CADET _____ SECTION _____TIME OF DEPARTURE _____

DEPARTMENT OF CHEMISTRY & LIFE SCIENCE

CH365 2022-2023
WRITTEN PARTIAL REVIEW II
7 October 2022, Practice

TEXT: Smith, Van Ness, Abbott & Swihart
SCOPE: Lessons 10-20
TIME: 55 Minutes

References Permitted: Open notes, book, internet, CHEMCAD, Mathematica, Excel.

INSTRUCTIONS

1. Do not mark this exam or open it until "begin work" is given.
2. You have 55 minutes to complete the exam.
3. Solve the problems in the space provided. Show all work to receive full credit.
4. There are 3 problems on 4 pages in this exam (not including the cover page). Write your name on the top of each sheet.
5. Save CHEMCAD and Mathematica files on your desktop and re-save frequently.
6. Upload all CHEMCAD and Mathematica files to your SharePoint directory.
7. **The file name of uploaded files must be written clearly on the exam.**

(TOTAL WEIGHT: 200 POINTS)

DO NOT WRITE IN THIS SPACE

PROBLEM	VALUE	CUT
A	80	
B	70	
C	50	
TOTAL CUT		
BONUS	30	
TOTAL GRADE	200	

Cadet:_____

Problem:	Weight:
A	80

0.100 kmol of nitrogen gas in a closed system is changed from an initial state of 5.00 m^3, 1.00 bar and 601.4 K to a final state of 1.00 m^3, 5.00 bar, and 601.4 K by the following mechanically reversible processes:

(a) isothermal compression

(b) adiabatic compression followed by cooling at constant pressure

(c) adiabatic compression followed by cooling at constant volume

(d) heating at constant volume followed by cooling at constant pressure

(e) cooling at constant pressure followed by heating at constant volume

Calculate Q, W, ΔU and ΔH for the overall process in (a) through (e) in units of kJ.

Solutions:

(a) ΔH=0; ΔU=0; Q = -804.72; W = 804.72

(b) ΔH=0; ΔU=0; Q = -1,021.54; W = 1,021.54

(c) ΔH=0; ΔU=0; Q = -1,129.25; W = 1,129.54

(d) ΔH=0; ΔU=0; Q = -2,000.00; W = 2,000.00

(e) ΔH=0; ΔU=0; Q = -400.00; W = 400.00

Answers are in kJ.

Cadet:_____

Problem:	Weight:
B	70

Calculate the molar volume of chloroform vapor at 190°F and 2.00 atm in units of $ft^3/lbmol$ (cubic feet per pound-mole) using the

(a) Peng-Robinson (PR) equation of state

(b) Soave-Redlich-Kong (SRK) equation of state

(c) truncated virial equation of state (Eqn. 3.36), with a value of B from the generalized Pitzer correlation (Eqns. 3.58-3.62)

(d) Lee-Kesler table method

(e) ideal gas equation of state.

(f) CHEMCAD and SRK equation of state

Solutions:

(a) 226.5957

(b) 227.0415

(c) 227.0325

(d) 225.9064

(e) 237.2080

(f) 227.0067

Answers are in $ft^3/lbmol$

Cadet:_____

Problem:	Weight:
C	50

The hydrogenation of 1-hexene to form n-hexane can be written as:

$$C_6H_{12}(g) + H_2(g) \rightarrow C_6H_{14}(g)$$

(a) Calculate the standard gas-phase heat of hydrogenation of 1-hexene at 425 °C and 12.00 bar in 50% excess hydrogen, with 6.00 moles of steam added per mole of 1-hexene as a diluent to control the reactor temperature. The process is isothermal with reactants and products at 425 °C.

(b) Verify your answer in CHEMCAD and discuss any observed difference.

Solutions:

(a) -129,509.7737

(b) -129,650.2734

Answers are in J/mol

Cadet:_____

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