10. Heat Transfer

Starter Quiz ·

University Mechanical Engineering Name: _____ Score: _____

1. Resistance of 50 mm of wool, k = 0.04, over 12 m2 (four decimals, K/W)?

   _____ K/W

2. Biot number of a 10 mm steel ball, k = 43, h = 500 (three decimals)?

   _____

3. Re for air at 4 m/s along a 150 mm plate, nu = 1.6e-5?

   _____

4. Plates at 600 K and 300 K, both eps = 0.8: flux (W/m2, whole number)?

   _____ W/m2

5. Duty cooling 2.0 kg/s of water from 40 to 30 degrees C, c = 4180 (one decimal, kW)?

   _____ kW

6. A fin is less useful far from its base because:

   ☐ air cannot reach the tip

   ☐ its area is smaller there

   ☐ aluminium conducts poorly

   ☐ its temperature falls along it

7. In the wall, the largest temperature drop is across:

   ☐ the plaster

   ☐ the inside air film

   ☐ the wool

   ☐ the brick

8. For the shaft, the lumped model:

   ☐ underestimates the time and misses the gradient

   ☐ cannot be used at all for any body

   ☐ is exact

   ☐ overestimates the time

9. A thinner thermal boundary layer gives:

   ☐ no convection

- ☐ a larger h
- ☐ the same h
- ☐ a smaller h

10. Temperatures in sigma T^4 must be in:
    - ☐ degrees Fahrenheit
    - ☐ degrees Celsius
    - ☐ either
    - ☐ kelvin

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Answers ·

University Mechanical Engineering

1. **0.1042 K/W**

   L over k A.

2. **0.019**

   h (r/3) over k.

3. **37500**

   U L over nu.

4. **4593 W/m2**

   sigma (T1^4 - T2^4) over 1.5.

5. **83.6 kW**

   m c delta T.

6. **its temperature falls along it**

   The driving difference shrinks toward the tip.

7. **the wool**

   It has the largest resistance.

8. **underestimates the time and misses the gradient**

   It gives 10.4 s against 15.6 s and assumes a uniform shaft.

9. **a larger h**

   Heat crosses the still layer by conduction.

10. **kelvin**

    Emission depends on absolute temperature.