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Courses » Fundamentals Of Combustion (Part 1)

Announcements   **Course**   Ask a Question   Progress   Mentor

Unit 3 - Week 2 :
Thermodynamics of combustion

Course outline

How to access the portal?

Week 1 : Introduction to Combustion

Week 2 : Thermodynamics of combustion

● Lecture 6 : Thermodynamics of combustion

● Lecture 7 : Thermodynamics of combustion(Contd..)

● Lecture 8 : Laws of thermodynamics and Stoichiometry

● Lecture 9 : Stoichiometric calculations for air-gas mixture

● Lecture 10 : Mixture fraction calculation for diffusion flames

○ Quiz : Week 2 : Assessment 2

● Week 2 : Assessment 2 Solutions

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Week 3 : Themochemistry

Week 4 : Chemical

Week 2 : Assessment 2

The due date for submitting this assignment has passed. **Due on 2018-02-21, 23:59 IST.**

Submitted assignment

1) A heat engine working on thermodynamic cycle draws 250 kJ of heat energy from a source **2 points** at 1000 K per cycle and rejects a certain amount of heat energy at 200K per cycle. Which of the following statement is correct

- ○ Amount of heat energy rejected must be 50 kJ
- ○ Amount of heat rejected must be less than 50kJ
- ○ Amount of heat energy rejected must be greater than or equal to 50 kJ
- ○ The given data is insufficient to conclude.

No, the answer is incorrect.
Score: 0

Accepted Answers:
Amount of heat energy rejected must be greater than or equal to 50 kJ

2) The statement of first law of thermodynamics for an isolated system is   **1 point**

- ○ Conservation of momentum
- ○ Conservation of energy
- ○ Conservation of heat
- ○ Conservation of work

No, the answer is incorrect.
Score: 0

Accepted Answers:
Conservation of energy

3) 1.5 kg of water at 80^0C is mixed thoroughly with 3 kg of water at 50^0C in a perfectly   **3 points** insulated tank. Assuming the specific heat of water to be constant (4.18 kJ/kgK) the entropy generated in J/K during this process is

- ○ 0
- ○ 16.6
- ○ 126.1
- ○ 512.6

No, the answer is incorrect.
Score: 0

Accepted Answers:
16.6

4) An ideal gas expands in an adiabatic friction-less nozzle from the inlet conditions of 15 bar **2 points** 1000K to the ambient pressure of 1 bar at the outlet. The specific heat C_p for gas in 1 kJ/kg and the specific heat ratio γ=1.4. Neglecting inlet kinetic energy, the velocity of the gas in m/s at nozzle exit is

○ 38

○ 538

○ 838

○ 1038

No, the answer is incorrect.
Score: 0

Accepted Answers:
1038

5) Air at the rate of 125 g/s enters at 290 K with a velocity of 15 m/s and leaves at 325 K with a **2 points** velocity of 18 m/s flows steadily into an air heater. The heating is accomplished in this air heater with help of a burner. Determine power in Watts for this ideal burner? Assume C_p=1005 J/kg K.

○ 2403

○ 5406

○ 3404

○ 4403

No, the answer is incorrect.
Score: 0

Accepted Answers:
4403

6) Determine the air-fuel ratio on a mass basis for stochiometric combustion of liquid n- **2 points** dodecane ($C_{12}H_{26}$)

○ 14.94

○ 29.88

○ 56.64

○ 88.06

No, the answer is incorrect.
Score: 0

Accepted Answers:
14.94

7) Estimate lower heating value of liquid ethanol in J per kg of C_2H_5OH, given the heat **1 point** of formation of C_2H_5OH, CO_2, H_2O(g), are -278000, -393546, and -241845 J/mol and latent heat of vaporization is 44010 J/mol.

○ 29910

○ 26840

○ 29630

○ 28610

No, the answer is incorrect.
Score: 0

Accepted Answers:
26840

8) Estimate higher heating value of liquid ethanol in J per kg of C_2H_5OH, given the heat of **2 points** formation of C_2H_5OH, CO_2, H_2O(g) are -278000, -393546, and -241845 J/mol respectively and latent heat of vaporization is 44010 J mol^{-1}

○ 29910

○ 29840

○ 29630

◯ 29710

No, the answer is incorrect.
Score: 0

Accepted Answers:
29710

9) If methanol is burnt with 200% stoichiometric air, obtain corresponding product mole   **3 points**
fractions for CO_2, H_2O, N_2, O_2 respectively.

◯ 0.06,0.13,0.71,0.1
◯ 0.06,0.09,0.75,0.1
◯ 0.06,0.09,0.65,0.2
◯ 0.09,0.06,0.71,0.14

No, the answer is incorrect.
Score: 0

Accepted Answers:
0.06,0.13,0.71,0.1

10)An aviation gas turbine engine utilizing liquid n-dodecane as the fuel operates with an air-   **2 points**
fuel ratio of 20 (mass basis). Determine the corresponding equivalence ratio.

◯ 0.25
◯ 0.35
◯ 0.50
◯ 0.75

No, the answer is incorrect.
Score: 0

Accepted Answers:
0.75

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