

**Petroleum Engineering 310**

EXAM 1

September 22, 1999

Name: \_\_\_\_\_

Section: \_\_\_\_\_

THIS EXAMINATION CONSISTS OF TWO PARTS

Part I has **nine** completion questions worth **four** points each. Write the answer in the space provided.

Part II consists of **eight** problems worth **eight** points each. Grading will be on the basis of approach and answers. Work out the answer in the space provided. If calculations are necessary, show the equations or the approach you would use to calculate the answer. **SHOW ALL WORK.**

This examination is **CLOSED BOOK, CLOSED NOTES, and CLOSED CALCULATORS.**

Questions are not permitted.

Do not fold or unstaple the examination booklet.

Time allotted for the examination is 120 minutes.

STATEMENT

When you have completed the examination, read and sign the statement below, then turn in the examination booklet.

I pledge that I have neither given nor received aid in completing this examination. I have followed the strictures of the Texas A&M University Aggie Code of Honor during the examination.

Signature: \_\_\_\_\_



4. Describe and give an example of structural isomerism.

5. Describe and give an example of geometric isomerism.

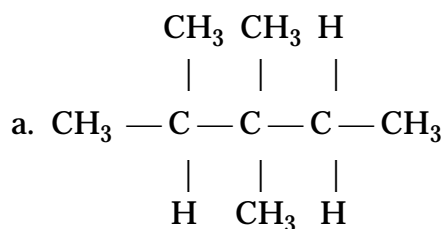
6. Describe the benzene bond.



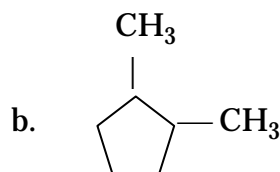
## PART II

Part II consists of **eight** problems worth **eight** points each. Grading will be on the basis of approach and answers. Work out the answer in the space provided. If calculations are necessary, show the equations or the approach you would use to calculate the answer. **SHOW ALL WORK.**

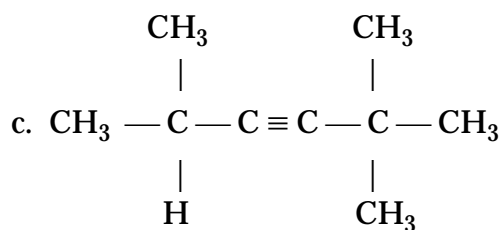
10. Name the following compounds using the IUPAC rules:



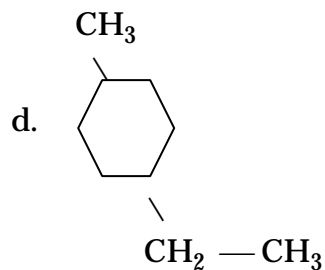
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11. Sketch and completely label the phase diagram for a typical volatile oil. Show the path of reservoir pressure during production. Show the pressure and temperature of the first stage separator.



12. A pure substance occupies a sealed container having a volume of  $1.0 \text{ ft}^3$ . What is the volume of liquid in the container if the densities of the liquid and vapor are  $35.6 \text{ lb}_m/\text{ft}^3$  and  $0.624 \text{ lb}_m/\text{ft}^3$ , respectively, and the mass of the substance is  $40.0 \text{ lb}_m$ ?

13. Sketch a pressure-volume diagram for a pure substance in Fig B. Show the paths 1-2 of Fig. A in your diagram. Label all important parts.

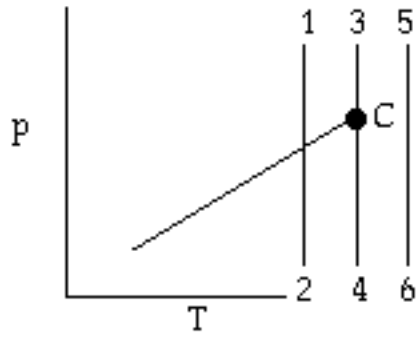


Fig. A

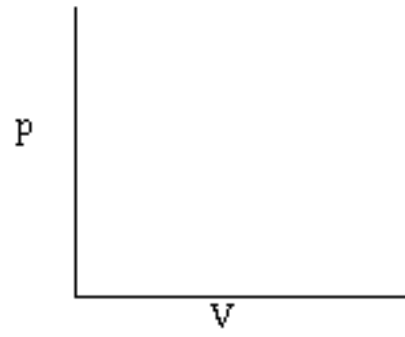


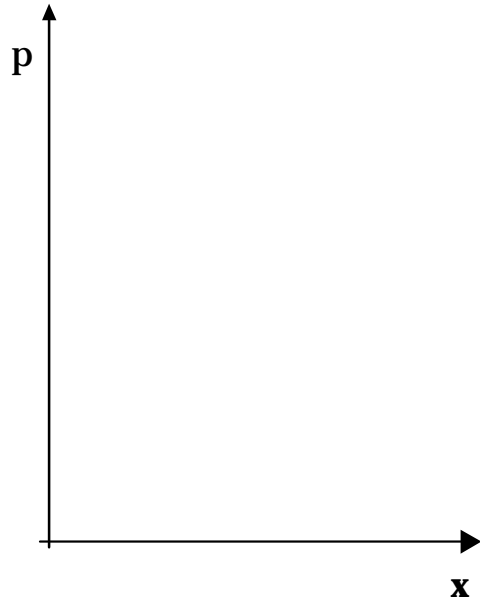
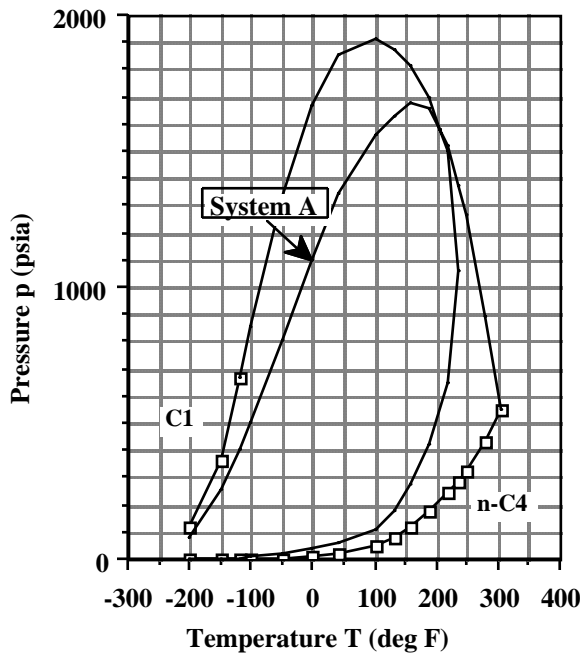
Fig. B

Discuss the laboratory procedure used to determine the PVT relationships sketched above.

14. Consider the phase diagram (below left) of  $C_1/n-C_4$  Systems. The critical pressures of  $C_1$  and  $n-C_4$  are 666 and 551 psia, respectively, and the critical temperatures of  $C_1$  and  $n-C_4$  are  $-117$  and  $306$  °F, respectively.

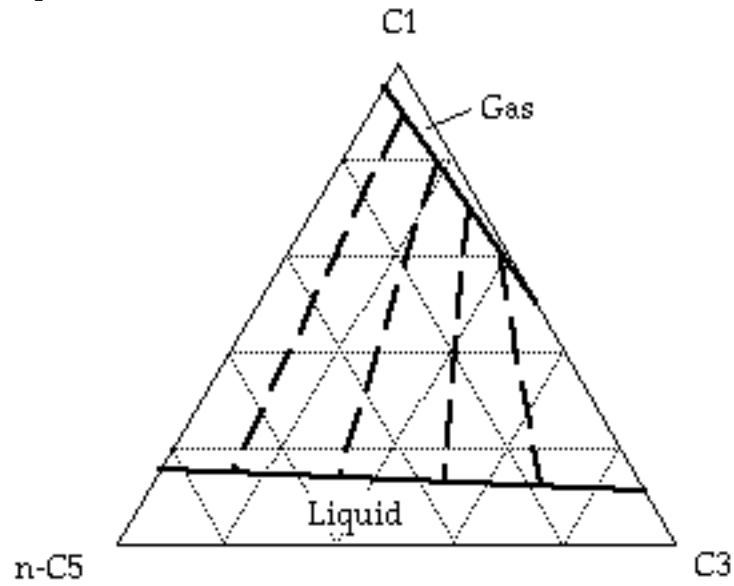
Sketch a graph (below right) of pressure vs mole fraction  $C_1$  at a temperature of  $100$  °F.

System A is  $0.5$  mole fraction  $C_1$ . Further, the critical composition of the  $C_1/n-C_4$  System at  $100$  °F is  $0.7$  mole fraction  $C_1$ . Also, the maximum composition at which the  $C_1/n-C_4$  System can exist in two phases at  $100$  °F is  $0.9$  mole fraction  $C_1$  at  $1000$  psia.



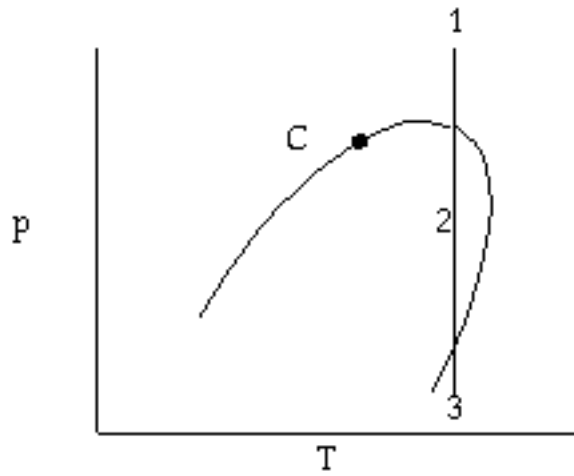
**Phase Diagram of the  $C_1/n-C_4$  Systems Showing Critical Loci and System A**

15. You are testing a mixture of 40% C<sub>1</sub>, 40% C<sub>3</sub>, and 20% n-C<sub>5</sub> at 200 °F and 500 psia. What are the compositions of the liquid and gas phases? What are the relative amounts of each phase?



**C<sub>1</sub>/C<sub>3</sub>/n-C<sub>5</sub> System at 500 psia & 200 °F**

16. Given the following multi-component phase diagram, describe in detail what is happening in the reservoir as the pressure declines along the path 1-2-3.



17. The following notices were taken from the Sunday Business Sections of the *Bryan-College Station Eagle*, on November 30, 1986 and December 7, 1986. All of the wells were reported to have been completed in the Glenrose Formation of the Alabama Ferry Field in Leon County, Texas. Make an estimate of the type of reservoir fluid in the Alabama Ferry Field

**LEON COUNTY**

Flowing 133 barrels of 37-gravity crude per day plus 98,000 CF of casinghead gas, the No. 4 Largent Heirs has been finaled in the Alabama Ferry Field about 12 miles southeast of Centerville [GOR = 737 SCF/STB].

Houston-based Mitchell Energy Inc. is the operator.

The well probed to a total depth of 10,752 feet. After plugback to 10,478 feet, it was perforated to produce from the Glenrose at 10,228 to 10,290 feet into the wellbore.

Flowing tubing pressure came in at 450 PSI. Water production totaled seven barrels daily.

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Murphy H. Baxter, independent operator from Houston, has filed first production figures for the No. 4 Frank Leathers Unit in the Alabama Ferry Field, Leon County, 10.5 miles southeast of Centerville.

Bottomed at 10,350 feet, the well will produce from a set of Glenrose perforations at 9,801 to 9,860 feet into the wellbore.

It potentialled at 112 barrels of 41-gravity crude plus 283,000 CF casinghead gas on a quarter-inch choke [GOR = 2527 SCF/STB]. It also made 48 barrels of water per day. Flowing tubing pressure registered 385 PSI.

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Majestic Resources Inc. has posted first production data for the No. 1 Maude Wakefield, a new producer in the Alabama Ferry Field, Leon County, seven miles southeast of Centerville.

The well potentialled at 151 barrels of 48-gravity crude per day plus 502,000 CF gas and nine barrels of waste water [GOR = 3325 SCF/STB]. Potential was gauged on a 18/64 choke. Flowing tubing pressure registered 425 PSI.

Majestic took the hole to a 9,557-foot bottom and perforated the Glenrose for production at 9,381 to 9,400 feet.