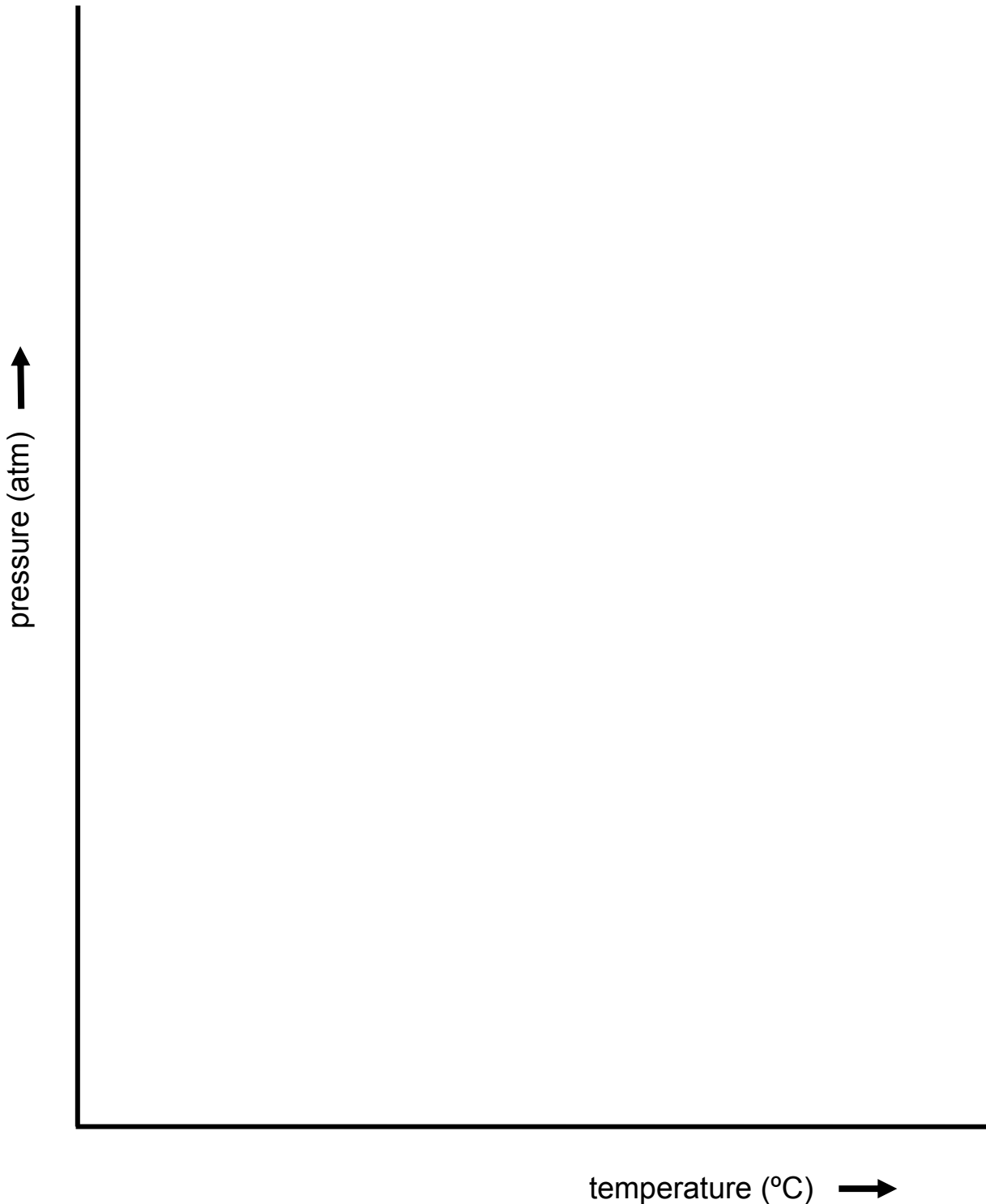
2009 Final Exam, Problem #9

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

(a) Explain why a lenticular phase diagram is to be expected for this binary system.

(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.

(1)

(2)

(3)

3.091SC Introduction to Solid State Chemistry

Fall 2009