South Dakota School of Mines and Technology
Department of Materials and Metallurgical Engineering

Met 320 Ternary Phase Diagram Problems

1. **CaO-Al_2O_3-SiO_2 (C-A-S) Ternary Phase Diagram**
   Show all constructions on the diagram.

   a) For the bulk composition marked "**1**", what is the bulk composition's

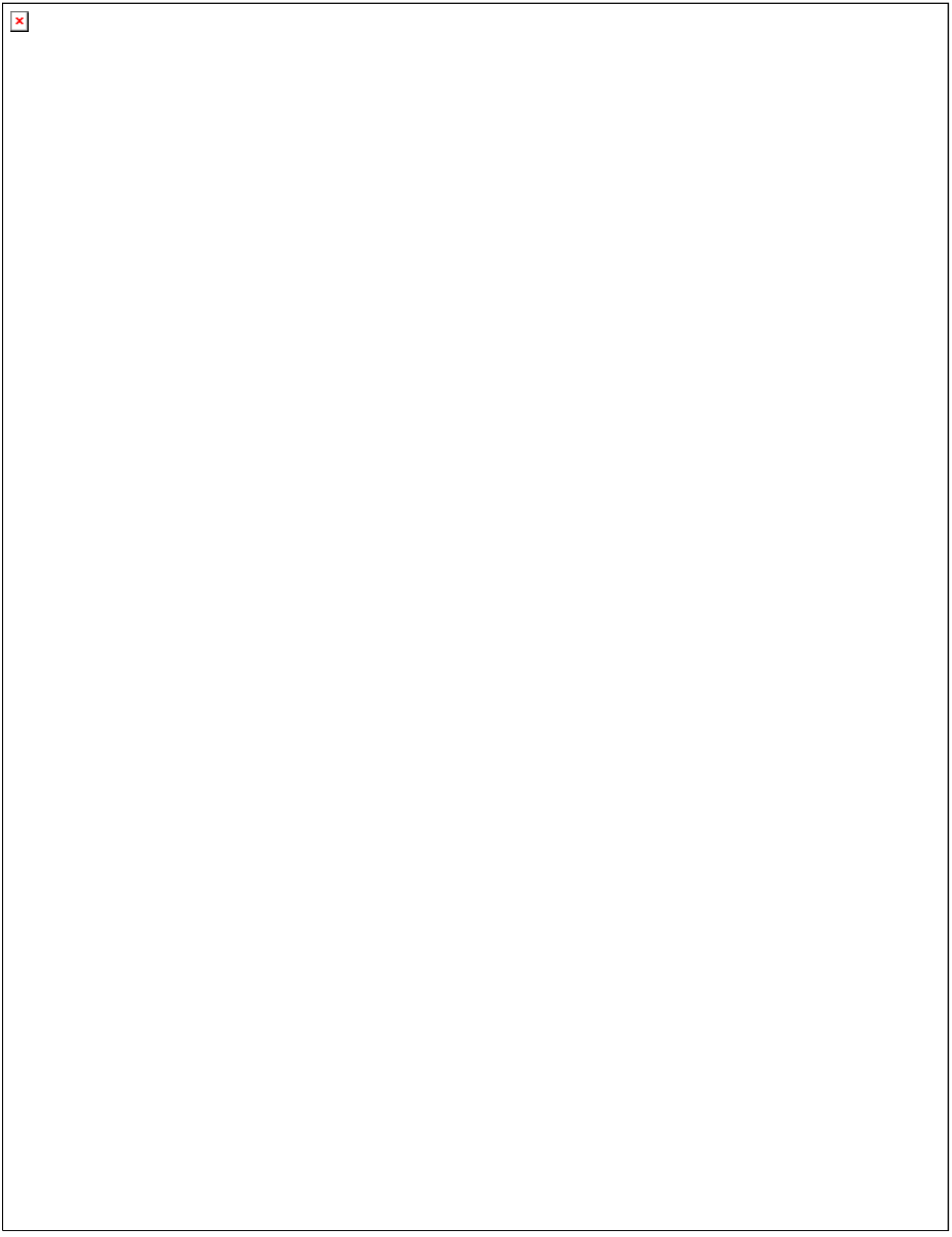
      i) Percent SiO_2 = _____

      ii) Percent CaO = _____

   b) For the bulk composition marked "**1**", what is the 1st crystal to appear upon cooling?

   c) For the bulk composition marked "**1**", what are the final 3 crystals?

   d) For the bulk composition marked "**2**", what percent liquid is present at 2200 °C



2. Shade in the regions, if any, of the next CaO-Fe_2O_3-SiO_2 ternary phase diagram where the melt at 1600°C or hotter is saturated with solid
    a) SiO_2
    b) CaO
    c) Fe_2O_3

CaO–Fe_2O_3–SiO_2

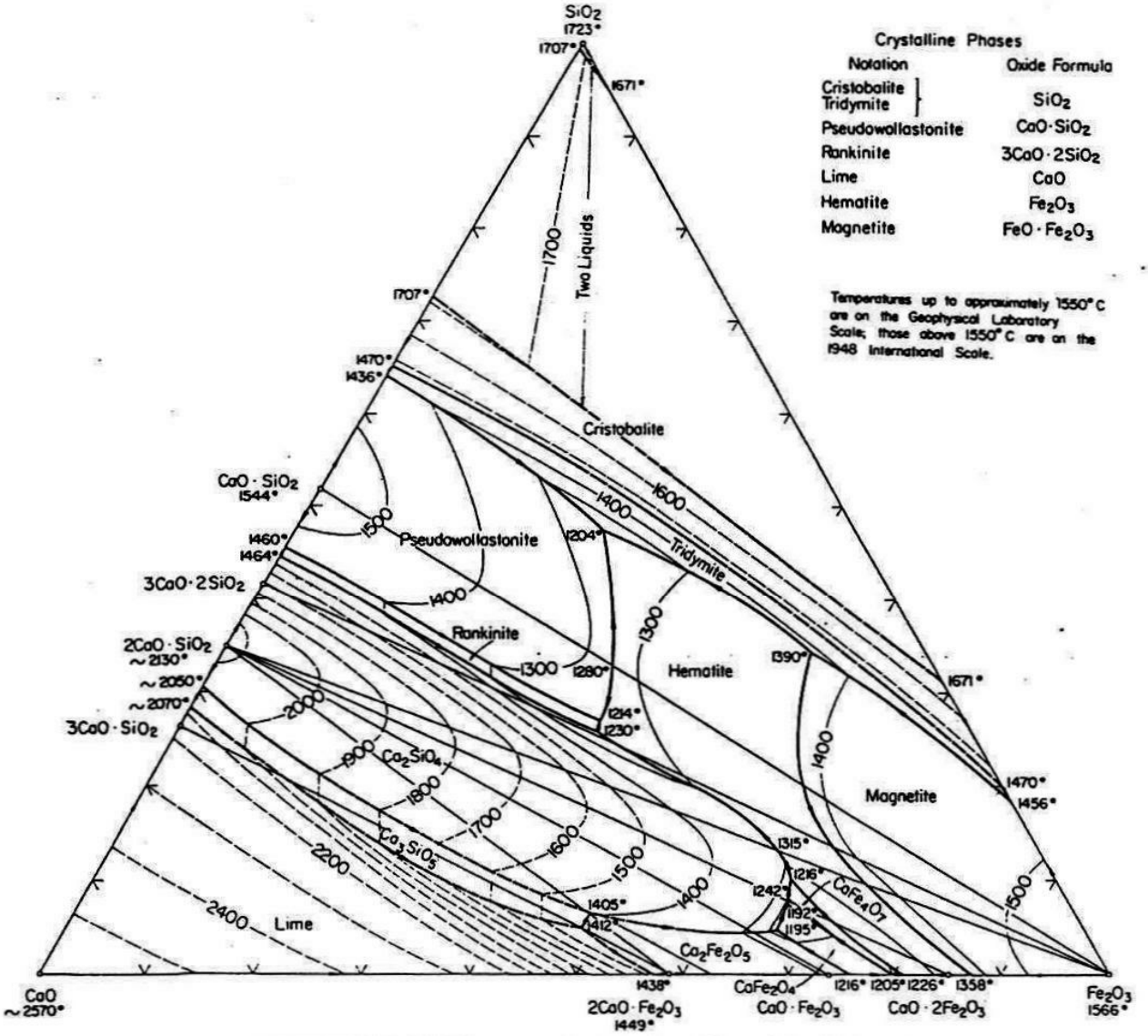


FIG. 656.—System CaO–"Fe_2O_3"–SiO_2; composite. (Condensed Phases in Equilibrium with Air).

E. F. Osborn and Arnulf Muan, revised and redrawn "Phase Equilibrium Diagrams of Oxide Systems," Plate 10, published by the American Ceramic Society and the Edward Orton, Jr., Ceramic Foundation, 1960.

Principal References

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3. CaO-Fe_2O_3-SiO_2 Ternary System
   Characterize a bulk composition of 80% CaO and 10% SiO_2 (balance Fe_2O_3) at
   a) 2000 C

   b) 1500 C

4. Refer to the attached FeO-SiO_2-Al_2O_3 phase diagram and indicated bulk composition.
   i) What are the final three crystals?

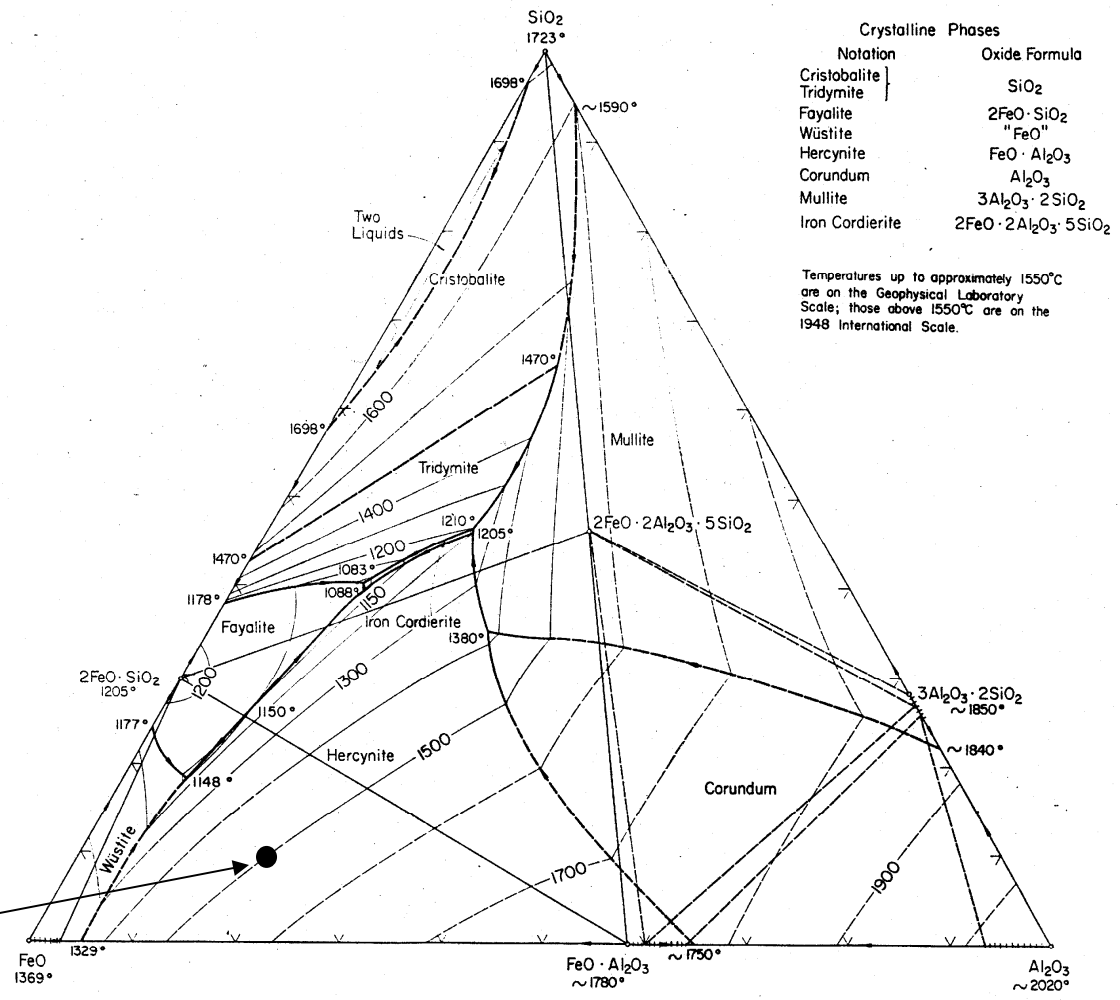
   ii) What is the first crystal and at what temperature does it first?

   iii) What is the second crystal and at what temperature does it first?

   iv) What is the third crystal and at what temperature does it first?

   v) What is the percentage liquid at 1300 C?

FeO–Al_2O_3–SiO_2



Bulk Comp

FIG. 696.—System "FeO"–Al_2O_3–SiO_2; composite. (Oxide Phases in Equilibrium with Metallic Iron).

E. F. Osborn and Arnulf Muan, revised and redrawn "Phase Equilibrium Diagrams of Oxide Systems," Plate 9, published by the American Ceramic Society and the Edward Orton, Jr., Ceramic Foundation, 1960.