

Solutions

2.1 C Wien gives inverse- T wavelength; Stefan–Boltzmann gives T^4 integrated flux.

Compare the rejected options: Peak doubles; flux doubles; Peak halves; flux increases $4\times$; Peak unchanged; flux increases $16\times$; Peak halves; flux unchanged. Use the stated model and conditions.

2.2 C $r=a_0 \ n^2/Z=a_0 \cdot 4/2=2a_0$.

Compare the rejected options: $a_0/2$; a_0 ; $4a_0$; $8a_0$. Use the stated model and conditions.

2.3 483. $2.898\times 10^{-3}/6000 \text{ m}=483 \text{ nm}$.

2.4 False. Changing the spectral interval introduces a Jacobian and changes the location of the maximum.

3.1 Original emitted power is $P_0 = \epsilon\sigma 4\pi R^2 T^4$. Final net power is $P_f = \epsilon\sigma 4\pi (2R)^2 [(2T)^4 - T^4] = 60P_0$. Peak wavelength halves. Original net power in that same environment is zero, so a ratio to original NET power would be undefined. Award reference power, final power, peak and reference distinction.