3.091 OCW Scholar

Self-Asessment

Solid Solutions

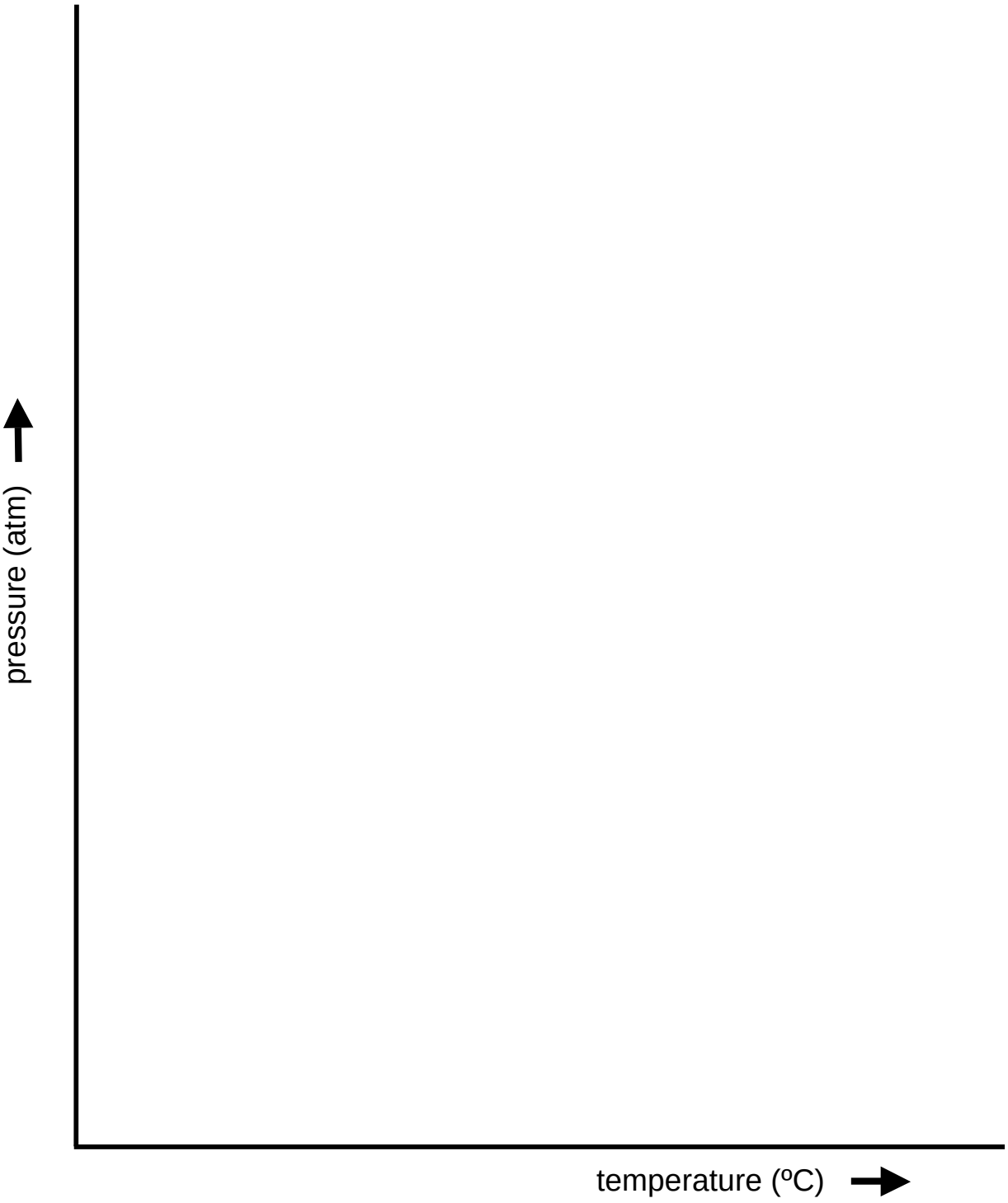
Supplemental Exam Problems for Study

2008 Final, Problem #6

Sketch the unary phase diagram (pressure *vs* temperature) of iodine (I). 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.

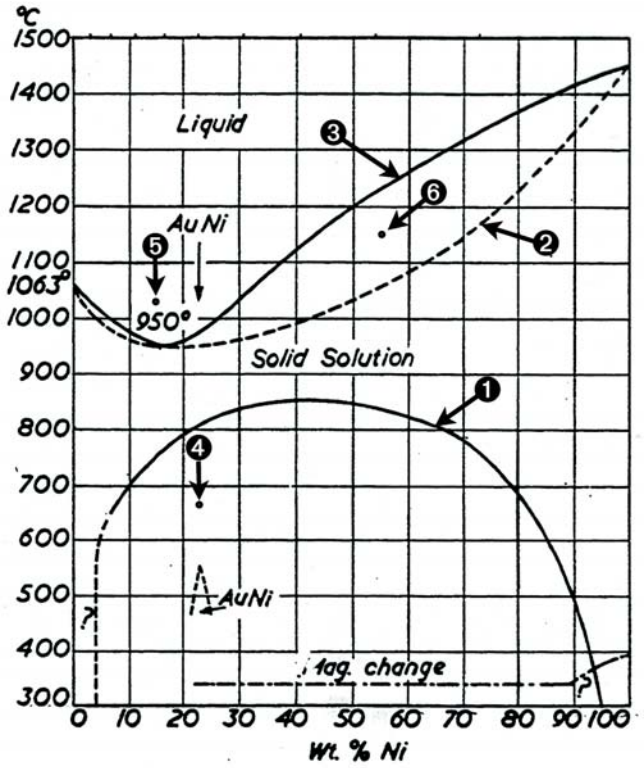
triple point: P = 0.12 atm, T = 113.5ºC

critical point: P = 115 atm, T = 546ºC



2008 Final Exam, Problem #8

The phase diagram of the binary system, gold-nickel (Au - Ni), is given below.



(a) (i) Name each of the lines labeled on the diagram above, and, for each, (ii) write the equilibrium it represents.

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(b) At each of the temperature-composition pairs labeled on the diagram above, (i) identify all phases present at equilibrium and (ii) give the composition of each phase present, expressed in wt % Ni.

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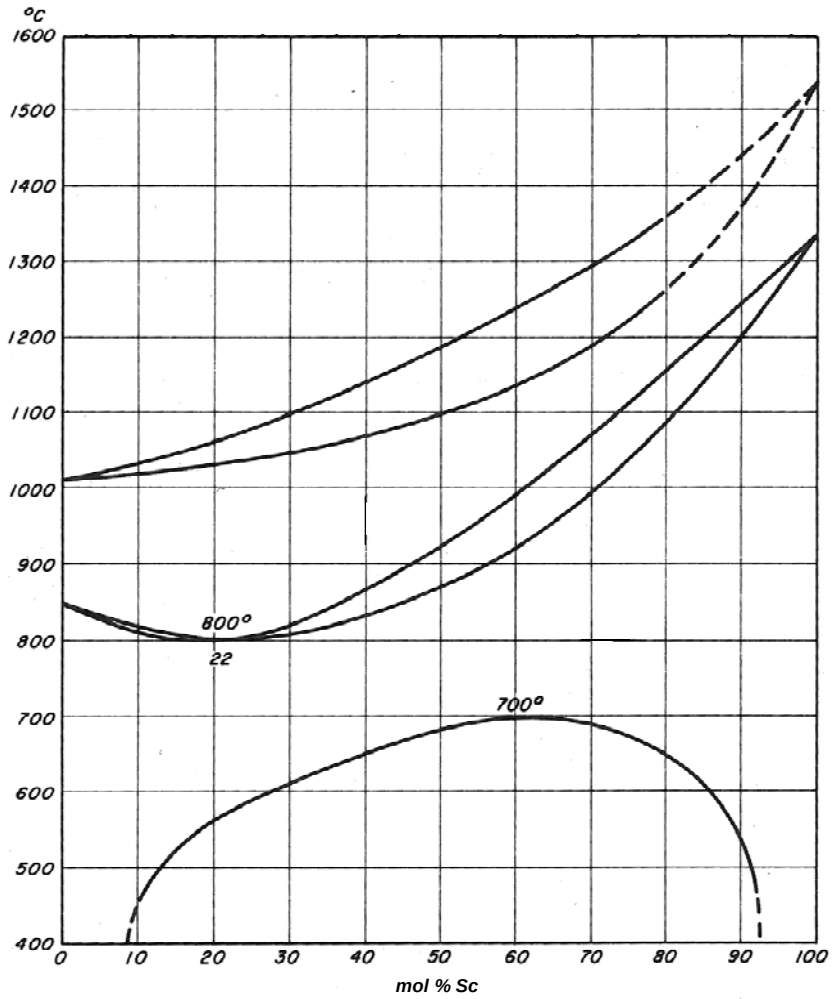
2007 Final Exam, Problem #9

The phase diagram of the binary system, neodymium-scandium (Nd-Sc), is given at right.



(a) On the diagram, label all phase fields identifying the phases present in each.

(b) An alloy with bulk composition 40 mol % Sc is heated to 500ºC and held at temperature for a long enough time to reach equilibrium. Calculate the relative amounts of all phases present.

(c) Sc is frightfully expensive. Explain how to use this phase diagram to design a process to raise the Sc content from 50 mol % to something exceeding 80 mol %, starting with a 50:50 Nd-Sc alloy.

3.091SC Introduction to Solid State Chemistry

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