

Practice Question Set For A-Level
Subject : Physics
Paper-2 Topic : 10_Space

Name of the Student: _____

Max. Marks : 20 Marks

Time : 20 Minutes

Q1.

Rigel A in the constellation of Orion is one of the brightest stars in the sky. It is a massive blue variable star with an intensity peak at a wavelength λ_{max} of $0.25 \mu\text{m}$.

RR Lyrae stars are also variable stars. They are used by astronomers as standard candles, although none of them are close enough for trigonometric parallax to be useful.

(i) State what is meant by a standard candle.

(1)

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*(ii) Describe how astronomers use standard candles.

(3)

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(iii) Explain why stars have to be within a certain distance from the Earth for trigonometric parallax to be useful.

(2)

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(Total for question = 12 marks)

Q2.

In 2016 the Breakthrough Starshot initiative was announced. This project intends to send a fleet of small probes to Proxima Centauri, the nearest star to the Sun. This journey would take about twenty years.

Describe how the distance to nearby stars like Proxima Centauri is determined.

(3)

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(Total for question = 3 marks)

Q3.

In 1864, William Huggins and William Miller used dark lines in the spectrum of the Sun to identify elements in the Sun's atmosphere.

In 1868, William Huggins analysed light from the star Sirius A. The wavelength of the hydrogen-alpha line for light from Sirius A was slightly different from the hydrogen-alpha line observed from a source in a laboratory.

Huggins suggested that this difference could be explained using the Doppler effect and could be used to determine the speed and direction of the star's motion relative to the Earth.

(i) Assess Huggins's suggestion.

(3)

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(ii) Sirius A has a component of velocity away from the Earth of 5.5 km s^{-1} .

The wavelength of the hydrogen-alpha line observed from a source in the laboratory is 656.46 nm.
Calculate the wavelength of the hydrogen-alpha line as seen in the spectrum of Sirius A.

(2)

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Wavelength = ...

(Total for question = 5 marks)