

Unit 4 - Week 2

Assignment 2

 The due date for submitting this assignment has passed. **Due on 2019-08-21, 23:59 IST.**
 As per our records you have not submitted this assignment.

1) Which one of the following statement is TRUE? 1 point

(a) Kelvin-Planck and Clausius statements are not equivalent
 (b) Efficiencies of Carnot reversible and irreversible heat engines are equal
 (c) In any process entropy is always conserved
 (d) Coefficient of performance of refrigerator and heat pump are different

(a)
 (b)
 (c)
 (d)

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

2) 1 point

The entropy change for a reversible process from state 1 to state 2 is given by ΔS_R and that for an irreversible process between the same states (from 1 to 2) is given by ΔS_I . Pick the CORRECT statement.

(a) $\Delta S_R = \Delta S_I$
 (b) $\Delta S_R > \Delta S_I$
 (c) $\Delta S_R < \Delta S_I$
 (d) $\Delta S_R \neq \Delta S_I$

(a)
 (b)
 (c)
 (d)

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

3) 1 point

The molar Gibbs free energy of formation ($\Delta_g f$) for water (liq) at 298.15 K and 1 bar pressure from hydrogen (gas) and oxygen (gas), both at same temperature and pressure is -237.1 kJ/mole. This means,

a. 237.1 kJ/mole of energy can be obtained by decomposing 1 mole of water into its constituents at 1 bar pressure and 298.15 K
 b. 237.1 kJ/mole of energy is required to decompose 1 mole of water into its constituents at 1 bar pressure and 298.15 K
 c. 237.1 kJ/mole of energy is required to form 1 mole of water from hydrogen and oxygen at 1 bar pressure and 298.15 K
 d. None of the above

a.
 b.
 c.
 d.

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

4) For an isentropic process to be spontaneous, 1 point

a. Energy has to flow into the system
 b. Energy has to flow out of the system
 c. There should not be any energy interaction
 d. Never possible

a.
 b.
 c.
 d.

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

5) 2 points

Match the following constraints with the corresponding criteria of spontaneity for a closed system undergoing only PV work. [constants have usual meanings]

Constraint	Criteria of Spontaneity
1. Constant s, v	i. $dg \leq 0$
2. Constant s, P	ii. $dh \leq 0$
3. Constant v, T	iii. $du \leq 0$
4. Constant P, T	iv. $da \leq 0$

a. 1-i, 2-iv, 3-ii, 4-iii
 b. 1-ii, 2-i, 3-iii, 4-iv
 c. 1-iii, 2-ii, 3-iv, 4-i
 d. 1-iv, 2-iii, 3-i, 4-ii

a.
 b.
 c.
 d.

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

6) 2 points

For the reaction $A \leftrightarrow B$, the ΔH_r and ΔS_r values are found to stay constant at -205 kJ/mol and -0.9 kJ/K.mol respectively for a range of temperature and pressure. At what temperature does the system attain equilibrium?

a. 459.38 K
 b. 314.07 K
 c. 227.78 K
 d. 152.25 K

a.
 b.
 c.
 d.

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

7) 2 points

The molar volume of an inorganic solvent at 500 K and 1 bar is $0.23 \text{ m}^3/\text{kmol}$ and its coefficient of volume expansion is $1.45 \times 10^{-3} \text{ K}^{-1}$. What is the change in volume per unit temperature at constant pressure?

(a) $3.335 \times 10^{-4} \text{ m}^3/\text{kmol}\cdot\text{K}$.
 (b) $4.235 \times 10^{-4} \text{ m}^3/\text{kmol}\cdot\text{K}$.
 (c) $2.127 \times 10^{-4} \text{ m}^3/\text{kmol}\cdot\text{K}$.
 (d) $1.305 \times 10^{-4} \text{ m}^3/\text{kmol}\cdot\text{K}$.

(a)
 (b)
 (c)
 (d)

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

8) 5 points

Assuming that air is a mixture of 21% O_2 and 79% N_2 by volume at room temperature and atmospheric pressure. Calculate the entropy of mixing of pure O_2 and pure N_2 (in J/mol.K) to form air at the same temperature and pressure. Given $R = 8.314 \text{ J/mol.K}$

a. 4.27
 b. 8.67
 c. 1.39
 d. 13.50

a.
 b.
 c.
 d.

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

9) 5 points

A steel ball at a temperature 1500 K, weighing 10 kg is quenched in 100 kg of water at 300 K. Assuming no heat losses to atmosphere, determine the total change in entropy (in kJ/K). The specific heat (C_p) of steel is 0.88 kJ/kg.K and that of water is 4.18 kJ/kg.K.

a. 3.38
 b. 8.57
 c. 14.05
 d. 19.66

a.
 b.
 c.
 d.

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

10) 5 points

For a gas obeying the equation of state $P(v-b)=RT$, calculate (i) enthalpy change and (ii) entropy change when the gas is taken from state 1 [$P_1=10 \text{ bar}$, $T_1=300\text{K}$] to state 2 [$P_2=20 \text{ bar}$, $T_2=400\text{K}$]. Assume constant C_p ($=40 \text{ kJ/kmol.K}$) over the temperature and pressure range and constant, $b = 0.2 \text{ m}^3/\text{kmol}$. Also given, $R = 8.314 \text{ J/mol.K}$

a. $dh = 3200 \text{ KJ/kmol}$, $ds = 3.74 \text{ KJ/kmol.K}$
 b. $dh = 4200 \text{ KJ/kmol}$, $ds = 5.74 \text{ KJ/kmol.K}$
 c. $dh = 4200 \text{ KJ/kmol}$, $ds = 3.74 \text{ KJ/kmol.K}$
 d. $dh = 3200 \text{ KJ/kmol}$, $ds = 5.74 \text{ KJ/kmol.K}$

a.
 b.
 c.
 d.

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

Course outline

How to access the portal

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Week 1

Week 2

- Lecture 6: Entropy Change during Spontaneous Processes
- Lecture 7: Criteria for Spontaneity
- Lecture 8: Criteria for Spontaneity (Contd.)
- Lecture 9: Thermodynamic Network
- Lecture 10: Thermodynamic Network (Contd.)

WEEK 2 NOTES

- Quiz : Assignment 2
- Feedback for week 2

Week 3

Week 4

Week 5

Week 6

Week 7

Week 8

DOWNLOAD VIDEOS

Assignment Solution

Live Session