Q1. (a)	Define the term absolute magnitude.	
		(1)
(b)	The figure below shows the axes of a Hertzsprung-Russell diagram.	
	Mark suitable scales on the absolute magnitude and temperature axes.	
	absolute magnitude	
	temperature / K	(2)
		(-)
(-)		
(c)		
	(i) the Sun	(1)
	(ii) star W, which has the same intrinsic brightness as the Sun, but has a	
	significantly higher temperature	(1)

	(iii)	star 2	X , which has a $\mathfrak s$	similar spectru	m to the Sun, bເ	ıt is significar	-	1)
	(iv)				than the Sun an od titanium oxide		pectrum.	1)
(d)			he diameter of s in your answer.	star W, in part	(ii), compare wi	th the diamet	er of the	
				•••••				
								٥١
							(Total 10 mark	3) s)
Q2. (a) Th	ne table Minor.		marises some c	of the propertie	s of two stars in	the constella	tion of Ursa	
	na	me	apparent magnitude		s of star of the Sun	spectral class		
	Pol	aris	2.0		50	F		
	Ko	cab	2.0		50	K		
	1	the ap			lain one similari seen with the un			

	difference	
		(2)
(ii)	Deduce which of the two stars is further from the Earth.	
		(3)
light	A Minor also contains the galaxy NGC 6251. Measurements indicate that the from the galaxy has a red shift, z , of 0.025 and that the galaxy is 340 million years from Earth.	
(i)	Use these data to calculate a value for the Hubble constant.	
	value k ms ⁻¹ Mpc ⁻¹	(3)
(ii)	Use your answer to part (b)(i) to estimate a value for the age of the Universe. State an appropriate unit for your answer.	

(b)

age	unit	
_		(3)
		(Total 11 marks)

Q3. (a) Bellatrix and Betelgeuse are stars in the constellation of Orion. Some of their properties are summarised below.

	Bellatrix	Betelgeuse
absolute magnitude	-6.0	-2.7
apparent magnitude	0.4	1.6
black-body temperature / K	22 000	2 400

(i)	Explain what is meant by absolute magnitude.	
		(1)
(ii)	Which of the two stars is closer to the Earth? Explain your answer.	
		(1)

(b) (i) Calculate the wavelength of the peak intensity in the black-body radiation curve of Bellatrix.

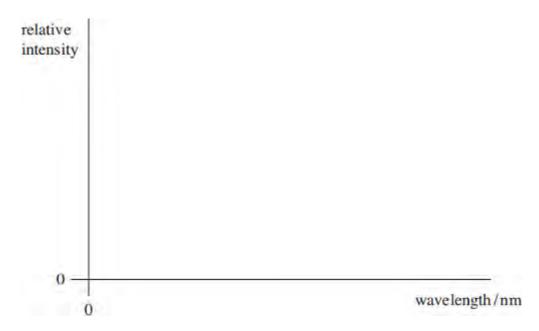
answer =	 m
	(2)

(3)

(1)

(1)

(ii) Sketch the black-body radiation curve for Bellatrix. Label the wavelength axis with a suitable scale.



(c) Detailed analysis of the light from both stars reveals the presence of prominent absorption lines in the spectra.

(i) To which spectral class does Bellatrix belong?

(ii) Prominent features in the Bellatrix spectrum are the Balmer absorption lines due to hydrogen. State the other element responsible for the prominent absorption lines in the spectrum of Bellatrix.

.....

(iii)	Why does the absorption line	spectrum of Bees?	etelgeuse not co
I. (a) Ca	The table sumr ssiopeia.	marises the pro	perties of five of
name	absolute magnitude	apparent magnitude	spectral class
Achird	4.6	3.5	G
Chaph	1.9	2.3	F
Ruchbah	0.24	2.7	А
Segin	-2.4	3.4	В
Shedir	-0.9	2.2	К
Ex	plaining your ans	wer in each ca	se, state which s
(ii)	is likely to app	ear orange in o	colour,

Q4.

	(iii)	appears the brightest from Earth,	
	(iv)	is less than 10 pc away from the Earth.	
			(4
(b)	2.2,	constellation Cassiopeia contains another star with an apparent magn absolute magnitude of –4.6 and a surface temperature of 12 000 K. Canis star,	itude of alculate,
(b)	2.2,	absolute magnitude of -4.6 and a surface temperature of 12 000 K. Ca	itude of alculate,
(b)	2.2, for th	absolute magnitude of –4.6 and a surface temperature of 12 000 K. Canis star,	itude of alculate,
(b)	2.2, for th	absolute magnitude of –4.6 and a surface temperature of 12 000 K. Canis star,	itude of alculate,
(b)	2.2, for th	absolute magnitude of –4.6 and a surface temperature of 12 000 K. Canis star,	itude of alculate,
(b)	2.2, for th	absolute magnitude of –4.6 and a surface temperature of 12 000 K. Canis star,	itude of alculate,
(b)	2.2, for th	absolute magnitude of –4.6 and a surface temperature of 12 000 K. Canis star, its distance from the Earth,	itude of alculate,

Q5. Figure 1 shows the black body radiation curves for three stars, labelled P, Q and R.

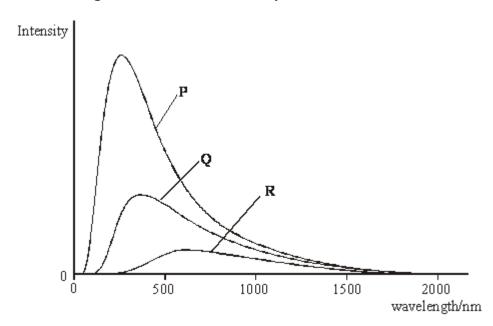


Figure 1

- (a) (i) State and explain, without calculation, which one of the three stars is the hottest.
 - (ii) Calculate the black body temperature of the hottest star.

(b)		detailed analysis of the hottest star's spectrum revealed the presence of ogen Balmer absorption lines.
	(i)	For which two spectral classes are these lines the prominent feature?
	(ii)	Describe how these absorption lines are produced in the spectrum of a star.
		(4 (Total 7 marks