GET BETTER AT PHYSICS · MARK SCHEME

Redshift & Hubble's Law: tiered multiple choice

Edexcel IAL Physics · Unit 5 (WPH15) · Specification points 169–170 · 5 questions · 5 marks

1 mark per correct letter

Worked reasoning for every question

How students did = from Pearson examiner reports, where available

Answer key

Q1	Q2	Q3	Q4	Q5
A	D	C	D	D

Easy

Questions 1–5

1 **A**

Redshifted wavelength of a receding galaxy · Edexcel IAL June 2025 · Unit 5 · Q5

$z = \Delta\lambda/\lambda \approx v/c = 0.1$. $\Delta\lambda = 0.1 \times 410$ nm = 41 nm. The galaxy is moving away, so the wavelength is longer: 410 + 41 = 451 nm.

2 **D**

Why spectral lines from a receding star shift · Edexcel IAL October 2023 · Unit 5 · Q5

The star emits the same wavelengths as the laboratory source. Because the star is moving away, the light received at Earth is stretched to longer wavelengths (redshift).

> **Watch out:** Don't say the star emits longer wavelengths: it is the received light that is shifted.

How students did: Examiners reported that at least 60% of students got this right in October 2023.

3 **C**

Wavelength from a star moving away at 2.5% of c · Edexcel IAL June 2023 · Unit 5 · Q2

$\Delta\lambda/\lambda = v/c = 0.025$, so $\Delta\lambda = 0.025 \times 410 \approx 10$ nm. The star is moving away, so the observed wavelength is longer: about 420 nm.

4 **D**

Age of the universe from the Hubble constant · Edexcel IAL June 2025 · Unit 5 · Q4

The age of the universe $\approx 1/H_0$, with H_0 in s^{-1}. $H_0 = 74$ km s^{-1} Mpc^{-1} = $(74 \times 10^3$ m $s^{-1}) \div (3.1 \times 10^{22}$ m). So the age = $3.1 \times 10^{22} \div (74 \times 10^3)$ s.

> **Watch out:** Convert km to m before working out $1/H_0$.

5 **D**

Lines shifted to higher frequencies · Edexcel IAL January 2023 · Unit 5 · Q5

A shift to higher frequency (shorter wavelength) is a blueshift, which means the star is moving towards the Earth. A Doppler shift tells us about velocity, not acceleration.

End of mark scheme. Answers from Pearson's published mark schemes; explanations written for this pack. Pearson Edexcel material is © Pearson Education Ltd. More free packs and 1-to-1 tuition: **www.getbetteratphysics.co.uk**

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