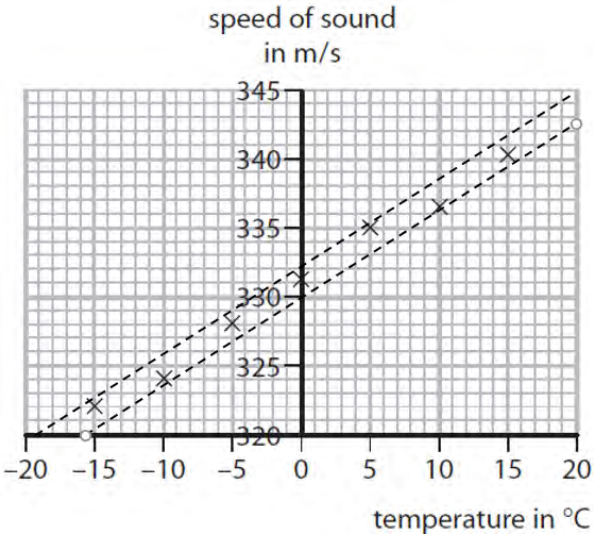
Question number	Answer	Notes	Marks
5 (a)	idea that higher frequency gives higher pitch;	allow reverse argument condone idea of proportionality / linearity	1
(b) (i)	(wave) speed = frequency × wavelength	allow abbreviation, e.g. v = f × λ or rearrangements	1
(ii)	substitution into correctly rearranged equation; evaluation; e.g. (v =) 340 / 160 (v =) 2.1 (m)	 allow 2.125, 2.12, 2.13 or 2 (if supported)	2
(c) (i)	straight line of best fit drawn within indicated area;  	line does not need to be extended beyond data range for this mark	1
(ii)	line of best fit extended to 20°C; student's own value from graph ± half a square;		2

Question number	Answer	Notes	Marks
8 (a) (i)	385 (J);		1
(ii)		reverse calculation e.g. calculating a voltage or charge gains 1 mark max.	
	substitution into E=QV; evaluation to at least 2 s.f.;		2
		if no other mark given allow 1 mark for 10^6 or 1000000 seen in working	
	e.g. (E =) 385 × 180 000 (E =) 69 000 000 (J) / 69 (MJ)	allow ecf from 8(a)(i) value	
(iii)	MP1. idea of <u>energy</u> wasted;	allow not 100% efficient, <u>energy</u> lost	2
	MP2. appropriate mechanism;	e.g. heat in wires	
8 (b) (i)	charge = current × time;	allow abbreviations e.g. Q = I × t or rearrangements	1
(ii)	substitution; rearrangement; evaluation;	ignore not converting time to seconds until evaluation	3
	e.g. 180 000 = current x (110 x 60) (current =) 180 000 / (110 × 60) (current =) 27 (A)	allow 27.3, 27.27…	
		1600, 1640, 1636 etc. gain 2 marks	
		if no other mark given allow 1 mark for 60 seen anywhere in working (attempt to convert to seconds)	

Total 9 marks

Question number	Answer	Notes	Marks
9	any 5 from: MP1. increased voltage (with step up transformer); MP2. (therefore) reduced current; MP3. current linked to heating; MP4. (therefore) less {energy / power} is lost / wasted (in transmission); MP5. reference to $P=I^2R$ equation; MP6. example of an efficiency enhancing detail of cables; MP7. example of an efficiency enhancing detail of transformer construction; MP8. step down transformer reduces voltage / increases current;	 allow 'steps up voltage' allow $P=IV$ if clear that V is the voltage drop across the cables. e.g. good conductor, low resistance, large diameter e.g. low resistance coils, coils wrapped on top of each other, soft iron core, laminated core allow 'steps down voltage'	5

Total 5 marks