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Courses » Fundamentals of Combustion (Part 2)

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Unit 5 - Week 4: Introduction to Turbulent Premixed Flames and Diffusion Flames

Course outline

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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

- Lecture 16: Ignition in Premixed Flames

Week 4: Assignment

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

Due on 2018-09-12, 23:59 IST.

1) Smallest length scale associated with turbulent flow is *1 point*

- Characteristic width of flow or macroscale
- Integral scale or turbulence microscale
- Taylor microscale
- Kolmogorov microscale

No, the answer is incorrect.
Score: 0

Accepted Answers:
Kolmogorov microscale

2) When oxygen is used in place of air, minimum ignition energy *1 point*

- increases
- decreases
- remains same

No, the answer is incorrect.
Score: 0

Accepted Answers:
decreases

3) For a fixed ratio of length scale, when turbulent intensity increases for a particular flame with certain fuel-air mixture, Damkohler number *1 point*

- increases

4) Which of followings is not an example of diffusion flame **1 point**

- Forest fire
- Candle flame
- Wick flame
- Bunsen flame

No, the answer is incorrect.
Score: 0

Accepted Answers:
Bunsen flame

5) Minimum ignition energy for hydrogen-air system is quite less as compared to hydrocarbon-air mixture. Following statement is **1 point**

- True
- False

No, the answer is incorrect.
Score: 0

Accepted Answers:
True

6) Minimum ignition energy for igniting stoichiometric C_2H_2-air mixture (S_L=60 cm/s) at ambient conditions (P=1 atm, T=298 K) and at another condition when the pressure is tripled (T_{ad}=2200 K, C=2, n=2, k_g=0.06 W/mK and C_p=1.3 kJ/kg.K) **4 points**

- .031 mJ and .0034 mJ
- 3.5 mJ and .038 mJ
- 3.5 J and 31.5 mJ
- 0.3 mJ and 2.79 mJ

No, the answer is incorrect.
Score: 0

Accepted Answers:
.031 mJ and .0034 mJ

7) If at the sea level, 6 J is provided to a gas turbine engine for ignition, then the amount of ignition energy required at an altitude of 6 km (P=47.166 kPa and T=248 K) (Assume constant T_{ad}=2200K) is **3 points**

- 13.6 J
- 18.4 J
- 27.7 J
- 32.8 J

No, the answer is incorrect.
Score: 0

Accepted Answers:
27.7 J

8) A setup consists of 20mm × 20mm square channel is established to measure turbulent burning velocity. The unburnt fuel air mixture passes through the channel with mean flow velocity of 70 m/s at T=298K and P=1 atm. If the time averaged flame surface area is measured to be 0.004 m^2, then turbulent burning velocity is (MW=28 kg/kmol) **3 points**

- 3 m/s

- 5 m/s
- 7 m/s
- 9 m/s

No, the answer is incorrect.
Score: 0

Accepted Answers:
7 m/s

9) If the turbulent mixing time scale is given to be 1 ms for a turbulent flow of octane-air flame (phi=0.8) at 800 K and 1.2 MPa then the value of Damkohlar number is (Take $S_L=S_{L,r}(Tu/Tu,r)^{\gamma}(P/Pr)^{\beta}$ γ=2.18-0.8(∅-1), β=-0.16+0.22(∅-1) $S_{L,r}$=26.32-84.72(∅-1.13)^2 , α=1.38×10^{-5} m^2/s Tu,r=298K, Pr=1 atm) ***4 points***

- 50
- 69
- 98
- 48

No, the answer is incorrect.
Score: 0

Accepted Answers:
48

10) A gas turbine is operating at 2.2 MPa which uses methane-air mixture. Minimum energy required for ignition of this mixture (at sea level n=2.2, C=4, kg=0.08, Cp=1.1 kJ/kmol, S_L=38 cm/s, Tad=2300 K) ***3 points***

- 0.28 mJ
- 0.23 µJ
- 0.56 mJ
- 0.5 µJ

No, the answer is incorrect.
Score: 0

Accepted Answers:
0.23 µJ

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