

Unit 6 - Week 4: Molecular Theory of Corresponding States

Course outline

How does an NPTEL online course work?

Week 0: Prerequisite

Week 1: Introduction of Phase Equilibria

Week 2: Estimation of Thermodynamic Properties

Week 3: Potential Energy Functions and Intermolecular Forces

Week 4: Molecular Theory of Corresponding States

Lec 1: Molecular Theory of Corresponding States

Lec 2: Molecular Theory of Corresponding States – 2

Quiz : Assessment 4

Lecture Notes: Week 4

Weekly feedback form for week 4

Solution: Assignment 4

Week 5: Intermolecular Interactions and E.o.S

Week 6: Gaseous Mixtures and Fugacity

Week 7: Liquid Mixtures and Fugacity

Week 8: Models for Activity Coefficients using Excess Gibbs Energy

Week 9: Vapour - Liquid Equilibria of Multicomponent Non-Ideal Systems

Week 10: Liquid - Liquid Equilibria of Multicomponent Non-Ideal Systems

Week 11: Vapour - Liquid - Liquid Equilibria of Multicomponent Non-Ideal Systems

Week 12: Solid - Liquid Equilibria of Non-Ideal Systems

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Assessment 4

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-02-26, 23:59 IST.

1) The critical temperature and critical pressure of nitrogen gas are given as $T_c = 126.2\text{K}$ and $P_c = 34$ bar. If this gas is obeying van der Waals equation of state then what are its constants "a" and "b"?

- a = 3.3546 Pa m⁶/mol², b=6.658×10⁻² m³/mol
- a = 2.6786 Pa m⁶/mol², b=4.658×10⁻⁶ m³/mol
- a = 2.9614 Pa m⁶/mol², b=5.658×10⁻⁴ m³/mol
- a = 0.1366 Pa m⁶/mol², b=3.857×10⁻⁵ m³/mol

No, the answer is incorrect.
Score: 0

Accepted Answers:
a = 0.1366 Pa m⁶/mol², b=3.857×10⁻⁵ m³/mol

2) The critical temperature and critical pressure of n-butane are given as $T_c = 425.1\text{K}$ and $P_c = 37.96$ bar. If this gas is obeying van der Waals equation of state then what are its constants "a" and "b"?

- a = 1.3882 Pa m⁶/mol², b=1.164×10⁻⁴ m³/mol
- a = 3.3546 Pa m⁶/mol², b=2.658×10⁻³ m³/mol
- a = 2.1587 Pa m⁶/mol², b=0.592×10⁻² m³/mol
- a = 5.3619 Pa m⁶/mol², b=3.284×10⁻⁵ m³/mol

No, the answer is incorrect.
Score: 0

Accepted Answers:
a = 1.3882 Pa m⁶/mol², b=1.164×10⁻⁴ m³/mol

3) The critical temperature and critical pressure of nitrogen gas are given as $T_c = 126.2$ K and $P_c = 34$ bar. If this gas is obeying Redlich-Kwong equation of state then what are its constants "a" and "b"?

- a = 0.9316 Pa K^{1/2} m⁶/mol², b = 3.4296 ×10⁻⁴ m³/mol
- a = 3.2051 Pa K^{1/2} m⁶/mol², b = 3.8147 ×10⁻³ m³/mol
- a = 1.555 Pa K^{1/2} m⁶/mol², b = 2.6737 ×10⁻⁵ m³/mol
- a = 4.314 Pa K^{1/2} m⁶/mol², b = 6.2135 ×10⁻⁴ m³/mol

No, the answer is incorrect.
Score: 0

Accepted Answers:
a = 1.555 Pa K^{1/2} m⁶/mol², b = 2.6737 ×10⁻⁵ m³/mol

4) The critical temperature and critical pressure of n-butane are given as $T_c = 425.1\text{K}$ and $P_c = 37.96$ bar. If this gas is obeying Redlich-Kwong equation of state then what are its constants "a" and "b"?

- a = 29 Pa K^{1/2} m⁶/mol², b = 8.0667 ×10⁻⁵ m³/mol
- a = 18 Pa K^{1/2} m⁶/mol², b = 2.7581 ×10⁻⁷ m³/mol
- a = 15 Pa K^{1/2} m⁶/mol², b = 0.9377 ×10⁻⁴ m³/mol
- a = 35 Pa K^{1/2} m⁶/mol², b = 1.4625 ×10⁻³ m³/mol

No, the answer is incorrect.
Score: 0

Accepted Answers:
a = 29 Pa K^{1/2} m⁶/mol², b = 8.0667 ×10⁻⁵ m³/mol

5) What is the molar volume of methane gas at 500°C and 15 atm pressure if it obeys van der Waals equation of state? The critical temperature and critical pressure of methane are given as $T_c = 190.6\text{K}$ and $P_c = 45.99\text{bar}$.

- 4.2356 ×10⁻³ m³/mol
- 7.8175 ×10⁻³ m³/mol
- 2.7664 ×10⁻⁵ m³/mol
- 5.5497 ×10⁻² m³/mol

No, the answer is incorrect.
Score: 0

Accepted Answers:
4.2356 ×10⁻³ m³/mol

6) What is the molar volume of methane gas at 500°C and 15 atm pressure if it obeys Redlich-Kwong equation of state? The critical temperature and critical pressure of methane are given as $T_c = 190.6\text{K}$ and $P_c = 45.99\text{bar}$.

- 6.127 ×10⁻⁵ m³/mol
- 9.253 ×10⁻³ m³/mol
- 4.24 ×10⁻³ m³/mol
- 3.148 ×10⁻⁴ m³/mol

No, the answer is incorrect.
Score: 0

Accepted Answers:
4.24 ×10⁻³ m³/mol

7) What is the molar volume of methane gas at 500°C and 15 atm pressure if it obeys Peng-Robinson equation of state? Critical conditions for methane: $T_c = 190.6\text{K}$, $P_c = 45.99\text{bar}$, $z_c = 0.286$ and $\omega = 0.012$. Note: Consider largest root of molar volume as answer because the system is gaseous system.

- 1.036 ×10⁻⁴ m³/mol
- 4.24 ×10⁻³ m³/mol
- 0.751 ×10⁻⁷ m³/mol
- 7.526 ×10⁻⁵ m³/mol

No, the answer is incorrect.
Score: 0

Accepted Answers:
4.24 ×10⁻³ m³/mol