

## WEEK 4

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### Task 1

You should complete the modified example of simplified wall calculations that you went through in the assignment of week 3 and find the total heat transfer through wall.

	Wood Section	Insulation Section
Outside Air	0.03	0.03
Wood Bevel ( 13mm*200mm)	0.14	0.14
Plywood ( 13mm )	0.11	0.11
Urethane Rigid Foam Insulation (90mm)	-	$(90*0.98) / 25 = 3.528$
Wood Studs ( 90mm)	0.63	-
Gypsum Board (13mm)	0.79	0.79
Inside surface	0.12	0.12

$$R_{wood} = 0.03 + 0.14 + 0.11 + 0.63 + 0.079 + 0.12 = 1.109 \text{ m}^2 \frac{C}{W}$$

$$R_{insulation} = 0.03 + 0.14 + 0.11 + 3.53 + 0.079 + 0.12 = 4.009 \text{ m}^2 \frac{C}{W}$$

$$U_{wood} = \frac{1}{R_{wood}} = \frac{1}{1.109} = 0.9017 \frac{W}{\text{m}^2 C}$$

$$U_{insulation} = \frac{1}{R_{insulation}} = \frac{1}{4.009} = 0.2494 \frac{W}{\text{m}^2 C}$$

$$U_{total} = 0.25 + U_{wood} + 0.75 + U_{insulation} = 0.4125 \frac{W}{\text{m}^2 C}$$

$$R_{value} = \frac{1}{U_{total}} = \frac{1}{0.4125} = 2.4242 \text{ m}^2 \frac{C}{W}$$

$$\dot{Q} = U_{total} \cdot A_{total} \cdot \Delta T = 0.4125 \frac{W}{\text{m}^2 C} \cdot 100 \text{ m}^2 = 24^\circ C$$

### Task 1

You should write a summary of what you have learnt in this session about radiation and radiative heat transfer.

#### Radiative Heat Transfer

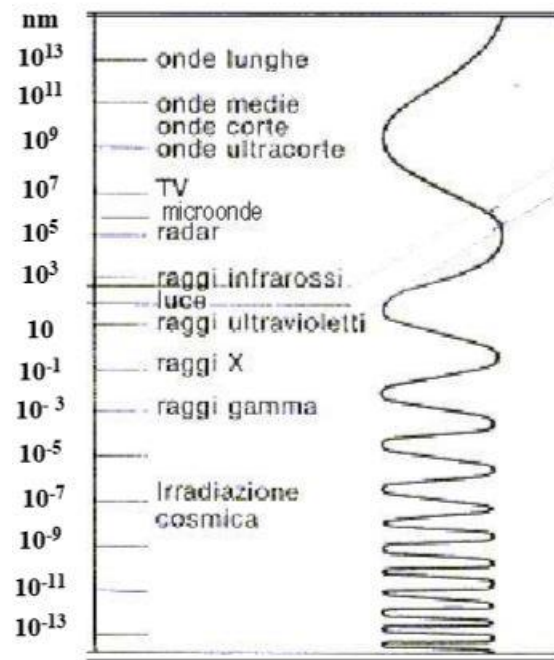
Heat propagation for radiation occurs because everybody whose temperature is higher than the absolute zero emits electromagnetic radiations. The radiation propagates in form of oscillations through electromagnetic waves. These latter are

defined through wavelength  $\lambda$  (distance run by the wave for a complete oscillation), frequency  $f$  (number of complete oscillations run in time unity), and propagation velocity  $c$  (velocity of propagation of electromagnetic waves).

Wavelength, frequency and velocity are linked together through the formula:

$$c = \lambda \cdot f$$

There are different kinds of electromagnetic range based on the wavelength.



Particular spectrum ranges:

< 0.38  $\mu\text{m}$  ultra-violet radiation UV

0.38-0.78  $\mu\text{m}$  visible radiation (light, visible to the human eye)

0.8 -100  $\mu\text{m}$  infra-red radiation IR (thermal radiation)