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

Name of the Student:_____
Max. Marks : 24 Marks **Time : 24 Minutes**

Q1.
* Parallax measurements are used to determine the distance to nearby stars, but this method is unsuitable for more distant objects.

Outline how parallax measurements are used to determine the distance to nearby stars and explain how the use of a standard candle enables the distance to more distant objects to be determined.

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(Total for Question = 6 marks)

Q2.

A student is constructing a spreadsheet to calculate the radius *R* of some stars. To obtain the radius, the surface temperature *T* of the star must first be calculated. She is given values for the stars' luminosities *L* and the wavelengths λ_{max} at which peak energy emission occurs. Part of the spreadsheet is shown, *A* is the surface area of the star.

	A	B	C	D	E
1	λ_{max} / 10^{-7} m	T / 10^{3} K	L / 10^{27} W	A / 10^{19} m^2	R / 10^{9} m
2	6.85	4.23	0.039		0.41
3	5.74	5.05	0.384	1.04	0.91
4	3.56	8.14	3.385	1.36	1.04
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(a) Write an equation to show how the value in B2 is calculated.

(1)

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(b) Show that the value in D2 is about 0.2

(2)

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(c) The student was given the luminosity values to enter into column C.

Describe how astronomers could determine the luminosity of a star.

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(Total for Question = 5 marks)

Q3.

Almost a century ago Edwin Hubble was investigating the light spectra emitted from a large number of galaxies. He used redshift values obtained from these spectra to determine the velocity of the galaxies relative to the Earth. He also measured the distances to each galaxy using Cepheid variable stars, which are a type of standard candle. From these measurements Hubble was able to formulate a law linking the velocity of distant galaxies to their distance from the Earth.

(a) (i) Explain what is meant by redshift.

(2)

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*(ii) Explain how redshift can be used to determine the velocity of a galaxy relative to the Earth.

(3)

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

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(c) Explain how Hubble's law can be used to find a value for the age of the universe.

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(d) Hubble's law is seen as one piece of evidence supporting the Big Bang theory of the origin of the universe. In this theory the universe has been expanding ever since it was created 14 billion years ago.

(i) Describe how you would expect the average density of matter in the universe to affect its ultimate fate.

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(ii) It is difficult for scientists to estimate the average density of the universe reliably. Explain why.

(2)

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(Total for question = 13 marks)