Unit 5 - Week 3

Assignment 3

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

Due on 2019-08-21, 23:59 IST.

1) CO_2 exhibits sublimation at atmospheric pressure because — *1 point*

a. Critical point pressure is higher than the atmospheric pressure
b. Critical point pressure is lower than the atmospheric pressure
c. Triple point pressure is higher than atmospheric pressure
d. Triple point pressure is lower than atmospheric pressure

a
b
c
d

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

2) At critical temperature, the latent heat of vaporization for a substance is_____. — *1 point*

(a) negative
(b) always finite
(c) infinity
(d) zero

a
b
c
d

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

3) Gibbs-Helmholtz equation is given by — *1 point*

a. $\left[\frac{\partial(\Delta g/T)}{\partial T}\right]_p = -\frac{\Delta h}{T^2}$

b. $\left[\frac{\partial(\Delta g)}{\partial T}\right]_p = -\frac{\Delta h}{T^2}$

c. $\frac{1}{T}\left[\frac{\partial(\Delta g)}{\partial T}\right]_p = \frac{\Delta h}{T^2}$

d. $\left[\frac{\partial(\Delta g/T)}{\partial T}\right]_p = -\frac{\Delta h}{T}$

a
b
c
d

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

4) For a real gas, $\lim_{P\to 0} Z =$ ____, where Z is the compressibility factor. — *1 point*

(a) 0
(b) 1
(c) ∞
(d) ½

a
b
c
d

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

5) For 1 mole of an ideal gas, find out the value of Gibbs free energy change (Δg) when the gas is compressed from 2 bar to 7 bar at constant temperature of 100°C. — *2 points*

(a) 4567.23 J/mol
(b) 3884.97 J/mol
(c) 2978.56 J/mol
(d) 1235.78 J/mol

a
b
c
d

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

6) A vessel contains 10 m^3 of air at a pressure of 440 bar. If one-third of the air be removed by an air pump, what will be the pressure of the remaining air, the process being isothermal. The universal gas constant is R= 8.314 kJ/kmol K. — *2 points*

(a) 123.56 bar
(b) 184.78 bar
(c) 293.33 bar
(d) 345.11 bar

a
b
c
d

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

7) Match Column I (Name of the equation of states for real gases) with Column II (corresponding expressions). [notations have usual meanings used in lectures] — *2 points*

Column I	Column II
A. Van der Waals Equation	i. $Z=\frac{PV}{RT}=1+\frac{B}{V}+\frac{C}{V^2}+\frac{D}{V^3}+\ldots\ldots$
B. Redlich-Kwong equation	ii. $P=\frac{RT}{V-b}-\frac{a\alpha}{V(V+b)+b(V-b)}$
C. Peng-Robinson equation	iii. $\left(P+\frac{a}{V^2}\right)(V-b)=RT$
D. Virial equation	iv. $P=\frac{RT}{V-b}-\frac{a}{T^{0.5}V(V+b)}$

(a) A-iii, B-ii, C-iv, D-i
(b) A-iii, B-iv, C-ii, D-i
(c) A-i, B-ii, C-iv, D-iii
(d) A-iv, B-ii, C-iii, D-i

a
b
c
d

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

8) Determine the pressure exerted by steam using Van der Waals equation of state at 200°C and molar volume of 2 m^3/mol. — *5 points*

For water, take R = 8.314 J/mol.K, $T_c = 647.1$K, and $P_c = 220.55$bar.

[HINT: For Van der Waals equation, constants 'a' and 'b' are expressed in terms of Tc and Pc]

(a) 8.235 kPa
(b) 5.458 kPa
(c) 1.967 kPa
(d) 0.731 kPa

a
b
c
d

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

9) A tank of $2m^3$ volume is filled with 7 kg ammonia at 300K. Determine the pressure exerted by ammonia (i) using the ideal gas law (ii) assuming ammonia obeys van der Waal's equation of state. [Given: a = 422.546 x 10^{-3} Pa$(m^3/mol)^2$ and b = 0.037 x 10^{-3} m^3/mol, R = 8.314 J/mol.K] — *5 points*

a. (i) 2.573 mPa (ii) 2.789 mPa
b. (i) 1.534 mPa (ii) 1.554 mPa
c. (i) 0.012 mPa (ii) 0.025 mPa
d. (i) 0.511 mPa (ii) 0.499 mPa

a
b
c
d

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

10) It's required to store 1000kg nitric oxide at 131.72 bar and 287K in a storage tank. Determine the size of the tank in m^3 using two parameter compressibility factor correlations with Lee-Kesler data. [Given: T_c = 179.2K, P_c = 65.86 bar, molecular mass = 30 x 10^{-3} kg/mol] — *5 points*

a. 5.283 m^3
b. 10.283 m^3
c. 18.283 m^3
d. 26.283 m^3

a
b
c
d

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