Unit 4 - Week 2: Thermochemistry,Thrust Equation & Performance Parameters of Rocket Engine

Week 2: Assignment

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

Due on 2019-08-21, 23:59 IST.

1) The speed of sound in helium gas at 400 K is: *1 point*

- 1175 m/s
- 1090 m/s
- 443 m/s
- 1235 m/s

No, the answer is incorrect.
Score: 0
Accepted Answers:
1175 m/s

2) Identify the correct statement with respect to the adiabatic flame temperature: *1 point*

- Constant pressure adiabatic flame temperature is higher as compared to the constant volume adiabatic flame temperature.
- Constant pressure adiabatic flame temperature is lower as compared to the constant volume adiabatic flame temperature.
- Constant pressure adiabatic flame temperature is always equal to the constant volume adiabatic flame temperature.
- None of the above mentioned

No, the answer is incorrect.
Score: 0
Accepted Answers:
Constant pressure adiabatic flame temperature is lower as compared to the constant volume adiabatic flame temperature.

3) The stoichiometric air to fuel ratio for C_4H_{10} on mass basis is: *1 point*

- 12.36
- 9.35
- 15.38
- 18.45

No, the answer is incorrect.
Score: 0
Accepted Answers:
15.38

4) The amount of excess air present in a mixture for equivalence ratio φ=0.8: *1 point*

- 100%
- 75%
- 50%
- 25%

No, the answer is incorrect.
Score: 0
Accepted Answers:
25%

5) The amount of thrust developed for a fully expanded rocket nozzle that consumes 400 kg of propellant in 10 s with equivalent exhaust velocity of 1850 m/s is: *1 point*

- 50 kN
- 74 kN
- 130 kN
- 64 kN

No, the answer is incorrect.
Score: 0
Accepted Answers:
74 kN

6) Adiabatic flame temperature always increases with equivalence ratio. Given statement is: *1 point*

- True
- False

No, the answer is incorrect.
Score: 0
Accepted Answers:
False

7) The reaction will attain its chemical equilibrium when Gibbs free energy attains its maximum value. Given statement is: *1 point*

- True
- False

No, the answer is incorrect.
Score: 0
Accepted Answers:
False

8) I_{sp} does not depend on the flight velocity for non-air breathing engines. Given statement is: *1 point*

- True
- False

No, the answer is incorrect.
Score: 0
Accepted Answers:
True

9) The I_{sp} value for electric rocket engine is high as compare to the solid propellant rocket engines. This statement is: *1 point*

- True
- False

No, the answer is incorrect.
Score: 0
Accepted Answers:
True

10) Mass flow coefficient depend on: *1 point*

- Mass flow rate of propellant
- Chamber pressure
- Nozzle throat area
- All of these

No, the answer is incorrect.
Score: 0
Accepted Answers:
All of these

11) Exhaust gas (γ=1.3) at pressure 100 kPa and temperature 600 K enters into a C-D nozzle with inlet Mach number 0.8. If the exit pressure is 70 kPa, then the exit Mach number and temperature are: *2 points*

- 1.20 & 470 K
- 1.20 & 553 K
- 1.12 & 553 K
- 1.12 & 470 K

No, the answer is incorrect.
Score: 0
Accepted Answers:
1.12 & 553 K

12) An aviation engine operates at air-fuel ratio of 5 on mass basis using octane as fuel. Corresponding equivalence ratio for this operating condition is: *2 points*

- 0.63
- 0.96
- 0.80
- 0.75

No, the answer is incorrect.
Score: 0
Accepted Answers:
0.63

13) Higher heating value of liquid ethanol and oxygen at 298 K is: *2 points*
(Heat of formation data:
$h_f(CO_2)$ = -394.0 kJ/mol,
$h_f(H_2O(l))$ = -286 kJ/mol,
$h_f(H_2O(g))$ = -243 kJ/mol,
$h_f(C_2H_5OH)$= -228 kJ/mol)

- 13.5 MJ/kg
- 30.8 MJ/kg
- 20.2 MJ/kg
- 9.3 MJ/kg

No, the answer is incorrect.
Score: 0
Accepted Answers:
30.8 MJ/kg

14) Consider the following equilibrium reaction *2 points*
$H_2 \rightarrow 2H$
The mole fractions of H_2 and H at 3000 K and 3 atm are: ($Kp=10^{-0.8}$)

- 0.914 & 0.086
- 0.825 & 0.175
- 0.855 & 0.145
- 0.784 & 0.216

No, the answer is incorrect.
Score: 0
Accepted Answers:
0.914 & 0.086

15) 2 moles of CH_4 react with air in stoichiometric proportion at 298K in a constant pressure vessel. The adiabatic flame temperature *2 points*
is:
Heat of formation data:
$(h_f(CH_4)$= -72.1 kJ/mol,
$h_f(CO_2)$= -394.0 kJ/mol,
$h_f(H_2O)$= -244.5 kJ/mol,
Specific heat capacity data:
$Cp(CH_4)$= -75.328 J/mol.K,
$Cp(CO_2)$=55.396 J/mol.K
$Cp(H_2O)$= 42.44 J/mol.K,
$Cp(N_2)$= 33.0 J/mol.K)

- 2130.6 K
- 2250.5 K
- 2385.6 K
- 2440.8 K

No, the answer is incorrect.
Score: 0
Accepted Answers:
2385.6 K