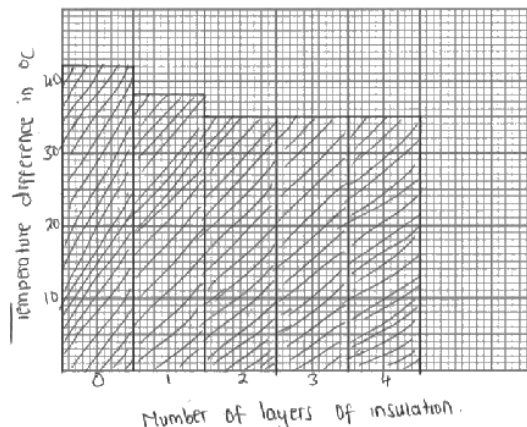


Question number	Answer	Notes	Marks																
1 (a) (i)	<p>1 mark for each correct property;;</p> <table border="1"> <thead> <tr> <th>Type of Radiation</th><th>Nature</th><th>Relative Charge</th><th>Ionising Ability</th></tr> </thead> <tbody> <tr> <td>alpha (<math>\alpha</math>)</td><td>helium nucleus</td><td>(+)2</td><td>high</td></tr> <tr> <td>beta (<math>\beta</math>)</td><td>(high energy) electron</td><td>-1</td><td>medium</td></tr> <tr> <td>gamma (<math>\gamma</math>)</td><td>electromagnetic wave</td><td>0</td><td>low</td></tr> </tbody> </table>	Type of Radiation	Nature	Relative Charge	Ionising Ability	alpha ( $\alpha$ )	helium nucleus	(+)2	high	beta ( $\beta$ )	(high energy) electron	-1	medium	gamma ( $\gamma$ )	electromagnetic wave	0	low	reject -2	2
Type of Radiation	Nature	Relative Charge	Ionising Ability																
alpha ( $\alpha$ )	helium nucleus	(+)2	high																
beta ( $\beta$ )	(high energy) electron	-1	medium																
gamma ( $\gamma$ )	electromagnetic wave	0	low																
(ii)	alpha / $\alpha$ ;		1																
(iii)	alpha and beta / $\alpha$ and $\beta$ ;	both required but can be in either order	1																
(b)	<p>top line correct; bottom line correct;</p> <p>e.g.</p> $\begin{array}{ccc} \boxed{14} & & \boxed{14} \\ \text{C} & \longrightarrow & \text{N} \end{array} + \begin{array}{c} \boxed{0} \\ \boxed{-1} \end{array} \beta$	e.g. 14, 0 e.g. 7	2																

Total for question = 6 marks

Question number	Answer	Notes	Marks
3 (a)	B – sound waves are transverse;		1
(b) (i)	calculation of time period; substitution into correct frequency equation; evaluation;  e.g. $(\text{time period} / T) = 0.02 \text{ (s)}$  $(f =) 1/0.02$  $(f =) 50 \text{ (Hz)}$	allow ecf for incorrect time period  allow 0.02 seen anywhere  16.7, 100 (Hz) get 2 marks max.	3
(ii)	line drawn has smaller amplitude than existing line <u>throughout</u> ; line drawn has higher frequency (pitch) <u>throughout</u> ;	ignore vertical position of line	2

Total for question = 6 marks

Question number	Answer			Notes	Marks																		
4 (a)	(i)	number of layers (of insulation);			1																		
	(ii)	final temperature (of the water) / temperature after 15 minutes / rate at which the water cools down;			1																		
(b)	(i)	<table><tr><th>Number of layers of insulation</th><th>Final temperature in °C</th><th>Temperature difference in °C</th></tr><tr><td>0</td><td>43</td><td>42</td></tr><tr><td>1</td><td>47</td><td>38</td></tr><tr><td>2</td><td>50</td><td>35</td></tr><tr><td>3</td><td>50</td><td>35</td></tr><tr><td>4</td><td>50</td><td>35</td></tr></table> <p>47 in first answer space; 50 in last three answer spaces;</p>	Number of layers of insulation	Final temperature in °C	Temperature difference in °C	0	43	42	1	47	38	2	50	35	3	50	35	4	50	35			2
	Number of layers of insulation	Final temperature in °C	Temperature difference in °C																				
0	43	42																					
1	47	38																					
2	50	35																					
3	50	35																					
4	50	35																					
	(ii)	<p>suitable scale chosen – longest bar occupies at least half of the grid;</p> <p>axes labelled correctly with quantities and temperature difference unit; all 5 bars correctly plotted; ;</p> 		<p>must be seen in all three spaces</p> <p>ignore orientation</p> <p>temperature scale should be linear but need not start at 0</p> <p>reject both plotting marks if a line graph is drawn</p> <p>award 3 marks max. if graph is drawn using final temperature values instead of temperature difference values</p>	4																		

(iii)	any 2 of: MP1. idea of inverse relationship;  MP2. idea that each additional layer gives a smaller decrease in temperature difference;  MP3. idea of no effect on temperature difference with more than 2 layers;	allow pattern statements negative correlation	2
(iv)	repeat AND {average (mean)/discard anomalies};		1

Total for question = 11 marks

Question number	Answer	Notes	Marks
6 (a)	B – energy;		1
(b) (i)	(resultant force =) 6750 (N);		1
(ii)	(resultant) force = mass x acceleration;	allow in standard symbols and rearrangements e.g. $F = m \times a$	1
(iii)	substitution OR rearrangement;  evaluation; unit;  e.g. acceleration = $6750/2500$ (acceleration =) $2.7 \text{ m/s}^2$	allow ecf from (b)(i)  unit mark is independent  allow $\text{m s}^{-2}$	3
(c)	any 5 of: MP1. there is a resultant force (to the right);  MP2. (so) it accelerates (0 to 50 s);  MP3. air resistance (and friction) increase as speed increases;  MP4. so acceleration decreases;  MP5. eventually air resistance (+ friction) = driving force;  MP6. (hence) resultant force is zero (after 50 s);  MP7. (hence) car travels at a constant speed (after 50 s);	allow idea that driving force is greater than air resistance and friction  the speed/velocity increases  forces are equal / balanced  no acceleration / terminal velocity	5

Total for question = 11 marks

Question number	Answer	Notes	Marks
7 (a)	D – newtons per square metre ( $\text{N/m}^2$ );		1
(b)	any 3 of:  MP1. air is heated / temperature of air increases;  MP2. (air) molecules move faster / gain kinetic energy;  MP3. more (frequent) collisions between molecules and walls;  MP4. molecules collide with walls with more force;	allow particles for molecules throughout allow pressure is proportional to (kelvin) temperature          allow molecules collide harder with walls   allow rate of change of momentum for force	3

Total for question = 4 marks