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NPTEL

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Courses » Radiative Heat Transfer

Announcements **Course** Ask a Question Progress FAQ

Unit 5 - Week 4

Register for Certification exam

Course outline

Assignment 4

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

Due on 2019-02-27, 23:59 IST

1) 50 % of incident radiation is transmitted through a gas contained in a cubical test section of dimension 1 m. Keeping gas conditions same, the amount of radiation transmitted when the dimension of the test section becomes 2 m is, ***1 point***

- 0.9
- 0.25
- 0.75
- 0.2

No, the answer is incorrect.
Score: 0

Accepted Answers:
0.25

2) A gas filled inside a transparent test section radiates energy. The intensity of radiation emitted from the gas will be nearly equal to blackbody intensity at the same temperature if ***1 point***

- The optical thickness in the test section is zero
- The optical thickness in the test section is much smaller than 1 but not zero
- The optical thickness in the test section is much larger than 1
- The temperature of the gas is very high

No, the answer is incorrect.
Score: 0

Accepted Answers:
The optical thickness in the test section is much larger than 1

3) Consider a cube of dimension 1 cm containing a gray gas (k_λ=0.002 cm^{-1}) at temperature T = 1000 K. The total heat loss from the cube is approximately ***1 point***

- 0.04536 W
- 0.4536 W
- 0.02 W
- 0.20 W

No, the answer is incorrect.
Score: 0

Accepted Answers:
0.04536 W

4) ***1 point***

A laser beam is directed onto the atmosphere of a (hypothetical) planet. The planet's atmosphere c 0.01% by volume of an absorbing gas. The absorbing gas has a molecular weight of 20 and, at t wavelength, an absorption coefficient $\kappa_\eta=10^{-4}cm^{-1}/(g/m^3)$. It is known that the pressure and temp distributions of the atmosphere can be approximated by $p=p_0e^{-2z/L}$ and $T= T_0e^{-2z/L}$ where p_0=0. T_0 = 400 K are values at the planet surface z = 0, and L = 2 km is a characteristic length. The abs coefficient of gas on the surface of planet in cm^{-1} is

- 4.570×10^{6}
- 3.890×10^{-6}
- 3.890×10^{6}

5) For the above problem, the fraction of the laser energy arrives at the planet's surface is *1 point*

- 60 %
- 40 %
- 20 %
- 80 %

No, the answer is incorrect.
Score: 0

Accepted Answers:
40 %

6) Consider an optically thick gray medium ($\kappa = 10$ m^{-1}) contained between two black, isothermal cylinders. The inner cylinder has a radius of 0.5 m and is at temperature *500 K*. The outer cylinder has a radius of 1 m and is at temperature *1000 K*. Assume radiative equilibrium, the magnitude of heat flux on the outer cylinder: *1 point*

- 15,984 W/m^2
- 500 W/m^2
- 9,034 W/m^2
- 10,239 W/m^2

No, the answer is incorrect.
Score: 0

Accepted Answers:
10,239 W/m^2

7) A semi-infinite medium contains a gray gas (κ=1m^{-1}, T=1000 K). The intensity of radiation leaving the medium is *1 point*

- 36,024 W/sr
- 4,075 W/sr
- 18,047 W/sr
- 9,042 W/sr

No, the answer is incorrect.
Score: 0

Accepted Answers:
18,047 W/sr

8) In the above problem the radiative heat flux exiting the medium is *1 point*

- 10,.4 kW/m^2
- 37.8 kW/m^2
- 156.2 kW/m^2
- 60.2 kW/m^2

No, the answer is incorrect.
Score: 0

Accepted Answers:
37.8 kW/m^2

9) For radiative equilibrium in a gray gas bounded by two plane parallel infinite plates, the temperature difference between gas and the walls decreases with: *1 point*

- Increase in optical depth
- Decrease in optical depth
- Remains constant
- Is zero for all values of optical depth

No, the answer is incorrect.
Score: 0

Accepted Answers:
Increase in optical depth

10) For radiative equilibrium in a gray gas bounded by two plane parallel infinite plates, the incident radiation at any point inside the medium is given as: *1 point*

- $\pi\sigma T^4$
- $4\pi\sigma T^4$
- σT^4
- $4\sigma T^4$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$4\sigma T^4$

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