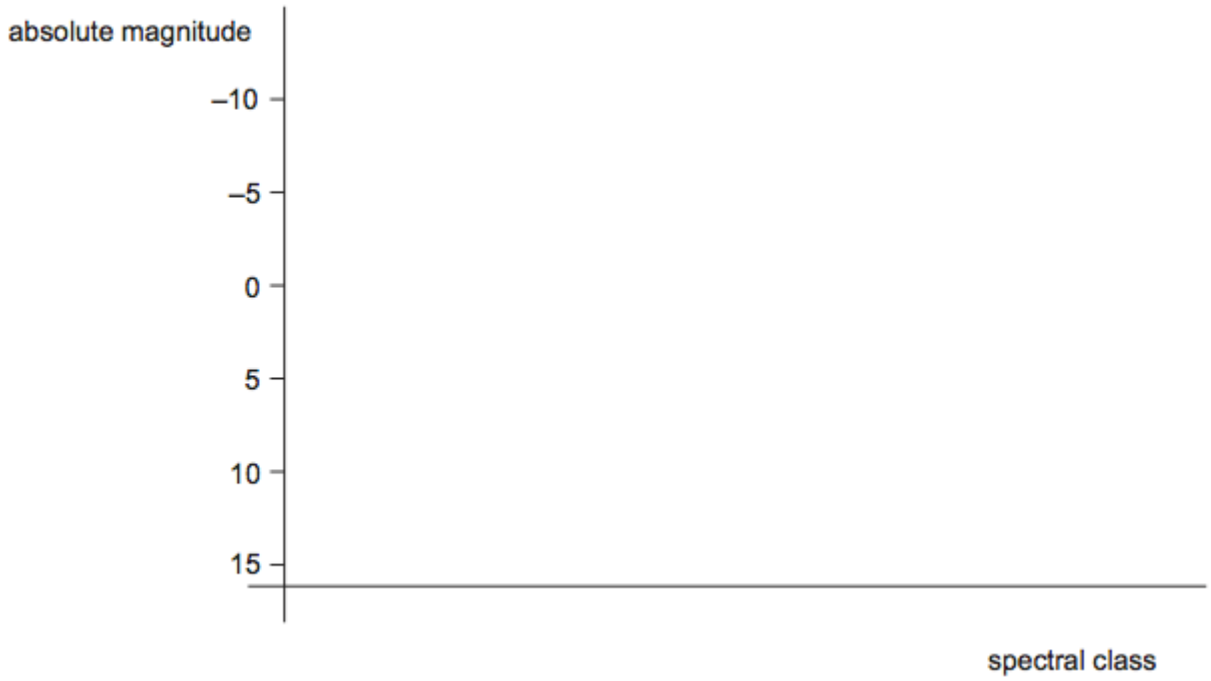
Name of the Student:_____
Max. Marks : 20 Marks **Time : 20 Minutes**

Q1.

(a) The graph shows the axes of a Hertzsprung–Russell (H–R) diagram.



(i) Label the spectral class axis with a suitable scale.

(1)

(ii) Complete the H–R diagram by marking the positions of the main sequence, dwarf star and giant star regions.

(2)

(b) The table summarises some of the properties of three stars in the constellation Aries.

Star	Apparent magnitude	Temperature / K	Radius / m
Hamal	2.0	4500	1.0×10^{10}
Sharatan	2.7	9000	1.8×10^{9}
41 Arietis	3.6	12000	9.6×10^{10}

(i) With reference to the data in the table, compare the three stars.
Your answer should include a discussion of:

- the appearance to the naked eye of the three stars as seen from Earth
- the spectrum of the three stars
- the region of the Hertzsprung–Russell diagram to which each star belongs.

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The quality of your written communication will be assessed in your answer.

(6)

(ii) Hamal is 66 light years from the Earth.
Calculate the absolute magnitude of Hamal.

absolute magnitude = _____

(3)

(iii) Identify which star is the greatest distance from Earth.
Explain your answer.

(3)

(Total 15 marks)

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Q2.

(a) State which property of the first identified quasar led to its discovery.

_____

(1)

(b) 3C48 is a quasar in the constellation Triangulum. It is believed to have a power output 4×10^{11} times greater than that of the Sun. At the Earth, the Sun's intensity is 1.4×10^{17} times greater than that of the quasar.

(i) Calculate, using the inverse square law, the distance from Earth to this quasar in AU.

distance = _____ AU

(3)

(ii) Measurements of the red shift of the quasar suggest the expansion of the Universe has accelerated since the detected light left the quasar.
State the cause of this acceleration.

_____

(1)

(Total 5 marks)

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