PEARSON EDEXCEL · INTERNATIONAL GCSE · PHYSICS • EXERCISE SHEET

8.2 Cosmology and red-shift (P)

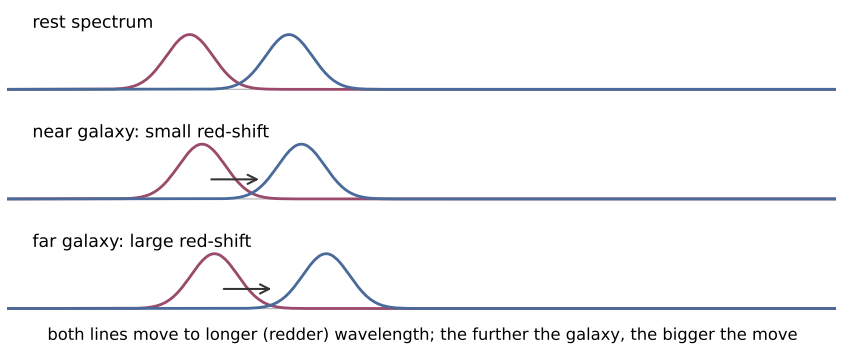
Name: _____ Class: _____ Date: _____ **Total: 14 marks**

Objective

Cover cosmology (8.13P–8.18P): the Big Bang theory, red-shift and CMB evidence, moving wave sources, and $v/c = \Delta\lambda/\lambda_0$ calculations. Original Physics-only practice.

1 Key knowledge and worked examples

■ Red-shift: the recession gauge



$$\frac{\Delta\lambda}{\lambda_0} = \frac{v}{c}$$

Worked check. A 600 nm line appears at 609 nm: $\Delta\lambda/\lambda_0 = 9/600 = 0.015 \rightarrow v = 0.015 \times 3 \times 10^8 = 4.5 \times 10^6$ m/s.

■ Two pillars of the Big Bang

Galaxy red-shift grows with distance (expansion); the cosmic microwave background is the cooled afterglow of the hot early universe.

2 Practice

2.1 (P) What happens to a wave's observed wavelength when its source recedes? [1]

2.2 (P) A 500 nm line appears at 502 nm. Calculate v/c. [2]

2.3 (P) Name the two main pieces of evidence for the Big Bang. [2]

2.4 (P) What is the cosmic microwave background? [1]

3 Exam-style questions

3.1 (P) Galaxies twice as far away show twice the red-shift. Explain how this supports an expanding universe. [3]

3.2 (P) A spectral line of rest wavelength 656 nm is observed at 659 nm in a galaxy. Calculate the galaxy's speed in m/s ($c = 3 \times 10^8$ m/s). [3]

3.3 (P) Explain why the CMB counts as evidence for a hot early universe. [2]