

A Level • OCR • Physics

 6 mins  6 questions

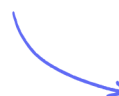
Multiple Choice Questions

Cosmology

Units for Astronomical Distances / Stellar Parallax / The Cosmological Principle / The Doppler Effect / Hubble's Law / An Expanding Universe / The Big Bang / The Age of the Universe / Evolution of the Universe / Dark Energy & Dark Matter

Easy (3 questions)	/3
Medium (1 question)	/1
Hard (2 questions)	/2
Total Marks	/6

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Easy Questions

- 1 The parallax angle for a star is 0.015 seconds of arc. What is the distance in parsecs (pc) of the star from the Earth?

- A. 67 pc
- B. 133 pc
- C. 220 pc
- D. 2.1×10^{18} pc

(1 mark)

- 2 In astronomy, distance can be measured in different units.

Which one of the following distances is the **largest**?

- A. 4.22×10^{16} m
- B. 1.91 pc
- C. 3.42 ly
- D. 593 AU

(1 mark)

- 3 Which two quantities are related in Hubble's law?

- A. Distance and mass of galaxies.
- B. Velocity and intensity of galaxies.
- C. Distance and velocity of galaxies.
- D. Distance and red shift of stars in our galaxy.

(1 mark)

Medium Questions

- 1 An astronomer analyses the light from a distant galaxy. One of the spectral lines in the spectrum observed from the galaxy has wavelength 610 nm. The same spectral line has a wavelength of 590 nm when measured in the laboratory.

What is the speed of this galaxy?

- A. $9.8 \times 10^6 \text{ ms}^{-1}$
- B. $1.0 \times 10^7 \text{ ms}^{-1}$
- C. $2.9 \times 10^8 \text{ ms}^{-1}$
- D. $3.0 \times 10^8 \text{ ms}^{-1}$

(1 mark)

Hard Questions

- 1 A spectral line corresponds to a wavelength λ_1 in the laboratory. The same spectral line observed in the spectrum of a receding galaxy corresponds to a wavelength λ_2 .

The distance of the galaxy from the Earth is d . The speed of light in a vacuum is c .

What is the correct expression for the Hubble constant H_0 ?

A. $H_0 \approx \frac{c(\lambda_2 - \lambda_1)}{d \lambda_1}$

B. $H_0 \approx \frac{c \lambda_1}{d(\lambda_2 - \lambda_1)}$

C. $H_0 \approx \frac{c \lambda_2}{d \lambda_1}$

D. $H_0 \approx \frac{c \lambda_1}{d \lambda_2}$

(1 mark)

- 2 Recent analysis of the data collected from the Hubble and Gaia telescopes gave the Hubble constant a value of $73.5 \text{ kms}^{-1} \text{ Mpc}^{-1}$.

What is this value, written to 2 significant figures, in s^{-1} ?

A. $2.4 \times 10^{-21} \text{ s}^{-1}$

B. $2.4 \times 10^{-18} \text{ s}^{-1}$

C. $2.4 \times 10^{-12} \text{ s}^{-1}$

D. $2.4 \times 10^{21} \text{ s}^{-1}$

(1 mark)