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. $9.8 \times 10^{6}\ ms^{-1}$

B. $1.0 \times 10^{7}\ ms^{-1}$

C. $2.9 \times 10^{8}\ ms^{-1}$

D. $3.0 \times 10^{8}\ ms^{-1}$

(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 kms^{-1} Mpc^{-1}.

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

A. 2.4×10^{-21} s^{-1}

B. 2.4×10^{-18} s^{-1}

C. 2.4×10^{-12} s^{-1}

D. 2.4×10^{21} s^{-1}

(1 mark)