

Exercise walk-through

15.3

Emission and Absorption Spectra

AP Physics 2

Spectra and blackbody radiation

Discrete levels give sharp spectral lines – a **fingerprint** of each element:

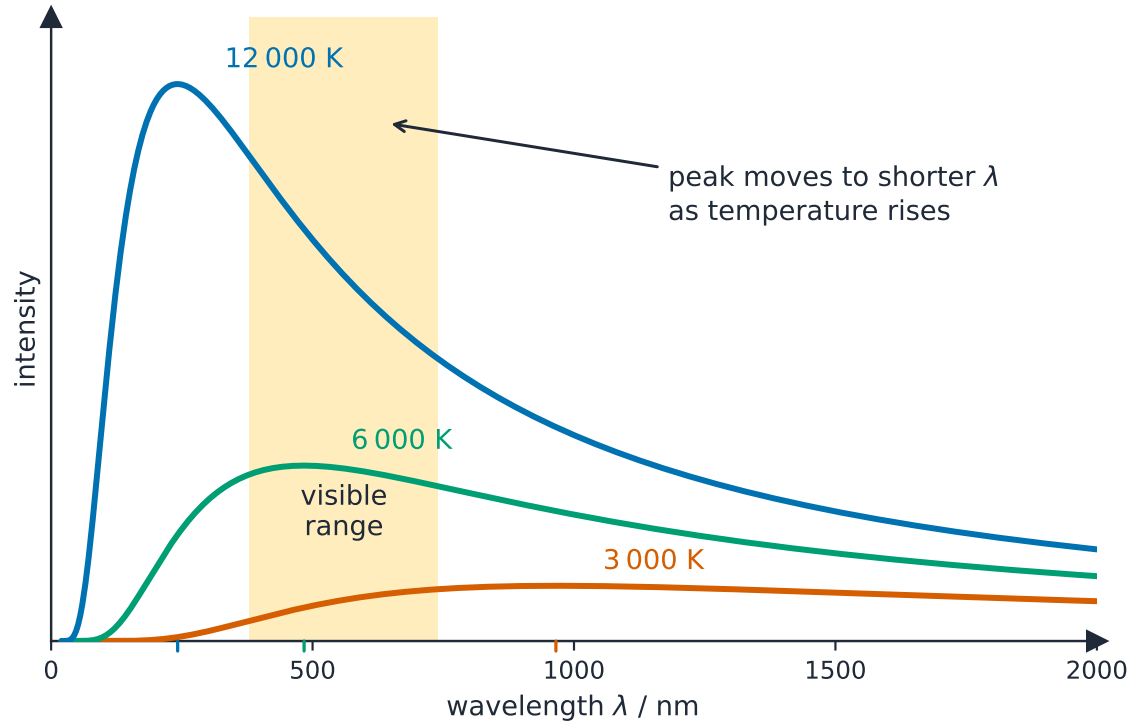
- **emission** : bright lines (electrons drop)
- **absorption** : dark lines in a rainbow (photons absorbed)

A hot **blackbody** glows across all wavelengths; hotter $\Rightarrow$ peak shifts to **shorter** λ (**Wien's law**).



Nuclear energy is released from the nucleus

A hotter black body radiates more



A hotter black body radiates more, and its peak shifts to shorter wavelengths

Exercises 2.1-2.3

2.1 Explain why atoms produce line spectra rather than continuous ones. [2]

2.2 State the difference between an emission and an absorption spectrum. [2]

2.3 State how a spectrum can identify an element. [1]

Exercises 2.1-2.3

2.1 Explain why atoms produce line spectra rather than continuous ones. [2]

2.1

- the energy levels are discrete, so only certain photon energies (and wavelengths) can be emitted or absorbed

2.2 State the difference between an emission and an absorption spectrum. [2]

2.2

- an emission spectrum is bright lines from emitted photons; an absorption spectrum is dark lines where photons are absorbed

2.3 State how a spectrum can identify an element. [1]

2.3

- each element has a unique pattern of lines

Exercises 3.1-3.2

3.1 Line spectra are evidence that atomic energy levels are

[1]

☐

A continuous

B quantized

C all zero

D random

3.2 A spectrum of dark lines on a bright background is produced by

[1]

☐

A emission

B absorption

C reflection

D diffraction

Exercises 3.1-3.2

3.1 Line spectra are evidence that atomic energy levels are

[1]

☐

A continuous

B quantized

C all zero

D random

3.1 B

- quantized.

3.2 A spectrum of dark lines on a bright background is produced by

[1]

☐

A emission

B absorption

C reflection

D diffraction

3.2 B

- absorption.

Exercise 3.3 (a)

3.3 The light from a star shows dark lines that match those of hydrogen.

(a) Name this type of spectrum.

[1]

Exercise 3.3 (a)

3.3 The light from a star shows dark lines that match those of hydrogen.

(a) Name this type of spectrum.

[1]

(a)

- an absorption spectrum

Exercise 3.3 (b)

3.3 The light from a star shows dark lines that match those of hydrogen.

(b) State what it tells us about the star.

[2]

Exercise 3.3 (b)

3.3 The light from a star shows dark lines that match those of hydrogen.

(b) State what it tells us about the star.

[2]

(b)

- hydrogen is present in the star's outer layers, absorbing those wavelengths