Unit 4 - Week 2: Estimation of Thermodynamic Properties

Assessment 2

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

Due on 2020-02-12, 23:59 IST.

1) Saturated water at 327°C has vapour pressure of 8.6 MPa and fugacity of 6.7 MPa. At such conditions, liquid has a molar volume of 25 cm^3/mol and the vapour has a molar volume of 40 cm^3/mol. Then what is fugacity at 10 MPa? **6 points**

- 4.36 MPa
- 8.51 MPa
- 6.75 MPa
- 9.24 MPa

No, the answer is incorrect.
Score: 0
Accepted Answers:
6.75 MPa

2) The van der Waals constants for n-butane (1) and n-octane (2) are given as: **6 points**
a_1 = 1.3874 Pa ($m^3/mol)^2$, b_1 = 0.1163×10^{-3} m^3/mol, a_2 = 3.7890 Pa ($m^3/mol)^2$ and b_2= 0.237×10^{-3} m^3/mol. What are the van der Waals constants "a" and "b" for equimolar mixture of n-butane and n-octane?

- a = 2.4405 Pa ($m^3/mol)^2$, b = 0.1767×10^{-3} m^3/mol
- a = 5.4315 Pa ($m^3/mol)^2$, b = 2.1837×10^{-6} m^3/mol
- a = 7.3985 Pa ($m^3/mol)^2$, b = 5.1315×10^{-4} m^3/mol
- a = 6.1767 Pa ($m^3/mol)^2$, b = 3.2405×10^{-5} m^3/mol

No, the answer is incorrect.
Score: 0
Accepted Answers:
a = 2.4405 Pa ($m^3/mol)^2$, b = 0.1767×10^{-3} m^3/mol

3) **6 points**
For a gaseous mixture, the appropriate equation of state is found to $P = \frac{RT}{v-b} - \frac{a}{v^2}$ (i.e., van der Waals equation) where constants "a" and "b" are given as a = 2.4405 Pa ($m^3/mol)^2$ and b = 0.1767×10^{-3} m^3/mol. What is molar volume of this mixture at P = 16 bar and T = 600K?

- 6.431×10^{-4} m^3/mol
- 2.781×10^{-3} m^3/mol
- 5.634×10^{-6} m^3/mol
- 8.529×10^{-9} m^3/mol

No, the answer is incorrect.
Score: 0
Accepted Answers:
2.781×10^{-3} m^3/mol

4) **6 points**
For a gaseous mixture, the appropriate equation of state is found to $P = \frac{RT}{v-b} - \frac{a}{v^2}$ (i.e., van der Waals equation) where constants "a" and "b" are given as: a = 2.4405 Pa ($m^3/mol)^2$ and b = 0.1767×10^{-3} m^3/mol. What is the compressibility of this mixture at P = 16 bar and T = 600K?

- 0.646
- 0.563
- 0.474
- 0.892

No, the answer is incorrect.
Score: 0
Accepted Answers:
0.892

5) **6 points**
The constants for van der Waals equation $P = \frac{RT}{v-b} - \frac{a}{v^2}$ for n-butane (1) and n-octane (2) are given as: a_1 = 1.3874 Pa ($m^3/mol)^2$, b_1 = 0.1163×10^{-3} m^3/mol, a_2 = 3.7890 Pa ($m^3/mol)^2$ and b_2= 0.237×10^{-3} m^3/mol. For their equimolar mixture, these constants are a = 2.4405 Pa ($m^3/mol)^2$ and b = 0.1767×10^{-3} m^3/mol; and the molar volume of the mixture is 2.781×10^{-3} m^3/mol. What is the fugacity of n-butane (1) at P = 16 bar and T = 600K?

- 11.547 bar
- 7.677 bar
- 4.246 bar
- 9.782 bar

No, the answer is incorrect.
Score: 0
Accepted Answers:
7.677 bar

6) **6 points**
The constants for van der Waals equation $P = \frac{RT}{v-b} - \frac{a}{v^2}$ for n-butane (1) and n-octane (2) are given as: a_1 = 1.3874 Pa ($m^3/mol)^2$, b_1 = 0.1163×10^{-3} m^3/mol, a_2 = 3.7890 Pa ($m^3/mol)^2$ and b_2= 0.237×10^{-3} m^3/mol. For their equimolar mixture, these constants are a = 2.4405 Pa ($m^3/mol)^2$ and b = 0.1767×10^{-3} m^3/mol; and the molar volume of the mixture is 2.781×10^{-3} m^3/mol. What is the fugacity of n-octane (2) at P = 16 bar and T = 600K?

- 3.986 bar
- 7.624 bar
- 9.564 bar
- 6.763 bar

No, the answer is incorrect.
Score: 0
Accepted Answers:
6.763 bar

7) **6 points**
The constants for van der Waals equation $P = \frac{RT}{v-b} - \frac{a}{v^2}$ for n-butane (1) and n-octane (2) are given as: a_1 = 1.3874 Pa ($m^3/mol)^2$, b_1 = 0.1163×10^{-3} m^3/mol, a_2 = 3.7890 Pa ($m^3/mol)^2$ and b_2= 0.237×10^{-3} m^3/mol. For their equimolar mixture, these constants are a = 2.4405 Pa ($m^3/mol)^2$ and b = 0.1767×10^{-3} m^3/mol; and the molar volume of the mixture is 2.781×10^{-3} m^3/mol. What is the fugacity of the mixture at P = 16 bar and T = 600K?

- 14.409 bar
- 12.354 bar
- 10.526 bar
- 8.648 bar

No, the answer is incorrect.
Score: 0
Accepted Answers:
14.409 bar

8) A gas mixture composing of 20% A, 35% B and 45% C on mole% basis, the fugacity co-efficient of these are 0.7, 0.6, and 0.9 respectively. What is the fugacity of the mixture at T = 398K and P = 6.08 MPa? **6 points**

- 4.52 MPa
- 6.62 MPa
- 7.96 MPa
- 2.42 MPa

No, the answer is incorrect.
Score: 0
Accepted Answers:
4.52 MPa

9) Calculate fugacity of water vapour at 320°C and 70 bar using Redlich-Kwong equation of state with constants a = 14.27 Pa $K^{1/2}$ m^6/mol^2 and b = 2.11×10^{-5} m^3/mol. **6 points**

- 88.45 bar
- 47.82 bar
- 60.46 bar
- 70.31 bar

No, the answer is incorrect.
Score: 0
Accepted Answers:
60.46 bar

10) Calculate fugacity of compressed liquid water at 320°C and 170 bar using Redlich-Kwong equation of state with constants a = 14.27 Pa $K^{1/2}$ m^6/mol^2 and b = 2.11×10^{-5} m^3/mol. **6 points**

- 84.68 bar
- 101.29 bar
- 132.51 bar
- 74.37 bar

No, the answer is incorrect.
Score: 0
Accepted Answers:
101.29 bar