Name of the Student:_____
Max. Marks : 26 Marks **Time : 26 Minutes**

Q1.

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

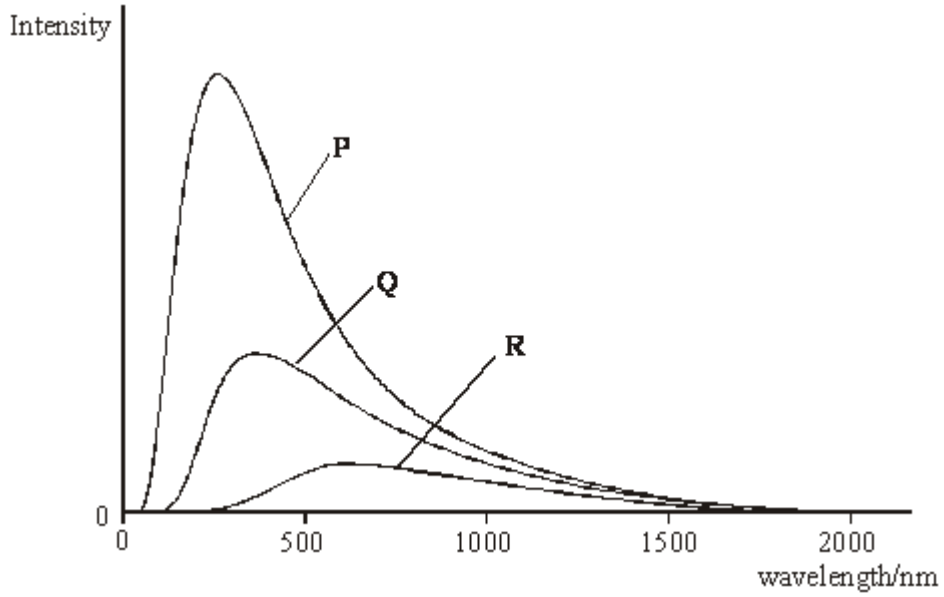


Figure 1

(a) (i) State and explain, without calculation, which one of the three stars is the hottest.

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_____

(ii) Calculate the black body temperature of the hottest star.

_____

_____

_____

(3)

(b) More detailed analysis of the hottest star's spectrum revealed the presence of Hydrogen Balmer absorption lines.

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(i) For which two spectral classes are these lines the prominent feature?

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(ii) Describe how these absorption lines are produced in the spectrum of a star.

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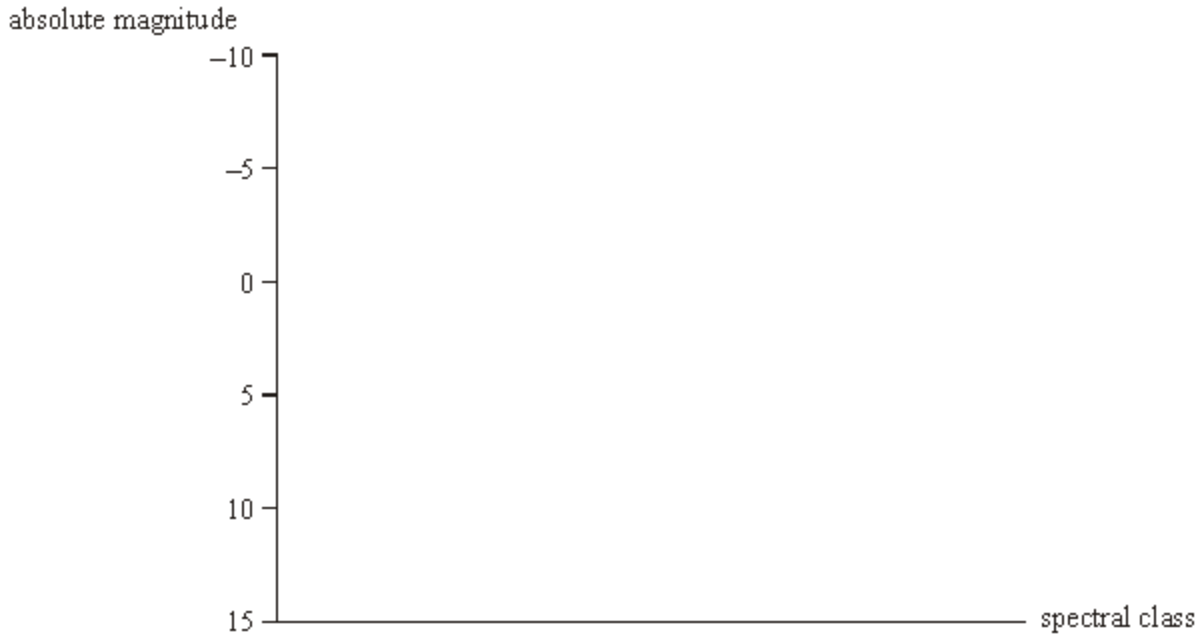
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(4)

(Total 7 marks)

Q2.

(a) (i) On the axes below draw the Hertzsprung-Russell (H-R) diagram labelling the main sequence stars, dwarf stars and giant stars. Complete the horizontal axis by labelling the spectral classes.



(ii) On the H-R diagram, mark with an **X** the current position of the Sun and draw a line to represent the evolution of the Sun, from its formation to its eventual state as a white dwarf.

(4)

(b) Matar is a star in the same spectral class as the Sun.

(i) State **two** properties common to Matar and the Sun.

_____

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(ii) The distance to Matar is 330 light years. What is this distance in parsec?

(iii) The apparent magnitude of Matar is 2.9. Calculate its absolute magnitude.

(iv) Which is the larger star, Matar or the Sun? Explain your answer.

(6)

(Total 10 marks)

Q3.

The Earth's atmosphere absorbs electromagnetic radiation of certain wavelengths. Detectors on the surface of the Earth are largely restricted to the visible and radio regions.

(a) (i) On the axes below, draw the black body radiation curve for the Sun.



(ii) Mark on the wavelength axis the region affected by the atmosphere's absorption of ultra violet radiation.

(iii) What is responsible for this absorption?

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(iv) What effect can this absorption have on the measured temperature of a star? Explain your answer.

(4)

(b) The atmosphere has little effect on radio waves between 30 MHz and 300 GHz. This radio window was first exploited in 1946 when a short pulse of radio waves of wavelength 2.7 m was transmitted from the Earth and reflected back by the Moon.

(i) Show that the frequency of the transmitted waves falls within the radio window.

(ii) The experimenters had to take into account the relative movement of the Earth and Moon when tuning the receiver. The maximum difference between the frequency of the detected and transmitted waves was 300 Hz.

What is the name of this effect?

(iii) Calculate the relative velocity of the Earth and Moon when the frequency of the received signal was 300 Hz greater than the transmitted frequency.

(5)

(Total 9 marks)

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