

Name of the Student: _____

Max. Marks : 17 Marks

Time : 17 Minutes

Mark Schemes

Q1.

Question Number	Acceptable Answer	Additional Guidance	Mark																																																				
*	This question assesses a student's ability to show a coherent and logically structured answer with linkages and fully sustained reasoning. Marks are awarded for indicative content and for how the answer is structured and shows lines of reasoning. The table shows how the marks should be awarded for indicative content and structure and lines of reasoning. <table><tr><th>Number of indicative marking points seen in answer</th><th>Number of marks awarded for indicative marking 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> <table><tr><th></th><th>Number of marks awarded for structure of answer and sustained line of reasoning</th></tr><tr><td>Answer shows a coherent and logical structure with linkages and fully sustained lines of reasoning demonstrated throughout</td><td>2</td></tr><tr><td>Answer is partially structured with some linkages and lines of reasoning</td><td>1</td></tr><tr><td>Answer has no linkages between points and is unstructured</td><td>0</td></tr></table>	Number of indicative marking points seen in answer	Number of marks awarded for indicative marking points	6	4	5-4	3	3-2	2	1	1	0	0		Number of marks awarded for structure of answer and sustained line of reasoning	Answer shows a coherent and logical structure with linkages and fully sustained lines of reasoning demonstrated throughout	2	Answer is partially structured with some linkages and lines of reasoning	1	Answer has no linkages between points and is unstructured	0	<table><tr><th>IC Points</th><th>IC Mark</th><th>Max linkage mark avail.</th><th>Max final mark</th></tr><tr><td>6</td><td>4</td><td>2</td><td>6</td></tr><tr><td>5</td><td>3</td><td>2</td><td>5</td></tr><tr><td>4</td><td>3</td><td>1</td><td>4</td></tr><tr><td>3</td><td>2</td><td>1</td><td>3</td></tr><tr><td>2</td><td>2</td><td>0</td><td>2</td></tr><tr><td>1</td><td>1</td><td>0</td><td>1</td></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr></table> IC3 and IC4 must include a mention of the walls/container	IC Points	IC Mark	Max linkage mark avail.	Max final mark	6	4	2	6	5	3	2	5	4	3	1	4	3	2	1	3	2	2	0	2	1	1	0	1	0	0	0	0	
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6

	Indicative content: 1. As the temperature of the gas increases the (average) speed/E_k of the atoms increases 2. Greater speed/E_k so the momentum of the atoms increases 3. The rate/frequency of collision of atoms with the container walls increases Or the time between collisions with the walls decreases 4. The rate of change of momentum at the walls increases 5. Rate of change of momentum is equal to the force 6. Pressure is $\frac{\text{force}}{\text{area}}$ and the force (on the walls) is greater		
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Q2.

Question Number	Acceptable Answer	Additional Guidance	Mark
	• Use of $L = 4\pi r^2 \sigma T^4$ (1) • Use of $I = \frac{L}{4\pi d^2}$ (1) • $I = 1.37 \text{ (kW m}^{-2}\text{)}$ (1) • This is less than $2 \text{ (kW m}^{-2}\text{)}$ and so the claim is false. (1)	<u>Example of calculation:</u> $L = 4\pi(6.96 \times 10^8 \text{ m})^2 \times 5.67 \times 10^{-8} \text{ W m}^{-2} \text{ K}^{-4} \times (2.7 \times 10^3 \text{ K})^4$ $L = 3.88 \times 10^{26} \text{ W}$ $I = \frac{3.88 \times 10^{26} \text{ W}}{4\pi(1.50 \times 10^{11} \text{ m})^2} = 1372 \text{ W m}^{-2}$	4

Q3.

Question Number	Answer	Mark
(a)	Idea that internal energy is the sum of (Total) kinetic energy and potential energy of molecules/atoms (1) (1)	2
(b)(i)	Use of $\Delta E = mc\Delta\theta$ $\Delta E = 8100 \text{ (J)}$ (1) (1) <u>Example of calculation:</u> $\Delta E = mc\Delta\theta = 175 \times 10^{-3} \text{ kg} \times 4200 \text{ J kg}^{-1} \text{ K}^{-1} \times (85 - 74) \text{ K} = 8090 \text{ J}$	2
(b)(ii)	Use of ΔE value from (i) in $\Delta E = mc\Delta\theta$ $m = 0.030 \text{ kg}$ (1) (1) No energy transferred to surroundings Or all energy transferred from tea used to heat milk (1) <u>Example of calculation:</u> $\Delta E = mc\Delta\theta$ $8100 \text{ J} = m \times 3900 \text{ J kg}^{-1} \text{ K}^{-1} \times (74 - 4.5) \text{ K}$ $\therefore m = \frac{8100 \text{ J}}{3900 \text{ J kg}^{-1} \text{ K}^{-1} \times 69.5 \text{ K}} = 0.0299 \text{ kg}$	3
Total for question		7