Chem 1063. Exam 2. J-Term 2009

Name_____

Show all work for credit! Remember sig figs!

Useful information: q= smΔT, s= 4.17J/g•ºC for water, R = 0.0821 L•atm/molK, 8.314 J/mol•K, PV=nRT, $\left(P+\frac{an^2}{V^2}\right)\left(V-nb\right)=nRT$, $u=\sqrt{\frac{3RT}{MW}}$, $\frac{rate1}{rate2}=\sqrt{\frac{MW2}{MW1}}$

(1)(6 points)(a) How much energy would be required to heat 1000 kg of iron from 20 ºC to its melting point (1540 ºC)? For iron, s=0.449 J/gºC.

(b) What is the ΔH_{rn} for the combustion of coal (reaction below)?

$C_{(s)} + O_{2(g)} \text{----> } CO_{2(g)}$

(c) How much coal (in kg) would be required to heat the iron in part a?

(2) List all intermolecular forces for the following molecules. Show all work.

(a) SiH_2F_2

(b) I_3^-

(c) NH_2OH (N and O are bonded)

(d) $AlCl_3$

(3)Explain (not just list) the type of solid being described. The possibilities are; ionic solid, network covalent solid, metallic solid, polar molecular solid, and nonpolar molecular solid.

(a) The solid has a high mp, does not conduct electricity, and does not dissolve.

(b) The solid dissolves in oil, does not conduct electricity, and has a low melting point.

(4)(6 points) Which of the following substances in each pair would have the higher melting point and why.

(a) CO_2 or CSe_2

(b) CH_3F or CH_3OH

(c) quartz or PCl_5

(5)(10 points) Which of the following substances would you expect to dissolve in water? Explain why.

(a) NH_3

(b) SF_6

(c) $CH_3CH_2CH_2CH_3$

(d) K_2SO_4

(e) Fe

(6)(6 points) Answer the following questions using the phase diagram below.

(a) What is the triple point of this compound?

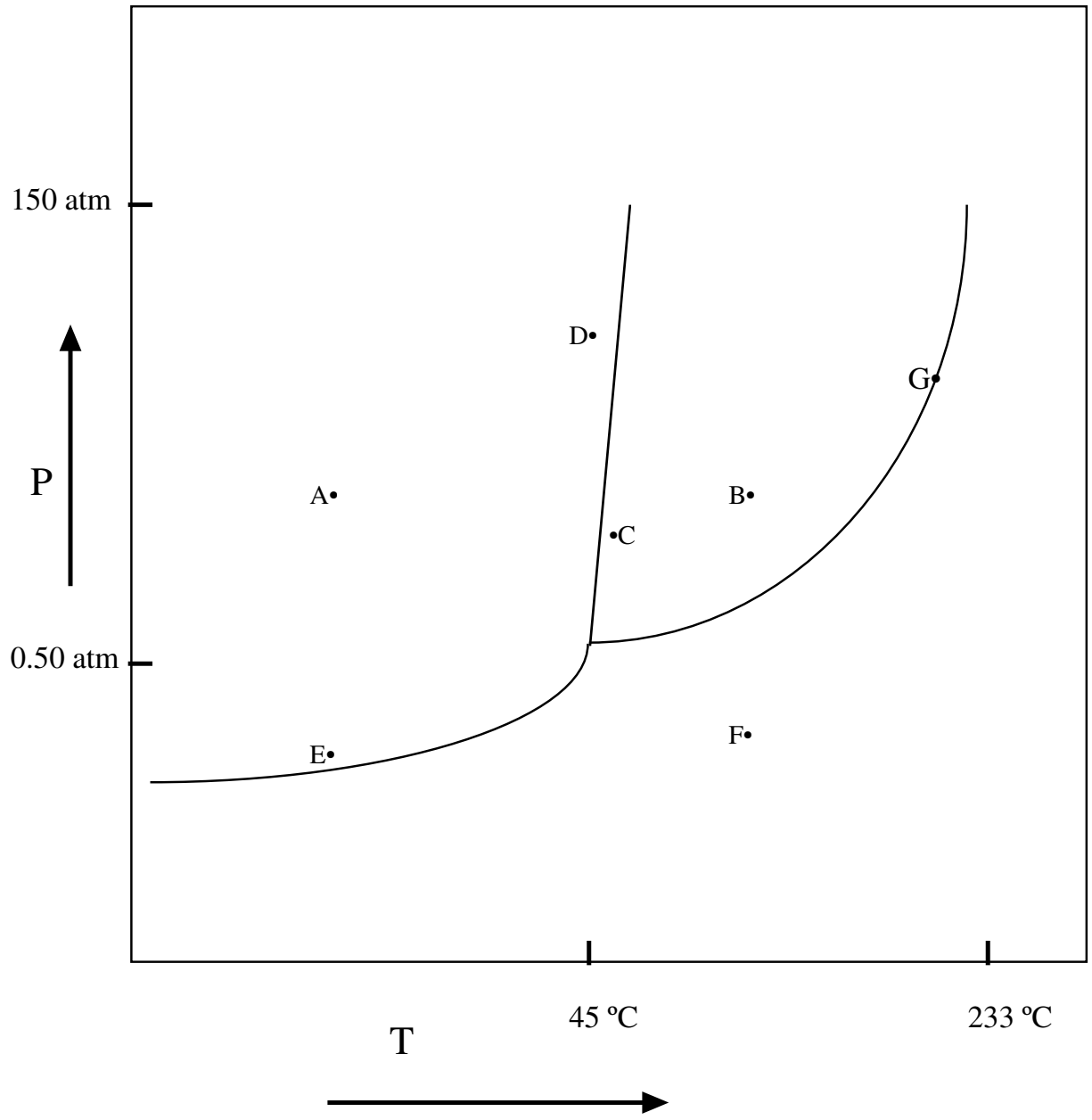
(b) In what region is this compound a supercritical fluid?

(c) What phases are present at point G?

(d) Is the liquid or solid more dense for this compound?

(e) If the compound is heated from conditions A to conditions B, what transition, if any, would occur?

(f) If the pressure was increased from conditions F to conditions B, what transition, if any, would occur?


150 atm
0.50 atm
P
D•
G•
A•
B•
•C
E•
F•
45 ºC
233 ºC
T

(7)(4 points) What is surface tension?

(8)(4 points) What is viscosity and what causes some liquids to be more viscous than others?