X

NPTEL reviewer4@nptel.iitm.ac.in

Courses » Fundamentals of Combustion (Part 2)

Announcements Course Ask a Question Progress Mentor FAQ

Unit 7 - Week 6: Droplet and Spray Combustion

Course outline

How to access the portal

Week 1: Introduction to Flame and One dimentional Combution Wave Analysis

Week 2: Laminar Premixed Flames and Burning Velocity

Week 3: Effects of Physical and Chemical Variables on Burning Velocity, Flame Extinction, Ignition and Stabilization

Week 4: Introduction to Turbulent Premixed Flames and Diffusion Flames

Week 5: Diffusion Flame and Introduction to Droplet Combustion

Week 6: Assignment

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

Due on 2018-09-19, 11:59 IST.

1) Droplet burning rate *1 point*

- increases with reduction in droplet size.
- decreases with reduction in droplet size.
- remains same.

No, the answer is incorrect.
Score: 0

Accepted Answers:
increases with reduction in droplet size.

2) Droplet burning rate *1 point*

- increases with increase in ambient pressure.
- decreases with decrease in ambient pressure.
- remains same.

No, the answer is incorrect.
Score: 0

Accepted Answers:
increases with increase in ambient pressure.

3) The lifetime of a droplet if initial diameter is 200 micro meter and burning constant is 2.32×10^{-6} m^2/s *1 point*

- 0.01 sec
- 0.03 sec
- 0.017 sec
- [illegible]

- increases along the length of combustor.
- decreases along the length of combustor.
- remains same.

No, the answer is incorrect.
Score: 0

Accepted Answers:
decreases along the length of combustor.

5) Choose the correct statement regarding droplet combustion ***1 point***

- Fuel and oxidizer mass fractions are zero at the interface of flame.
- Fuel mass fraction is 0 and oxidizer mass fraction is 1 at the interface of flame.
- Fuel mass fraction is 1 and oxidizer mass fraction is 0 at the interface of flame.
- Fuel and oxidizer mass fractions are 1 at the interface of flame.

No, the answer is incorrect.
Score: 0

Accepted Answers:
Fuel and oxidizer mass fractions are zero at the interface of flame.

6) An methanol fuel droplet diameter of 200 micrometer gets evaporated in a quiescent air at temperature of 700 K and pressure of 0.5 MPa. The lifetime of this droplet is: ***4 points***
(Boiling point of methanol=337 K, density of methanol=790 kg/m^3, thermal conductivity of methanol=0.202 *W/mK*, thermal conductivity of air=.0404 *W/mK*, Heat capacity of gaseous mixture=1.1 *kJ/kg.K*, Heat of combustion=715 *kJ/kg.K*, Heat of vaporization=38.278 *kJ/kg.K*)

- 0.016 s
- 0.028 s
- 0.036 s
- 0.040 s

No, the answer is incorrect.
Score: 0

Accepted Answers:
0.016 s

7) A liquid fuel combustor is to be designed, considering the flow to be 1-D with mono dispersed spray of initial diameter of 250 micro m. The initial velocity of air is 2 m/s at 600 K and 0.1 MPa. The fuel/air ratio by mass is estimated to be 0.05 with adiabatic flame temperature of 2300 K. Assume burning constant to be 0.9 mm^2/s. The density of liquid fuel is 800 kg/m^3. ***4 points***
The initial droplet number density, the length of reaction zone and the combustion intensity are: (Cp=1.2 kJ/kg K)

- 9.8 $\times 10^6$ m^{-3}, 0.22 m and 9.5 MW/m^3
- 4.2 $\times 10^6$ m^{-3}, 0.37 m and 6.3 MW/m^3
- 9.8 $\times 10^6$ m^{-3}, 0.37 m and 6.3 MW/m^3
- 4.2 $\times 10^6$ m^{-3}, 0.22 m and 9.5 MW/m^3

No, the answer is incorrect.
Score: 0

Accepted Answers:

4.2 ×10^6 m^{-3}, 0.37 m and 6.3 MW/m^3

8) An n-hexane fuel with droplet diameter of 1 mm is burning in air at ambient condition. The ratio of the flame radius to droplet radius is calculated to be: (Boiling Temperature of hexane=342K, T_{inf}=1300 K and P=1 atm, Cp_{mix}=*1.19 kJ/kg.K*, Heat of combustion=45000 *kJ/kg.K*, Heat of vaporization=*316 kJ/kg.K*) **3 points**

- 29
- 58
- 126
- 164

No, the answer is incorrect.
Score: 0

Accepted Answers:
126

9) Droplets of n-hexane are burnt at two different temperatures 1000 K and 500 K. The ratio of the transfer number B at these two temperatures: (Boiling Temperature of hexane=342 K; At both temperatures, consider Cp_{mix}=*1.19 kJ/kg.K*, Heat of combustion=*45000 kJ/kg.K*, Heat of vaporization=*316 kJ/kg.K)* **3 points**

- 1.1
- 0.8
- 1.25
- 1.7

No, the answer is incorrect.
Score: 0

Accepted Answers:
1.7

10) Two different fuels with same densities are injected into hot air at 1000 K using same atomizer. The atomizer produces two different size droplets of 100 micro m and 200 micro m. If the transfer numbers of two different fuels are 2 and 4 respectively then the ratio of droplet evaporation lifetime (Assume same heat capacity and thermal conductivity for both the fuel mixtures) **3 points**

- 1.18
- 1.50
- 0.37
- 0.63

No, the answer is incorrect.
Score: 0

Accepted Answers:
0.37

Previous Page End