



## GCE PHYSICS

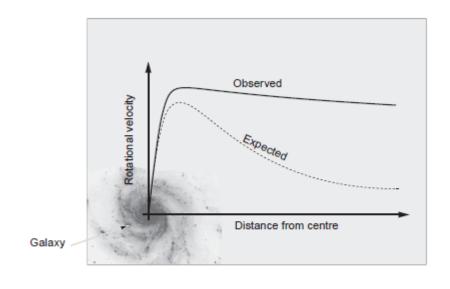
S21-A420QS

## Assessment Resource number 12 Electricity and the Universe Resource C

	$\rho_c = \frac{3H_0^2}{8\pi G}$	
	$\rho_c = \frac{1}{8\pi G}$	
(ii)	Use the above equation to show that the critical density of the universe correspond to approximately 5 atoms of hydrogen per m <sup>3</sup> .	onds [2]
Ast	ronomers analysing the wavelengths of the dark lines from the line spectrum of a di	stant
Ast	ronomers analysing the wavelengths of the dark lines from the line spectrum of a di axy note that they are increased by 16 % compared with their normal wavelength	stant
Ast gal	ronomers analysing the wavelengths of the dark lines from the line spectrum of a di axy note that they are increased by 16% compared with their normal wavelength State why there is an increase in wavelength.	stant s. [1]
gal	axy note that they are increased by 16% compared with their normal wavelength	S.
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gal	axy note that they are increased by 16% compared with their normal wavelength  State why there is an increase in wavelength.	S.
(i)	State why there is an increase in wavelength.	[1]
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(i) (ii)	State why there is an increase in wavelength.  Calculate the distance of the galaxy from Earth.	[1]
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1.

The diagram shows the key features of the rotation curves for a distant spiral galaxy. Explain how these features relate to the structure and motion of the galaxy. [6 QER]



3	(a)	Diagram 1 shows how the intensity of electro distance from its centre. Diagram 2 shows he the Earth from the Sun is distributed across to	ow the intensity of the radiation incident on
Intensi /kW m <sup>-</sup>		Spectri intensit arbitrar units	ty /
	(	0 1 2 3 4 5 Distance (x 10 <sup>11</sup> )/m	100 300 500 700 900 1100 Wavelength/nm
		Diagram 1	Diagram 2
		(i) Confirm that Diagram 1 shows the ex distance.	spected relationship between intensity and [3]
(b) In	2006	agram 1 to show that the Sun's luminosity is ab	a solar telescope aboard NASA's
Sc qu	olar a uote) '	and Heliospheric Observatory satellite to measure supprecedented accuracy. They measured it to $R_{\rm sun}$ = 696 342 km	re the radius of the Sun with (they be:
Us inf	se info	ormation from Diagram 2 along with your answ ation from Diagrams 1 and 2 are consistent with	rer to (a)(ii) to evaluate whether the the scientists' findings. [5]
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(c)	For centuries scientists have attempted to measure the Sun's diameter accurately. The following article is taken from a scientific paper written in 2004:
	The solar diameter, and its possible variation, have been the subject of careful measurements for over 350 years, with ever increasing accuracy. Different techniques have been used, and the instrumentation has evolved in time. However, the long-term evolution of the Sun is still a controversial subject. Even for the short term, the results are inconsistent even with the most advanced instruments presently in use. These discrepancies probably have several origins.
	[Past, present and future measurements of the solar diameter: Gerard Thuillier, Sabatino Sofia, Margit Haberreiter November 2004]
	Suggest two reasons why it has been difficult for scientists to determine an accurate value for the Sun's diameter. [2]