

Unit 7 - Week 5: Intermolecular Interactions and E.o.S

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

Week 5: Intermolecular Interactions and E.o.S

● Lec 1: Intermolecular Potential and EoS

● Lec 2: Virial Coefficients from Potential Functions

● Lec 3: Virial Coefficients from Corresponding States Theory

○ Quiz : Assessment 5

● Lecture Notes: Week 5

○ Weekly feedback form for week 5

● Solution: Assignment 5

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 5

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

Due on 2020-03-04, 23:59 IST.

1) Which of the following is van der Waals equation of state? 4 points

- $v^3 - \left[\frac{RT}{p} + b \right] v^2 + \frac{a}{p} v - \frac{ab}{p} = 0$
 $v^3 - \left(\frac{RT}{p} \right) v^2 - \left(b^2 + \frac{bRT}{p} - \frac{a}{p\sqrt{T}} \right) v - \frac{ab}{p\sqrt{T}} = 0$
 $v^3 + \left(b - \frac{RT}{p} \right) v^2 - \left(3b^2 + \frac{2bRT}{p} - \frac{a}{p} \right) v + b^3 + \frac{b^2RT}{p} - \frac{ab}{p} = 0$
 None of the above

No, the answer is incorrect. Score: 0

Accepted Answers:

$$v^3 - \left[\frac{RT}{p} + b \right] v^2 + \frac{a}{p} v - \frac{ab}{p} = 0$$

2) Which of the following is Redlich-Kwang equation of state? 4 points

- $v^3 - \left[\frac{RT}{p} + b \right] v^2 + \frac{a}{p} v - \frac{ab}{p} = 0$
 $v^3 - \left(\frac{RT}{p} \right) v^2 - \left(b^2 + \frac{bRT}{p} - \frac{a}{p\sqrt{T}} \right) v - \frac{ab}{p\sqrt{T}} = 0$
 $v^3 + \left(b - \frac{RT}{p} \right) v^2 - \left(3b^2 + \frac{2bRT}{p} - \frac{a}{p} \right) v + b^3 + \frac{b^2RT}{p} - \frac{ab}{p} = 0$
 None of the above

No, the answer is incorrect. Score: 0

Accepted Answers:

$$v^3 - \left(\frac{RT}{p} \right) v^2 - \left(b^2 + \frac{bRT}{p} - \frac{a}{p\sqrt{T}} \right) v - \frac{ab}{p\sqrt{T}} = 0$$

3) Which of the following is Peng-Robinson equation of state? 4 points

- $v^3 - \left[\frac{RT}{p} + b \right] v^2 + \frac{a}{p} v - \frac{ab}{p} = 0$
 $v^3 - \left(\frac{RT}{p} \right) v^2 - \left(b^2 + \frac{bRT}{p} - \frac{a}{p\sqrt{T}} \right) v - \frac{ab}{p\sqrt{T}} = 0$
 $v^3 + \left(b - \frac{RT}{p} \right) v^2 - \left(3b^2 + \frac{2bRT}{p} - \frac{a}{p} \right) v + b^3 + \frac{b^2RT}{p} - \frac{ab}{p} = 0$
 None of the above

No, the answer is incorrect. Score: 0

Accepted Answers:

$$v^3 + \left(b - \frac{RT}{p} \right) v^2 - \left(3b^2 + \frac{2bRT}{p} - \frac{a}{p} \right) v + b^3 + \frac{b^2RT}{p} - \frac{ab}{p} = 0$$

4) Consider a gas obeying van der Waals equation of state, then what is its compressibility at the critical conditions? 4 points

- 0.307
 0.333
 0.375
 None of the above

No, the answer is incorrect. Score: 0

Accepted Answers:

0.375

5) Consider a gas obeying Redlich-Kwang equation of state, then what is its compressibility at the critical conditions? 4 points

- 0.307
 0.333
 0.375
 None of the above

No, the answer is incorrect. Score: 0

Accepted Answers:

0.333

6) Consider a gas obeying Peng-Robinson equation of state, then what is its compressibility at the critical conditions? 4 points

- 0.307
 0.333
 0.375
 None of the above

No, the answer is incorrect. Score: 0

Accepted Answers:

0.307

7) In the virial equation of state $z = \frac{pv}{RT} = 1 + \frac{B}{v} + \frac{C}{v^2} + \frac{D}{v^3} + \dots$, coefficient "C" accounts for 4 points

- deviations from ideal behaviour due to interactions between three molecules
 deviations from ideal behaviour due to interactions between two molecules
 deviations from ideal behaviour due to interactions between four molecules
 None of the above

No, the answer is incorrect. Score: 0

Accepted Answers:

deviations from ideal behaviour due to interactions between three molecules

8) In the virial equation of state $z = \frac{pv}{RT} = 1 + \frac{B}{v} + \frac{C}{v^2} + \frac{D}{v^3} + \dots$, coefficient "B" accounts for 4 points

- deviations from ideal behaviour due to interactions between three molecules
 deviations from ideal behaviour due to interactions between two molecules
 deviations from ideal behaviour due to interactions between four molecules
 None of the above

No, the answer is incorrect. Score: 0

Accepted Answers:

deviations from ideal behaviour due to interactions between two molecules

9) The 2nd virial coefficient obtained from which of the following intermolecular potential is independent of the temperature? 4 points

- Sutherland potential
 Square well potential
 Lennard Jones potential
 Hard sphere model

No, the answer is incorrect. Score: 0

Accepted Answers:

Hard sphere model

10) For a system, if the two-body intermolecular potentials $\Gamma_{ij}, \Gamma_{ik}, \Gamma_{jk}$ are known, then what is the important assumption for obtaining the 3rd virial coefficient from these potentials? 4 points

- $\Gamma_{ij} + \Gamma_{ik} + \Gamma_{jk} = 0$
 $\Gamma_{ij} + \Gamma_{ik} + \Gamma_{jk} > 0$
 $\Gamma_{ij} + \Gamma_{ik} + \Gamma_{jk} < 0$
 $\Gamma_{ijk} = \Gamma_{ij} + \Gamma_{ik} + \Gamma_{jk}$

No, the answer is incorrect. Score: 0

Accepted Answers:

$$\Gamma_{ijk} = \Gamma_{ij} + \Gamma_{ik} + \Gamma_{jk}$$