

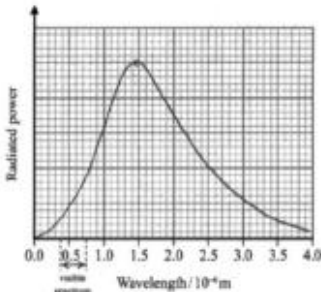
Name of the Student: \_\_\_\_\_

Max. Marks : 19 Marks

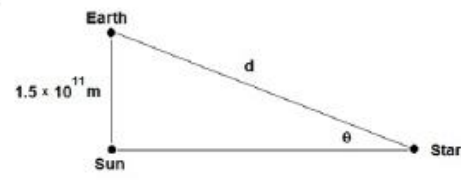
Time : 19 Minutes

Mark Schemes

Q1.

Question Number	Acceptable answers	Additional guidance	Mark
(i)	<ul style="list-style-type: none"> <li>• Use of <math>\lambda_{\max} T = 2.898 \times 10^{-3} \text{ m K}</math> (1)</li> <li>• <math>\lambda_{\max} = 1.4 \times 10^{-6} \text{ (m)}</math> (1)</li> <li>• correct black body radiation shape (1)</li> <li>• peak at correct wavelength (1)</li> <li>• line not zero at long wavelength <b>and</b> not positive at 0.0 on wavelength axis (1)</li> </ul>	<p><u>Example of calculation and graph</u></p> <p><math>\lambda_{\max} \times 2026 \text{ K} = 2.898 \times 10^{-3} \text{ m K}</math>  <math>\lambda_{\max} = 1.43 \times 10^{-6} \text{ m}</math></p> 	5
(ii)	<ul style="list-style-type: none"> <li>• Most radiation at infrared <b>or</b> <math>\lambda_{\max}</math> isn't in the visible spectrum <b>or</b> only a small proportion of radiation/power in visible spectrum (1)</li> <li>• Ratio of useful output/input is therefore very small <b>Or</b> so proportion of energy transfer that is useful is small (1)</li> </ul>		2

Q2.

Question Number	Answer	Mark
(a)	<p><b>Max 6</b></p> <p>The young star cluster consists (mainly) of main sequence stars (1)</p> <p>The old star cluster has a truncated main sequence (1)</p> <p>The old star cluster has lost its heaviest main sequence stars (1)</p> <p>The old star cluster has (many) red giant stars (1)</p> <p>The old star cluster has (some) white dwarf stars (1)</p> <p>Massive main sequence stars are the first stars (to deplete sufficient hydrogen in their core) to evolve into red giant stars. (1)</p> <p>Some red giant stars have evolved into white dwarf stars in the old cluster (1)</p>	6
(b)(i)	Star A is closer to Earth than Star B (1)	1
(b)(ii)	 <p>Use of appropriate trigonometric relationship (1)</p> <p><math>d = 4.0 \times 10^{16} \text{ m}</math> (1)</p> <p><u>Example of calculation:</u></p> $\sin \theta = \frac{1.5 \times 10^{11} \text{ m}}{d}$ $d = 4.01 \times 10^{16} \text{ m}$	2
(c)	<p><math>\lambda_{\text{max}} = 1.0 \times 10^{-6} \text{ m}</math> (1)</p> <p>Use of <math>\lambda_{\text{max}} T = 2.9 \times 10^{-3}</math> (1)</p> <p><math>T = 2900 \text{ K}</math> (1)</p> <p><u>Example of calculation:</u></p> $T = 2.9 \times 10^{-3} \text{ m K} / 1.0 \times 10^{-6} \text{ m} = 2900 \text{ K}$	3
<b>Total for question</b>		<b>12</b>