Name of the Student:_____

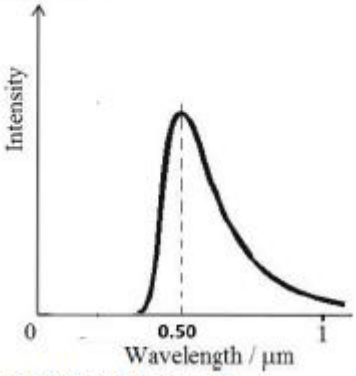
Max. Marks : 22 Marks **Time : 22 Minutes**

Mark Schemes

Q1.

Question Number	Acceptable answers	Additional guidance	Mark
(i)	An explanation that makes reference to the following points: • Electrons / atoms exist in discrete/fixed/certain energy levels **Or** there are only a certain number of specific differences in energy levels of electrons / atoms **(1)** • (Absorbing) a photon causes an electron / atom to move to a higher energy level **(1)** **Or** (Absorbing) a photon causes an electron / atom become excited **(1)** • Photons are (only) absorbed when the photon energy is equal to the difference between energy levels **(1)** • Photon energy depends on frequency/wavelength, so photons of specific frequencies/wavelengths are absorbed, (producing dark lines)	May refer to photon energy $E = hf$	**4**

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(ii)	• Use of $\lambda_{max}T = 2.898 \times 10^{-3}$ m K	(1)	Example of calculation: $\lambda_{max} = \frac{2.898 \times 10^{-3}\ \text{m K}}{5800\ \text{K}}$ $= 5.0 \times 10^{-7}$ m  2.898×10^{-3} m K Meets x axis on left but not on right, steeper on the left than on the right and narrower on the left at every point than on the right	4
	• $\lambda_{max} = 5.0 \times 10^{-7}$ (m)	(1)		
	• Curve with a peak at candidate's value of λ_{max}	(1)		
	• Black body asymmetric curve with intensity = 0 when wavelength = 0	(1)		
(iii)	An explanation that makes reference to the following points:			2
	• Fusion takes place (from hydrogen to helium)	(1)		
	• This releases energy and leads to an (outward) pressure/force which balances gravitational forces	(1)	Accept high temperature for energy	

Q2.

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Question Number	Acceptable Answer		Additional Guidance	Mark
	EITHER • Plot a graph of L against $1/f$ • $L = \lambda/4$ • $L = \frac{v}{4f}$ so speed of sound = 4 × gradient **OR** • (Calculate λ using) $\lambda = 4\,L$ • Plot a graph of λ against $1/f$ • Speed of sound = gradient	**(1)** **(1)** **(1)** **(1)** **(1)** **(1)**	Allow Plot a graph of L against $1/f$ $v = \frac{4}{\text{gradient}}$ Allow Plot a graph of f against $1/\lambda$	**3**

Q3.

Question Number	Acceptable Answer		Additional Guidance	Mark
	• There are nodes and antinodes on the plate • Sand is displaced away from the antinodes • Sand collected/gathers at the nodes	**(1)** **(1)** **(1)**	Allow "points with minimum/zero amplitude" for "nodes" and "points with maximum amplitude" for "antinodes" Accept "displacement" for "amplitude"	**3**

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Q4.

<table>
<tr><th>Question Number</th><th>Acceptable Answers</th><th>Additional guidance</th><th>Mark</th></tr>
<tr><td>*</td><td>
This question assesses a student's ability to show a coherent and logical structured answer with linkage and fully-sustained reasoning.
Marks are awarded for indicative content and for how the answer is structured and shows lines of reasoning.
The following table shows how the marks should be awarded for indicative content.
<table>
<tr><th>Number of indicative points seen in answer</th><th>Number of marks awarded for indicative points</th></tr>
<tr><td>6</td><td>4</td></tr>
<tr><td>5-4</td><td>3</td></tr>
<tr><td>3-2</td><td>2</td></tr>
<tr><td>1</td><td>1</td></tr>
<tr><td>0</td><td>0</td></tr>
</table>
Indicative Content

Two waves travelling in opposite directions (1)
Superpose / interfere (1)
Constructive (interference) if waves in phase
Or Constructive (interference) if path difference = $n\lambda$ (1)
Destructive (interference) if waves in antiphase
Or destructive (interference) if path difference = $(n + ½)\lambda$ (1)
Nodes are formed from points of destructive (interference) or antinodes are formed from points of constructive (interference) (1)
Nodes are points with min amplitude and antinodes are points with max amplitude (1)

</td><td></td><td>6</td></tr>
</table>

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