FREE REVISION PACK

Redshift & Hubble's Law

Pearson Edexcel International Advanced Level Physics · Unit 5 (WPH15) · Specification points 169–170

Easy | Multiple choice · past-paper questions

5	5	≈ 10 min
QUESTIONS	TOTAL MARKS	SUGGESTED TIME*

Contents

Q	LEVEL	FOCUS	SOURCE	MARKS
1	Easy	Redshifted wavelength of a receding galaxy	Edexcel IAL June 2025 · Unit 5 · Q5	1 mark
2	Easy	Why spectral lines from a receding star shift	Edexcel IAL October 2023 · Unit 5 · Q5	1 mark
3	Easy	Wavelength from a star moving away at 2.5% of c	Edexcel IAL June 2023 · Unit 5 · Q2	1 mark
4	Easy	Age of the universe from the Hubble constant	Edexcel IAL June 2025 · Unit 5 · Q4	1 mark
5	Easy	Lines shifted to higher frequencies	Edexcel IAL January 2023 · Unit 5 · Q5	1 mark

Key ideas to have ready

- $z = \Delta\lambda/\lambda \approx \Delta f/f \approx v/c$.
- Receding sources: received wavelengths are longer (redshift); approaching: shorter (blueshift).
- Hubble's law: $v = H_0 d$.
- Age of the universe $\approx 1/H_0$ (convert H_0 to s^{-1}).

How to use this pack

1. The questions are grouped into levels (Easy). Work through them in order, and check your answers at the end of each level before moving on.
2. Every question is multiple choice with one correct answer. Write down your working anyway; that is how you find mistakes.
3. The separate mark scheme uses the same numbers and explains every answer.

Levels are based on how students did in Pearson's examiner reports where that information exists, plus our own difficulty rating. *About 1.5 minutes per question.

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Easy

Definitions and one-step ideas. Most students get these right.

Questions 1–5

Choose **one** answer for each question and put a cross in the box next to it.

Edexcel IAL June 2025 · Unit 5 · Q5

1 On Earth, hydrogen is observed to emit a spectral line with a wavelength of 410 nm. The same spectral line is observed in the radiation received from a galaxy that is moving away from the Earth at a speed of $0.1\,c$.

Which of the following is the wavelength of the spectral line in the radiation received from the galaxy?

- ☒ **A** 451 nm
- ☒ **B** 430 nm
- ☒ **C** 410 nm
- ☒ **D** 369 nm

Edexcel IAL October 2023 · Unit 5 · Q5

2 A star is moving away from the Earth.

The wavelengths of spectral lines in the light received from the star are measured. These wavelengths are not the same as the wavelengths of the same lines measured from a source in the laboratory.

Which of the following explains the difference in the wavelengths?

- ☒ **A** The star emits light with a shorter wavelength.
- ☒ **B** The star emits light with a longer wavelength.
- ☒ **C** The light arrives at the Earth with a shorter wavelength.
- ☒ **D** The light arrives at the Earth with a longer wavelength.

Edexcel IAL June 2023 · Unit 5 · Q2

3 A hydrogen source on Earth emits a spectral line with a wavelength of 410 nm.

An observer determines the wavelength of the same line in the spectrum of a star. The star is moving away from the Earth at 2.5% of the speed of light.

What is the wavelength of the line as determined by the observer?

- ☒ **A** 400 nm
- ☒ **B** 410 nm
- ☒ **C** 420 nm
- ☒ **D** 430 nm

Edexcel IAL June 2025 · Unit 5 · Q4

4 A megaparsec, Mpc, is a unit of distance used by astronomers.
$1\,\text{Mpc} = 3.1 \times 10^{22}\,\text{m}$

Recent estimates of the Hubble constant give a value of $74\,\text{km}\,\text{s}^{-1}\,\text{Mpc}^{-1}$.

Which of the following gives the age of the universe in seconds?

☒ **A** $\dfrac{74}{3.1 \times 10^{22}}$

☒ **B** $\dfrac{74 \times 10^{3}}{3.1 \times 10^{22}}$

☒ **C** $\dfrac{3.1 \times 10^{22}}{74}$

☒ **D** $\dfrac{3.1 \times 10^{22}}{74 \times 10^{3}}$

Edexcel IAL January 2023 · Unit 5 · Q5

5 Absorption lines in the spectrum of light from a star are shifted to higher frequencies than the same lines viewed from a source on Earth.

Which of the following can be concluded from this?

☒ **A** The star is accelerating away from the Earth.

☒ **B** The star is accelerating towards the Earth.

☒ **C** The star is moving away from the Earth.

☒ **D** The star is moving towards the Earth.

End of questions. Check your answers with the matching mark scheme. More free packs and 1-to-1 tuition:
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