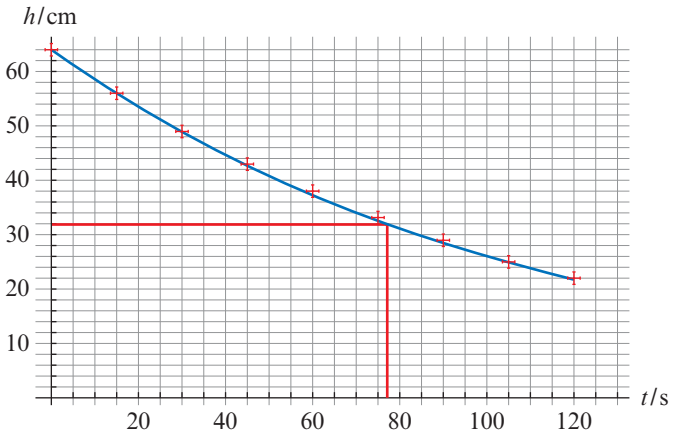
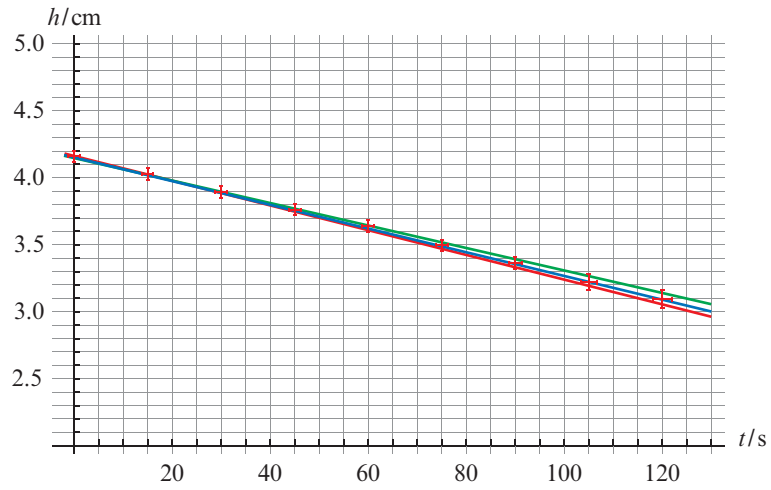
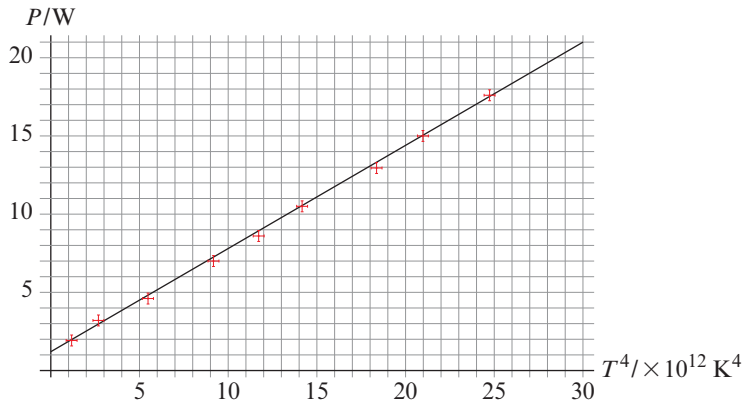
Markscheme

Section A

1 D
2 B
3 A
4 B
5 D
6 D
7 B
8 C
9 C
10 A
11 B
12 C
13 D
14 A
15 A
16 B
17 B
18 C
19 D
20 A
21 C
22 D
23 C
24 B
25 A
26 B
27 C
28 D
29 A
30 C
31 A
32 B
33 C
34 D
35 D
36 B
37 D
38 A
39 C
40 A

Section B

1				
a	I	s^{-1} ✓		[1]
	II	Chooses smallest value of h ✓ $\frac{\Delta(h)}{h} = \frac{1}{22} \times 100\% = 4.5\%$ ✓	Accept BCA	[2]
	III	Draw curve of best fit: ✓  77.5 s ✓	Accept time in range 75 s to 80 s	[2]
	IV	$\frac{\ln 2}{77.5} = 8.9 \times 10^{-3}\ s^{-1}$ ✓	Accept range $8.7 \times 10^{-3}\ s^{-1}$ to $9.2 \times 10^{-3}\ s^{-1}$	[1]
b	I	Draws line of best fit and lines of min and max slope ✓  Best fit slope = $8.8 \times 10^{-3}\ s^{-1}$ ✓ Max/min slopes = $-9.2 \times 10^{-3}\ s^{-1}/-8.4 \times 10^{-3}\ s^{-1}$ ✓ $k = (8.8 \pm 0.4) \times 10^{-3}\ s^{-1}$ ✓	Final answer for k consistent with max/min slopes	[4]
	II	This value uses all points not just one ✓ And gives an estimate of the range of possible values through the uncertainty ✓		[2]

2				
a	I	Convection ✓	Do not accept conduction	[1]
	II	Radiation is significant/dominant at large temperatures ✓		[1]
b	I	$\frac{\Delta(T^4)}{T^4} = 4\frac{\Delta T}{T}$ ✓ $\Delta(T^4) = 4 \times \frac{30}{2.14 \times 10^3} \times (2.14 \times 10^3)^4 = 0.8 \times 10^{12}\ \text{K}^4$ ✓		[2]
	II	 $P \propto T^4$ implies a straight line of best fit through the origin, which is not the case ✓		[1]
	III	Since the filament loses energy by convection the actual power due to radiation is less ✓	Accept any other reasonable statement	[1]
	IV	It is more likely ✓ Since the values for power will be less, shifting the graph closer to the origin ✓	ECF from answer to b iii	[2]