Redshift calculations and expansion

Teacher / technician

YEAR 11 / LESSON 111 / PHYSICS ONLY

Staff preparation and answer guidance. Keep separate from student sheets. Record actual measurements separately from labelled practice examples.

Coverage and delivery

Physics only: 8.1, 8.16P–8.18P. Fractional wavelength shift, approximate recession speed and expansion evidence.

Allow about 60 minutes. Follow the student sequence and use the answers to check reasoning.

Requisition • class of 30, working in 15 pairs

Item	Per pair / setup	Class total
Booklets and graph paper	1 each per learner	30 of each
Ruler and calculator	1 set per pair	15 sets

Immediate safety

Paper calculations only. No balloons, stretched elastic, discharge tubes or optical viewing of the Sun.

Preparation and delivery

Read alongside the student method

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1. Prepare the exact invented wavelength pairs and distinguish fractional shift from an absolute wavelength difference.

2. Use multiplication of coordinates on paper rather than an inflating-balloon activity. State the low-redshift and one-dimensional model limitations.

Close of lesson

• Retain the calculated spectra and coordinate diagrams.

Check before teaching

Check the cards, reference data and quantities against this requisition. Keep the staff answer guide separate until the checking stage. Supplied numerical practice datasets are labelled examples; they are not class measurements.

Answers and teaching notes

Expected explanations • do not give as experimental observations

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- 0.010.
- 3.0×10^{6} m s^{-1}.
- 3000 km s^{-1}.
- The reference wavelength.
- No; it is the stated low-redshift approximation.
- No; separation changes can be compared from any marked point.

References and provenance

Pearson Physics specification

NASA: cosmological redshift

Prepared 22 November 2026. Original wording, tables and questions. Sources inform the concepts and technique; the lesson scope and classroom quantities are explicitly described here. No laboratory trial or final school risk approval is claimed.