Unit 6 - Week 4: Basic Principles of Compressible System

Assignment 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.

Module 4: Basic Principles of Compressible System

All questions are compulsory
The assignment consists of 15 questions
Each question carries equal marks (1 mark)
There is no any negative marking for selecting the wrong choice.
Assume the value of constants, if data is not provided in the problem

1) Ideal gas law expressed as follows (symbols have their usual meanings) *1 point*

- $V = P/nRT$
- $P = nRT/V$
- $T = RP/nV$
- $T = nPV/R$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$P = nRT/V$

2) A system contains 1 gmol of ideal gas. The volume occupied by gas is 100 m^3 at 300 K. Calculate the pressure (Pa) of an ideal gas in a system. (The universal gas constant (R) = 8.3 J/gmol.K) *1 point*

- 2.7
- 8.3
- 36.1
- 24.9

No, the answer is incorrect.
Score: 0

Accepted Answers:
24.9

3) According to Dalton's law (symbols have their usual meanings) *1 point*

P_i and P_i are the total pressure and partial pressure of a component in a gaseous mixture
V_i and V_i are the total volume and partial volume of a component in a gaseous mixture
T_i and T_i are the overall temperature and individual temperature of a component in a gaseous mixture

- $P_t = P_1 + P_2 + ... + P_n$
- $V_t = V_1 + V_2 + ... + V_n$
- $T_t = T_1 + T_2 + ... + T_n$
- P - Constant

No, the answer is incorrect.
Score: 0

Accepted Answers:
$P_t = P_1 + P_2 + ... + P_n$

4) For an isothermal process in a system, the gas is expanded from initial pressure 2 kPa to 1 kPa. The final volume of the gas in a system is 2 m^3. Calculate the initial volume (m^3) of the gas. Gas obeys ideal gas law. *1 point*

- 4
- 2
- 1
- 0.25

No, the answer is incorrect.
Score: 0

Accepted Answers:
1

5) A gas mixture of N_2 and O_2 is stored in a room having volume 50 m^3 at total pressure 1 atm and temperature 25 °C. The room contains 20% O_2 (mole %) and remaining nitrogen. What is the partial pressure (atm) of nitrogen inside the room? (gas obeys ideal gas law) *1 point*

- 0.2
- 0.4
- 0.6
- 0.8

No, the answer is incorrect.
Score: 0

Accepted Answers:
0.8

6) The compressibility factor or gas deviation factor (for 1 mol real gas) is expressed as *1 point*
where, Z = compressibility factor, V = Volume/mole , P = Pressure, R = Universal gas constant, T = Temperature

- $V = PR/T$
- $Z = PV/RT$
- $Z = 1 + PV/RT$
- $Z = RT/PV$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$Z = PV/RT$

7) Critical Temperature of a gas can be defined as the temperature *1 point*

- at which liquid is converted to gas
- at which liquid and solid have same composition
- above which the gas cannot be liquefied regardless of pressure
- at which all the three phases (gas, liquid, and solid) are at equilibrium

No, the answer is incorrect.
Score: 0

Accepted Answers:
above which the gas cannot be liquefied regardless of pressure

8) Virial Equation of state is defined as *1 point*

$$z = 1 + \frac{b}{v} + \frac{c}{v^2} + \frac{d}{v^3} + ...$$

(b, c, d.... are the virial coefficients, Z and v are compressibility factor and specific volume respectively)
b is called as

- zeroth virial coefficient
- first virial coefficient
- second virial coefficient
- third virial coefficient

No, the answer is incorrect.
Score: 0

Accepted Answers:
second virial coefficient

9) The van der Waals equation for 1 mol of real gas can be expressed as *1 point*

$$\left(P + \frac{a}{v^2}\right)(v - b) = RT$$

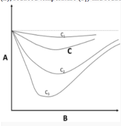
(where a and b are the van der Waals constants)
Constants a and b are accounted for

- intermolecular force only
- molecular size only
- molecular size and intermolecular force respectively
- intermolecular force and molecular size respectively

No, the answer is incorrect.
Score: 0

Accepted Answers:
intermolecular force and molecular size respectively

10)The graph shown below is a generalized compressibility factor diagram to predict relationship between compressibility factor (Z), reduced temperature (T_R) and reduced pressure (P_R). From the given diagram identify A, B, and C respectively *1 point*



- A ⊗ Z, B ⊗ T_R, C ⊗ P_R
- A ⊗ Z, B ⊗ P_R, C ⊗ T_R
- A ⊗ T_R, B ⊗ P_R, C ⊗ Z
- A ⊗ P_R, B ⊗ Z, C ⊗ T_R

No, the answer is incorrect.
Score: 0

Accepted Answers:
A ⊗ Z, B ⊗ P_R, C ⊗ T_R

11)Specific volume of a given gas (Molecular weight = 30) is 25 m^3/kmol. Calculate the density kg/m^3) of the system. *1 point*

- 1.12
- 1.2
- 0.83
- 0.75

No, the answer is incorrect.
Score: 0

Accepted Answers:
1.2

12)At STP (Standard temperature and pressure, i.e., at 0 °C, and 1 atm), 1 mol of ideal gas occupies volume (in litre) *1 point*

- 11.1
- 1.11
- 2.24
- 22.4

No, the answer is incorrect.
Score: 0

Accepted Answers:
22.4

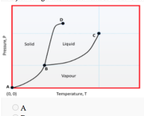
13)A gas is at temperature 100 K and pressure 1 atm inside a cylinder. Calculate the reduced temperature and pressure of the gas (Given, critical temperature and pressure of gas are 125 K and 2 atm respectively). *1 point*

- 0.5, 0.8
- 1.25, 0.5
- 0.8, 0.5
- 0.8, 2

No, the answer is incorrect.
Score: 0

Accepted Answers:
0.8, 0.5

14)The diagram shown below is the Phase diagram (P-T curve) for water. Identify the critical point from given options *1 point*



- A
- B
- C
- D

No, the answer is incorrect.
Score: 0

Accepted Answers:
C

15)The diagram shown below is the P-T curve for water. Identify the triple point of water from given options *1 point*

- A
- B
- C
- D

No, the answer is incorrect.
Score: 0

Accepted Answers:
B