Name of the Student:_____
Max. Marks : 19 Marks **Time : 19 Minutes**

Mark Schemes

Q1.

(a) Spectral class A✓ **1**

The temperature range for A class is 7500 K to 11 000 K✓ **1**

(b) Lowest value of apparent magnitude indicates the brightest star. ✓ **1**

Vega has the lowest apparent magnitude (so is brightest) ✓ **1**

(c) Closest of three stars is Altair✓ **1**

Using m – M = 5 log (d / 10)

To give 0.77 – 2.21 = - 1.44✓ **1**

And d = 5.2 pc✓
Allow ce for calculation of wrong star **1**

(d) Deneb is the largest✓
No mark for unsupported answer **1**

It has approximately the same temperature, but has a much brighter absolute magnitude and therefore greater power ouput✓ **1**

To have a much greater power output for a similar temperature, it must have a greater area✓

As $P = \sigma A T^4$ **1**

Allow alternative:
from position on HR diagram, from T and M,
Altair and Vega are main sequence stars
Deneb is a giant star
so Deneb largest.

(e) Using λ_{max} T = 0.0029

1

To give λ_{max} = 0.0029 / 7700✓

=3.8 x 10^{-7} m✓

1

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Q2.

(a) An object that produces a rapid increase in brightness ✓

Allow lowering in value of absolute magnitude

1

(b) Extremely dense ✓

Ignore descriptions of Neutron star surface

1

Made up of neutrons ✓

Ignore refs to spinning or producing radio waves

1

(c) Use of Rs = 2GM / c^2

To give

Rs = 2 x 6.67x 10^{-11} x 2 x 2 x 10^{30} / (3 x 10^8)^2 ✓

First mark is for substitution

1

= 5.9 x 10^3 m ✓

Second mark for answer

1

(d) Collapsing star can produce gamma ray bursts with energy similar to total output of Sun ✓

First mark is for gamma ray burst and an idea of the amount of energy

1

Highly collimated – if in direction of Earth, could cause mass extinction event ✓

Second mark is for consequence.

1

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