Unit 4 - Combustion Chemistry + Heat & Mass Transfer + Coupling of Chemical Kinetics and Thermodynamics + Laminar Premixed Flames

Assignment-3

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

1) Which of the following statements are true with regard to the NOx study:
   - 1 point
   - NOX intermediate mechanism is important in rich combustion study
   - NOX can be studied using extended Zeldovich mechanism
   - Prompt NOX is formed in the post-flame zone

   No, the answer is incorrect.
   Score: 0
   Accepted Answer:
   "Thermal NOX can be studied using extended Zeldovich mechanism"

2) Mass transfer takes place due to
   - 1 point
   - bulk motion of the species
   - diffusion due to concentration gradient
   - diffusion due to thermal gradient
   - All of the above

   No, the answer is incorrect.
   Score: 0
   Accepted Answer:
   "All of the above"

3) Which of the following is true about diffusivity:
   - 1 point
   - increases linearly with temperature and decreases with pressure
   - decreases with temperature and increases with pressure
   - increases with temperature and decreases hyperbolically with pressure
   - decreases linearly with temperature and pressure

   No, the answer is incorrect.
   Score: 0
   Accepted Answer:
   "Increase with temperature and decreases hyperbolically with pressure"

4) In liquid droplet evaporation of species A, which of the following is correct:
   - 1 point
   - the net mass flux of species A is directly proportional to the current droplet surface area
   - the net mass flux of species A decreases with increase in the mass fraction of species A in the surroundings
   - both above options are correct
   - None of the above

   No, the answer is incorrect.
   Score: 0
   Accepted Answer:
   "Both above options are correct"

5) For a droplet of liquid fuel (density = 840 kg/m³) with the diameter of 10μm evaporating in a dry nitrogen environment (mean gas density = 0.0425 kg/m³ at temperature 300K), the transfer number comes out to be 24.32. Select the correct value of evaporation constant from the options given below.
   (Use diffusivity constant D_A = 25 x 10⁻⁶ m²/s)

   - 0.015 m/s
   - 3.3 x 10⁻⁷ m/s
   - 0.015 m/s
   - 3.3 x 10⁻⁷ m/s

   No, the answer is incorrect.
   Score: 0
   Accepted Answer:
   "3.3 x 10⁻⁷ m/s"

6) Which of the following reactors witness flow work only:
   - 1 point
   - well-stirred reactor
   - constant pressure reactor
   - constant volume reactor
   - plug flow reactor

   No, the answer is incorrect.
   Score: 0
   Accepted Answer:
   "Constant pressure reactor"

7) Assuming steady-state, which of the correct expression of the residence time for the gases in the reactor:
   - 1 point

   \[ \tau = \frac{V}{\dot{V}} \]
   \[ \tau = \rho \cdot \dot{V} \]
   \[ \tau = \rho \cdot \dot{c}_p \text{ where } c_p \text{ is the heat capacity} \]
   \[ \text{None of the above} \]

   No, the answer is incorrect.
   Score: 0
   Accepted Answer:
   "\tau = \rho \cdot \dot{c}_p"

8) Which of the following characteristics the plug flow reactor and which zone of gas turbine combustion is modelled as a plug flow reactor:
   - 1 point
   - Unsteady flow, primary zone of the gas-turbine combustion
   - No mixing in the axial direction, primary zone of the gas-turbine combustion
   - Uniform properties in the direction perpendicular to the flow, dilution zone
   - Uniform properties in the direction axial to the flow, dilution zone

   No, the answer is incorrect.
   Score: 0
   Accepted Answer:
   "Uniform properties in the direction perpendicular to the flow, dilution zone"