Question 1

	Insulation	Wood
Outside air	0.03	0.03
Wood bevel 13mm-20mm	0.14	0.14
Plywood 13 mm	0.11	0.11
Urethane rigid foam insulation 90 mm	_	(0.98/ 25)x90 =3.53
Wood studs 90mm	0.63	_
Gypsum board 13 mm	0.07	0,07
Inside surface	0.12	0,12

$R_{insulation}$=0,03+0,14+0,11+3,53+0,07+0,12 = 4 m²°C/W

$U_{insulation}$= 1/$R_{insulation}$= 1/4 = 0.25 m²°C/W

R_{wood} = 0,03+0,14+0,11+0,63+0,07+0,12 = 1.1 m²°C/W

U_{wood} = 1/R_{wood} = 1/1.1 =0.9 m².°C/W

U_{total} = U_{wood} * (A_{wood} /Atot) + U_{ins} * (A_{ins}/A_{ins})
=(75% * $U_{insulation}$)+ (25% * U_{wood})
=(0.25*0.75) + (0.91*0.25)
= 0.4125 W/m².°C

ΔT= 22- (-2) = 24°C

Q = (U_{total} * Atot* ΔT) = 0.415W/m².°C * (125*0.8)m² *24°C = 990 W

2.Radiation :

Radiation is the emission of energy through space or through a material.
During conduction, the interactions between atoms and molecules are at the origin of this radiation. They can reduce it, which reduces their energy, or absorb it, which increases it. By its nature, the radiation only intervenes in transparent media(gas, glass, vacuum) or semi-opaque media (gas,smoke, water vapor)

Thermal radiation is an electromagnetic radiation emitted from a material that is due to the heat of the material with its characteristics which dependent on its temperature. It corresponds to a flow of electromagnetic waves emitted by any body, at any temperature greater than zero. The electromagnetic radiation is all the more elevated when its temperature is high.
Depending on the temperature of the material, it transmits radiation ranging from ultra-violet to infrared .

Emmisive power depends on the wavelength and temperature .

The wavelengths between 0.4µm and 0.8µm are the only ones visible to the eye.

Frequency υ
wavelength λ
speed of propagation of a wave c
$\lambda = c/\upsilon$

Infrared radiation should be between 0.76 – 100μm and Ultraviolet radiation between 0.01 – 0.40μm : Beyod this,its dangerous.

Black body radiation :

It is a body which would absorb, if it existed, any radiation that it would receive, whatever its wavelength is. For a black body to remain in thermal equilibrium (its temperature remains constant) it must also emit energy by radiation.
Its absorptivity is therefore equal to 1.
The interest of the black body resides in the fact that it serves as a reference for defining the radiative properties of a real body.

Blackbody radiation=E(T) = $o^{-}T^4$ (W/m^2)
It is expotentially increased by temperature

Blackbody emmissive power is o^{-} = 5,670*10^{-8} $W/m^2.K^4$ which is always constant and depends on the temperature
(λT)max power = 2897.8μmK