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Courses » Fundamentals Of Combustion (Part 1)

Announcements Course Ask a Question Progress Mentor

Unit 5 - Week 4 : Chemical Equilibrium and Kinetics

Course outline

How to access the portal?

Week 1 :
Introduction to Combustion

Week 2 :
Thermodynamics of combustion

Week 3 :
Thermochemistry

Week 4 :
Chemical Equilibrium and Kinetics

● Lecture 16
Chemical equilibrium and Gibbs free energy

● Lecture 17
Equilibrium constants and Le chatlier principle

● Lecture 18
Determination of chemical equilibrium composition

● Lecture 19
Chemical and reaction kinetics

● Lecture 20
Compact notation and reaction rate of chemical reaction

○ Quiz : Week 4 Assessment 4

● Week 4 :Assessment 4 Solutions

Week 4 Assessment 4

The due date for submitting this assignment has passed. **Due on 2018-03-07, 11:59 IST.**

Submitted assignment

1.¹⁾ When the system $A + B \rightleftharpoons C + D$ is at equilibrium, 1 point

- The sum of the concentrations of A and B must equal the sum of the concentrations of C and D.
- Both the forward and the reverse reactions have stopped.
- Either the forward reaction has stopped or the reverse reaction h
- Neither the forward nor the reverse reaction has stopped.

No, the answer is incorrect.

Score: 0

Accepted Answers:

Neither the forward nor the reverse reaction has stopped.

2) For the reaction, 3 points
 $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$ $\Delta H^0 = -197.8 \text{ kJ/mol}$ and $\Delta S^0 = -187.9 \text{ J/mol}$

Assume that ΔH^0 and ΔS^0 are independent of temperature, calculate the equilibrium constant for this reaction at 262 K

- 4.2×10^{25}
- 4.2×10^{29}
- 4.2×10^{34}
- 4.2×10^{39}

No, the answer is incorrect.

Score: 0

Accepted Answers:

4.2×10^{29}

3) Determine the mole fraction of H_2 , O_2 , H_2O at the equilibrium at 3000 K and 5 atm for the **5 points**
 chemical reaction $H_2 + 0.5O_2 \rightarrow H_2O$ when the ratio of the number of hydrogen to elemental oxygen is unity. Consider $g^0_f = 77326 \text{ kJ/kmol}$

- 0.02,0.34,0.64
- 0.09,0.64,0.27
- 0.19,0.17,0.64
- 0.04,0.68,0.28

No, the answer is incorrect.

Score: 0

Week 4
Feedback

Week 5 :
Chemical
Kinetics

Week 6 : Types of
reaction and
Introduction to
Physics of
combustion

Week 7 :
Transport
Phenomena

Week 8 :
Conservation
Equations

Accepted Answers:

0.02,0.34,0.64

4) For the reaction,
 $\text{CO}_2 \rightleftharpoons \text{CO} + 0.5\text{O}_2$

3 points

at 5 atm and 1200 K, the mole fractions at an instant is given to be 0.67,0.21 and 0.12 for CO_2 , CO and O_2 respectively. Evaluate K_p

- 0.243
 0.143
 0.147
 0.297

No, the answer is incorrect.

Score: 0

Accepted Answers:

0.243

5) For the reaction
 $\text{CO}_2 \rightleftharpoons \text{CO} + 0.5\text{O}_2$

1 point

at 5 atm and 1200 K, the mole fractions at an instant is given to be 0.67,0.21 and 0.12 for CO_2 , CO and O_2 respectively. Evaluate K_c

- 0.00443
 0.00314
 0.00243
 0.00175

No, the answer is incorrect.

Score: 0

Accepted Answers:

0.00243

6) Consider the equilibrium reaction $\text{H}_2 \rightleftharpoons 2\text{H}$ in a reactor vessel. Calculate the mole fractions of H_2 and H for $T= 3000 \text{ K}$, $P =1 \text{ atm}$ using following data:

2 points

$$g_{f,H}^0(2300\text{K}) = 46007 \text{ kJ/kmol} \quad g_{f,H}^0(3000\text{K}) = 88664 \text{ kJ/kmol.}$$

- 0.91,0.09
 0.71,0.29
 0.65,0.35
 0.83,0.17

No, the answer is incorrect.

Score: 0

Accepted Answers:

0.83,0.17

7) Consider the equilibrium reaction $\text{H}_2 \rightleftharpoons 2\text{H}$ in a reactor vessel. Calculate the mole fractions of H_2 and H for $T= 3000 \text{ K}$, $P =5 \text{ atm}$ using following data:

1 point

$$g_{f,H}^0(2300\text{K}) = 46007 \text{ kJ/kmol} \quad g_{f,H}^0(3000\text{K}) = 88664 \text{ kJ/kmol.}$$

- 0.65,0.35
 0.71,0.29
 0.93,0.07
 0.83,0.17

No, the answer is incorrect.

Score: 0

Accepted Answers:

0.93,0.07

8) Consider the equilibrium reaction $\text{H}_2 \rightleftharpoons 2\text{H}$ in a reactor vessel. Calculate the mole fractions of H_2 and H for $T=2300\text{ K}$, $P=5\text{ atm}$ using following data:

1 point

$$g_{f,H}^0(2300\text{K}) = 46007\text{ kJ/kmol} \quad g_{f,H}^0(3000\text{K}) = 88664\text{ kJ/kmol.}$$

- 0.996,0.004
 0.912,0.088
 0.934,0.066
 0.954,0.046

No, the answer is incorrect.

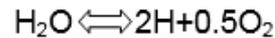
Score: 0

Accepted Answers:

0.996,0.004

9) A flame exhaust has the composition (by volume) of 14% CO_2 , 2% O_2 , 12% H_2O , the rest is N_2 . The flame temperature is 1900K operated at a pressure of 31 atm. Calculate the equilibrium mole fraction of H from the dissociation reaction

3 points



Assume that the effect on the mole fractions of the major species negligible.

$$g_{f,H}^0(1900\text{K}) = 112859\text{ kJ/kmol.} \quad g_{f,\text{H}_2\text{O}}^0(1900\text{K}) = -141435\text{ kJ/kmol.}$$

- 0.069
 0.075
 0.047
 0.084

No, the answer is incorrect.

Score: 0

Accepted Answers:

0.069

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