Name of the Student:_____
Max. Marks : 21 Marks **Time : 21 Minutes**

Q1.

Type 1a supernovae can be used as standard candles.

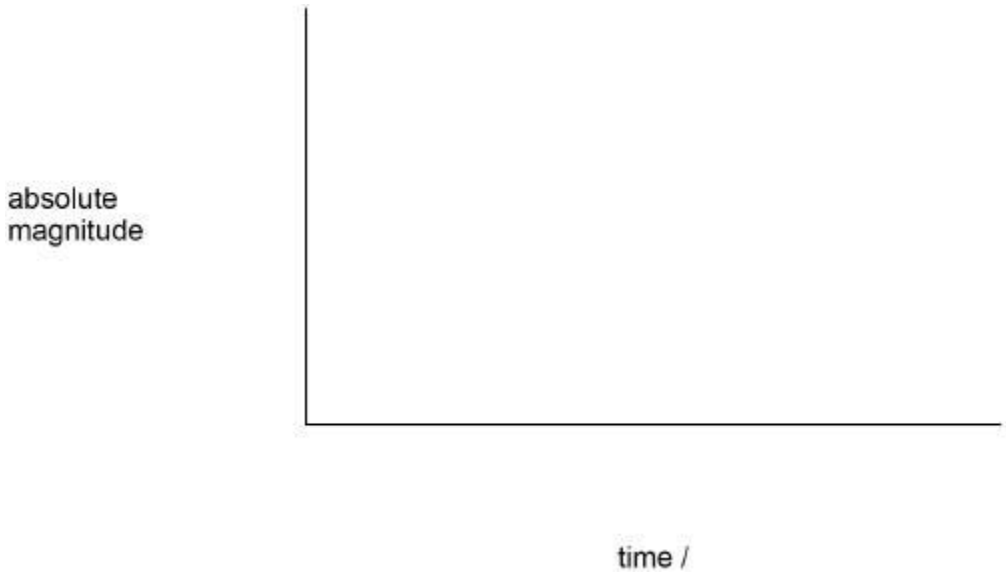
(a) State what is meant by a standard candle.

_____

_____

(1)

(b) Sketch on the axes below the light curve for a type 1a supernova.
Annotate your graph with suitable scales and a unit for time.



(3)

(c) Measurements of type 1a supernovae are used to find a value for the Hubble constant.

The distance from Earth is known for many type 1a supernovae.

Describe how these values of distance are used, with other data, to find the Hubble constant.

Your answer should include:

- the other data needed and how these data are used
- the graph plotted, including appropriate units for the axes
- how the Hubble constant is obtained and any limitations on the result.

_____

_____

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(6)

(Total 10 marks)

Q2.

The table summarises some information about four stars in the constellation Cassiopeia.

Name	Colour	Apparent magnitude	Distance / ly
Caph	white	2.3	55
Ruchbah	blue/white	2.7	99
Schedar	orange	2.2	228
Tsih	blue	2.2	610

(a) Which star has the highest surface temperature?
Tick (✓) **one** box.

Caph ☐

Ruchbah ☐

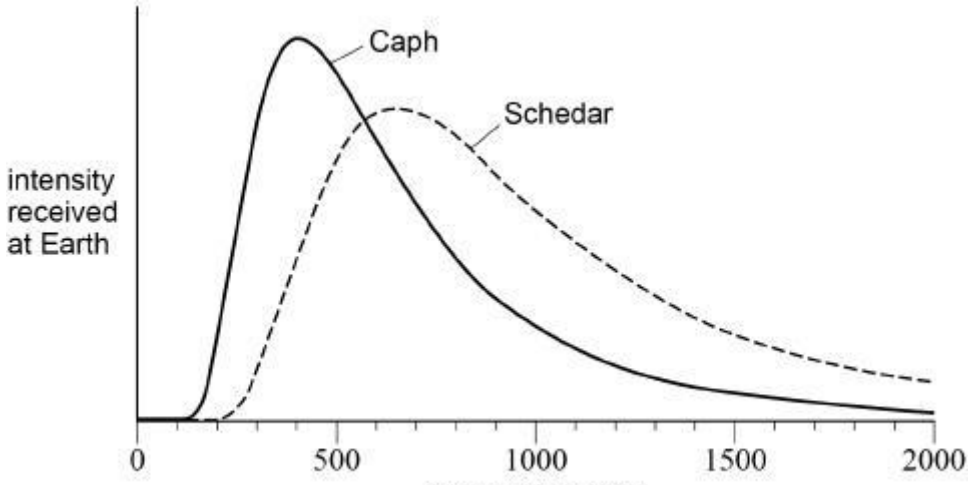
Schedar ☐

Tsih ☐

(1)

(b) The graph below shows the intensity received at Earth from two of the stars, plotted against wavelength.
The effect of absorption by the Earth's atmosphere is not shown.

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Discuss what information can be found from the graph about the temperature and colour of these stars.
Support your answer with suitable calculations.

(4)

(c) State which star in the table above is dimmest on the absolute magnitude scale.

(1)

(d) Calculate the absolute magnitude of Schedar.

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absolute magnitude = _____

(3)

(e) Tsih has a mass over 15 times the mass of the Sun.
Tsih may eventually collapse to form a black hole.

Calculate the radius of the event horizon for a black hole with a mass 15 times that of the Sun.

radius = _____ m

(2)

(Total 11 marks)

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