AP PHYSICS 2 • EXERCISE SHEET

15.4 Blackbody Radiation

Name: _____ Class: _____ Date: _____ **Total: 8 marks**

KEY WORDS blackbody 黑体 • wien's law 维恩定律 • energy quantization 能量量子化 • quanta 量子

Objective

Build the skills to answer exam questions on **blackbody radiation**.

You must be able to:

- describe the continuous spectrum emitted by a hot **blackbody** 黑体
- state that the peak wavelength shifts shorter as temperature rises (**Wien's law** 维恩定律)
- explain how blackbody radiation motivated the idea of **energy quantization** 能量量子化

1 Worked examples

Study these first. Each one shows the method for a question type used later.

■ A blackbody

A hot object emits a **continuous** spectrum of all wavelengths, with a peak that depends on temperature.

■ Wien's law

The **peak wavelength gets shorter** as the temperature rises — so a hotter object glows from red toward blue-white.

■ Why it mattered

Classical physics could not explain the blackbody curve; Planck fixed it by proposing that energy comes in **quanta** — the start of quantum theory.

2 Practice

2.1 State what happens to the peak wavelength of a blackbody as it gets hotter. [1]

2.2 State the type of spectrum emitted by a hot solid. [1]

2.3 State why blackbody radiation was historically important. [1]

3 Exam-style questions

3.1 As a blackbody gets hotter, its peak wavelength [1]

- **A** increases
- **B** decreases
- **C** stays the same
- **D** disappears

3.2 A hotter star appears more [1]

- **A** red
- **B** blue
- **C** green
- **D** infrared

3.3 Star A glows red and star B glows blue-white.

(a) State which star is hotter. [1]

(b) Explain your answer using the idea of peak wavelength. [2]

Solutions

2.1 it gets shorter.

2.2 a continuous spectrum.

2.3 it could not be explained by classical physics and led to the idea of energy quanta.

3.1 B.

3.2 B.

3.3 (a) star B (blue-white). (b) a shorter peak wavelength (bluer) means a higher temperature, by Wien's law.