1) The distribution of energy density for black body or cavity radiation as a function of frequency in a neighboorhood of df about f is given by..

$$u_f\,df = \left(\frac{8\pi h}{c^3}\right)\left(\exp\left(hf/(K_B T)\right) - 1\right)^{-1} f^3\,df$$

Integrate this function between 0 and infinity to find the total energy density. You may wish to recall that

$$\rightarrow \int_0^\infty \left(\exp(x) - 1\right)^{-1} x^3\,dx = \frac{\pi^4}{15}$$

2) [A] In an experiment to study the photoelectric effect, beams of photons of various wavelengths are incident on a very clean metallic surface in a vacuum. Derive a symbolic formula which gives the energy of the photons as a function of wavelength.

[B] Calculate the constant in this formula and calculate the energy of the photons in eV for the wavelengths

$\lambda = 800\,nm$

$\lambda = 625\,nm$

$\lambda = 500\,nm$