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Evidence to support the Big Bang theory comes from cosmological microwave background radiation and the relative abundance of hydrogen and helium in the Universe.

(a) Explain what is meant by cosmological microwave background radiation and how its existence supports the Big Bang theory.

(3)

(b) Explain how the relative abundance of hydrogen and helium supports the Big Bang theory.

(3)

(Total 6 marks)

7

The table summarises some of the properties of four stars in the constellation Hercules.

Star	Distance/pc	Spectral class	Apparent magnitude
Kornephoros	43	G	2.8
Rasalgethi	110	M	3.0
Rutilicus	11	G	2.8
Sarin	23	A	3.1

(a) Define the parsec. You may use a diagram as part of your answer.

(2)

(b) Deduce which star is larger, Kornephoros or Rutilicus.

(3)

(c) One of the four stars has the peak in its black-body radiation curve at a wavelength of $1.0 \mu\text{m}$.

Calculate the corresponding temperature for this curve.

temperature = _____ K

(2)

(d) Explain which star produced the black-body radiation curve described in question (c).

(2)

(e) Which star has the brightest absolute magnitude?

Tick (✓) the correct box.

Kornephoros

Rasalgethi

Rutilicus

Sarin

(1)

(f) Determine the absolute magnitude of Sarin.

absolute magnitude = _____

(3)

(Total 13 marks)

10

Two methods involved in the detection of exoplanets are the radial velocity method and the transit method.

(a) Explain what is meant by the transit method of detection.

(3)

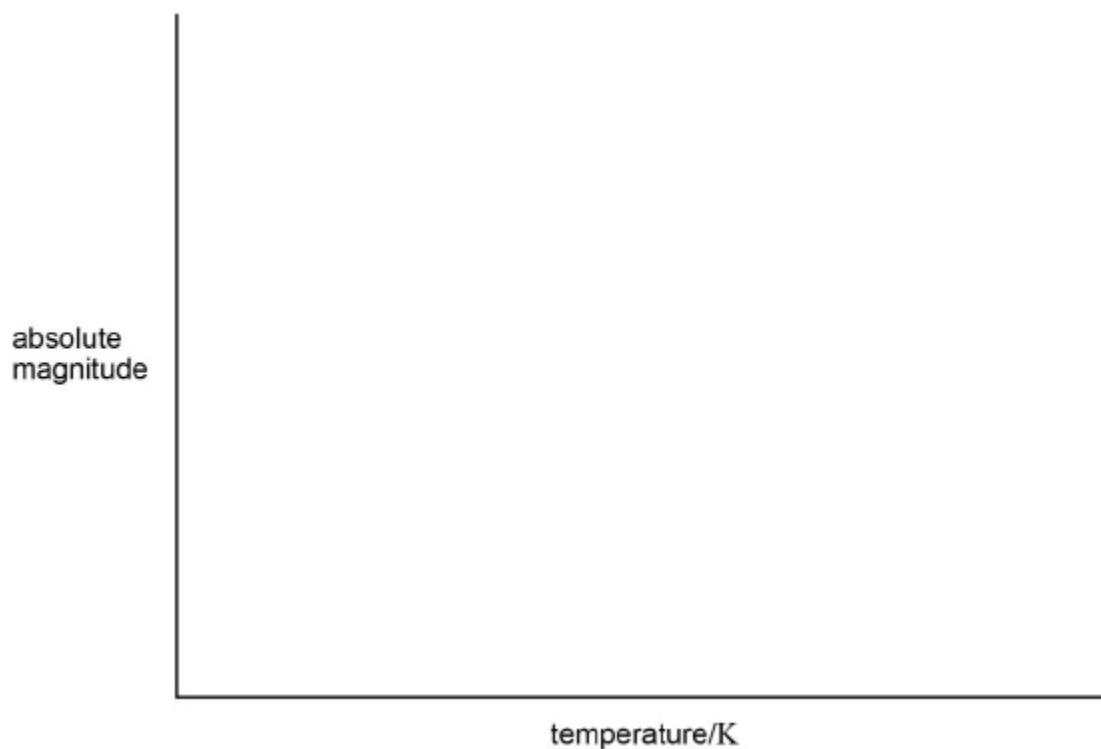
(b) Explain why it is important that there is more than one method of detection.

(2)

(Total 5 marks)

11

(a) Sketch a Hertzsprung–Russell diagram on the axes on the graph below. Label the position of the main sequence, white dwarf and giant stars.



(3)

(b) Label the minimum and maximum values on the scale of each axis.

(2)

(c) Some of the properties of three stars are shown in the table below.

	Rigel	Omicron 2 Eridani	Regulus A
distance/light year	860	16.5	79
apparent magnitude	0.13	9.5	1.3
temperature/K	12 000	16 500	12 500

Identify the spectral class to which all three stars belong.

Tick (✓) the correct answer in the right hand column.

	✓ if correct
A	
B	
F	
G	
K	
M	
O	

(1)

(d) Explain your answer to part (c).

(2)

(e) The three stars belong to different parts of the Hertzsprung–Russell diagram.

Deduce which star is a white dwarf.

(3)

(Total 11 marks)

(2)