2024 Ph H1 Q9

Section: Particles and Waves

Topic: Radiation – Blackbody Spectra

Question Summary

Graph shows energy emitted per unit area vs wavelength for stars W, X, Y, Z. Student makes 3 statements about star properties.

Worked Solution

Hotter star → shorter peak wavelength (Wien's law). Star Z peak shorter than W → Z hotter. (I correct)

Peak frequency inversely related to wavelength. Star W has longer peak wavelength, so not greatest frequency. (II incorrect)

Higher curve = greater total emission (Stefan–Boltzmann law). Star Y curve above X → Y emits more. (III correct).

Final Answer

D — I and III

Revision Tips

- Wien's law: $\lambda_{max} \propto 1/T$ — hotter stars peak at shorter λ.
- Stefan–Boltzmann: energy $\propto T^4$.
- Check both peak position and curve height on star spectra.
- Do not confuse peak λ with peak f — inverse relationship.