University of Alberta
Department of Chemical and Materials Engineering

Lecturer: Dr. Stojan Djokić

MAT E 201
Materials Science I

Assignment No.5 **(16 marks)**
February 7, 2020
Due Date: February 25, 2020 by 3:00 pm

1. Compare the diffusion coefficients for hydrogen and nitrogen in FCC iron at 1200 ^{o}C and explain the difference in their values. **(3 marks)**

2. A 0.02 % C steel is to be carburized at 1200 ^{o}C in 4 hours with a point 0.6 mm beneath the surface reaching 0.45 % C. Calculate the carbon content required at the surface of the steel. Consider that the steel is made of FCC iron. **(3 marks)**

3. Which of the following oxides is expected to have the largest solid solubility in CaO? a) MgO, b) NiO and c) FeO. **(3marks)**

4. Determine the liquidus temperature, solidus temperature, and freezing range for the following MgO-FeO ceramic compositions. (Figure 1) a) MgO-10wt% FeO; b) MgO-45wt% FeO; c) MgO-60wt% FeO; d) MgO-90wt% FeO. **(2marks)**

5. a) Determine the phases present, the composition of each phase, and the amount of each phase in wt% for the following MgO-FeO ceramics at 2000 ^{o}C. (Figure 1) i) MgO-20 wt%FeO; ii) MgO-50 wt%FeO; iii) MgO-60 wt%FeO; and iv) MgO-90 wt%FeO. b) Consider an alloy of 40 wt% Au and 60 wt% Ag. Calculate the composition of the alloy in at.%. **(3marks)**