Unit 7 - Week 5 : Basic principles of multiphase system

Assignment 5

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

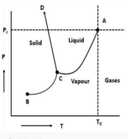
Due on 2020-03-04, 23:59 IST.

1) Compute the degree of freedom, if the system consists of water and carbon dioxide in equilibrium with its vapours — 1 point

- 0
- 2
- 1
- 4

No, the answer is incorrect.
Score: 0
Accepted Answers:
2

2) For *P* vs *T* phase diagram of a pure substance is shown in Figure — 1 point



- triple point
- boiling point
- freezing point
- None of the above

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

3) — 1 point

The Clausius – Clapeyron equation is expressed as (symbols have their usual meanings) where T is the absolute temperature, $\hat{V}_g$, $\hat{V}_l$ are specific molar volumes of gas and liquid, respectively. $\Delta\hat{H}_v$ is the latent heat of vaporisation.

- $\frac{dT}{dP^s} = \frac{\Delta\hat{H}_v}{T(\hat{V}_g + \hat{V}_l)}$
- $\frac{dP^s}{dT} = \frac{\Delta\hat{H}_v}{T(\hat{V}_g - \hat{V}_l)}$
- $\frac{dP^s}{dT} = \frac{\Delta\hat{H}_v}{T(\hat{V}_g + \hat{V}_l)}$
- $\frac{dT}{dP^s} = \frac{\Delta\hat{H}_v}{T(\hat{V}_l - \hat{V}_g)}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\frac{dP^s}{dT} = \frac{\Delta\hat{H}_v}{T(\hat{V}_g - \hat{V}_l)}$

4) The vapour pressure of water at 100 °C is 1 atm. Calculate the vapour pressure of water at 150 °C. Given: Heat of vaporisation of water is 26.21 kJ/mol. (take the value of universal gas constant (R) as 8.314 J/(mol.K) — 1 point

- 4.68 atm
- 3.21 atm
- 2.71 atm
- 1.48 atm

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

5) The general form of Antoine's equation is — 1 point
where, *A*, *B* and *C* are Antoine coefficient which varies from substance to substance

- $\ln(p^s) = A - \frac{B}{C+T}$
- $\ln(p^s) = A - \frac{B}{C-T}$
- $\ln(p^s) = B - \frac{A}{C+T}$
- $\ln(p^s) = A + \frac{B}{C+T}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\ln(p^s) = A - \frac{B}{C+T}$

6) A binary liquid mixture of benzene and toluene is in equilibrium with its vapour at 110 kPa and 395 K. The vapour pressures of benzene and toluene at 395 K are 140 kPa and 80 kPa respectively. What is the mole fraction of benzene in the liquid phase? — 1 point

- 0.005
- 0.1
- 0.5
- 0.054

No, the answer is incorrect.
Score: 0
Accepted Answers:
0.5

7) For Relative humidity (RH = 100 %) — 1 point
where, DBT = dry bulb temperature; WBT = wet bulb temperature; DPT = dew point temperature

- DBT > WBT > DPT
- DBT < WBT < DPT
- DBT = WBT > DPT
- DBT = WBT = DPT

No, the answer is incorrect.
Score: 0
Accepted Answers:
DBT = WBT = DPT

8) Grosvenor humidity (Molal humidity, MH) is defined as — 1 point

- $MH = \frac{n_i}{n_{i-free\ gas}}$
- $MH = \frac{n_{i-free\ gas}}{n_i}$
- $MH = \frac{n_{i-free\ gas}}{n_i} \times \frac{29}{18}$
- $MH = \frac{n_{i-free\ gas}}{n_i} \times \frac{18}{29}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$MH = \frac{n_i}{n_{i-free\ gas}}$

9) Humid heat is defined as the heat required to raise the temperature by 1 K of — 1 point

- 1 kg of water vapour
- 1 kg of dry air
- 1 kg of dry air and water vapour it contents
- None of the above

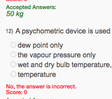
No, the answer is incorrect.
Score: 0
Accepted Answers:
1 kg of dry air and water vapour it contents

10) With increasing dry bulb temperature (DBT) of the system containing water vapour and air at constant absolute humidity, the wet-bulb temperature will — 1 point

- increase
- decrease
- remain the same
- insufficient data to predict

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

11) For a feed of 100 kg having 20% solute is to be evaporated in an evaporator. What is the amount of water evaporated for 40 % solute in the product as shown in Figure? *R* is the residue, and *D* is the distillate — 1 point



- 50 kg
- 60 kg
- 40 kg
- 70 kg

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

12) A psychometric device is used to measure — 1 point

- dew point only
- the vapour pressure only
- wet and dry bulb temperature, and humidity
- temperature

No, the answer is incorrect.
Score: 0
Accepted Answers:
wet and dry bulb temperature, and humidity

13) If the concentration of CO_2 dissolved in the sparkling water in a closed soda can is 0.75 mol/m^3, then find out partial pressure of CO_2 (bar) in the can at 25 °C. Henry's law constant for CO_2 in the water at 25 °C is 0.34 mol/m^3.bar — 1 point

- 2.45 bar
- 2.68 bar
- 2.20 bar
- 2.98 bar

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

14) The *K* value can be expressed as — 1 point
where *K_i* is the vapor-liquid equilibrium ratio. y_i, x_i represents the mole fraction in the vapor and the liquid. P_c and T_c are the critical pressure and temperature

- $\frac{P_{c_i}}{T_{c_i}}$
- $\frac{T_{c_i}}{P_{c_i}}$
- $\frac{y_i}{x_i}$
- $\frac{x_i}{y_i}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\frac{y_i}{x_i}$

15) Air-water vapour mixture has a dry bulb temperature of 60 °C and a dew point temperature of 40 °C. The total pressure is 101.3 kPa, and the vapour pressure of water at 40 °C and 60 °C are 7.30 kPa and 19.91 kPa respectively. The relative humidity of air in "kg of water/kg of dry air" is — 1 point

- 0.234
- 0.567
- 0.152
- 0.017

No, the answer is incorrect.
Score: 0
Accepted Answers:
0.152