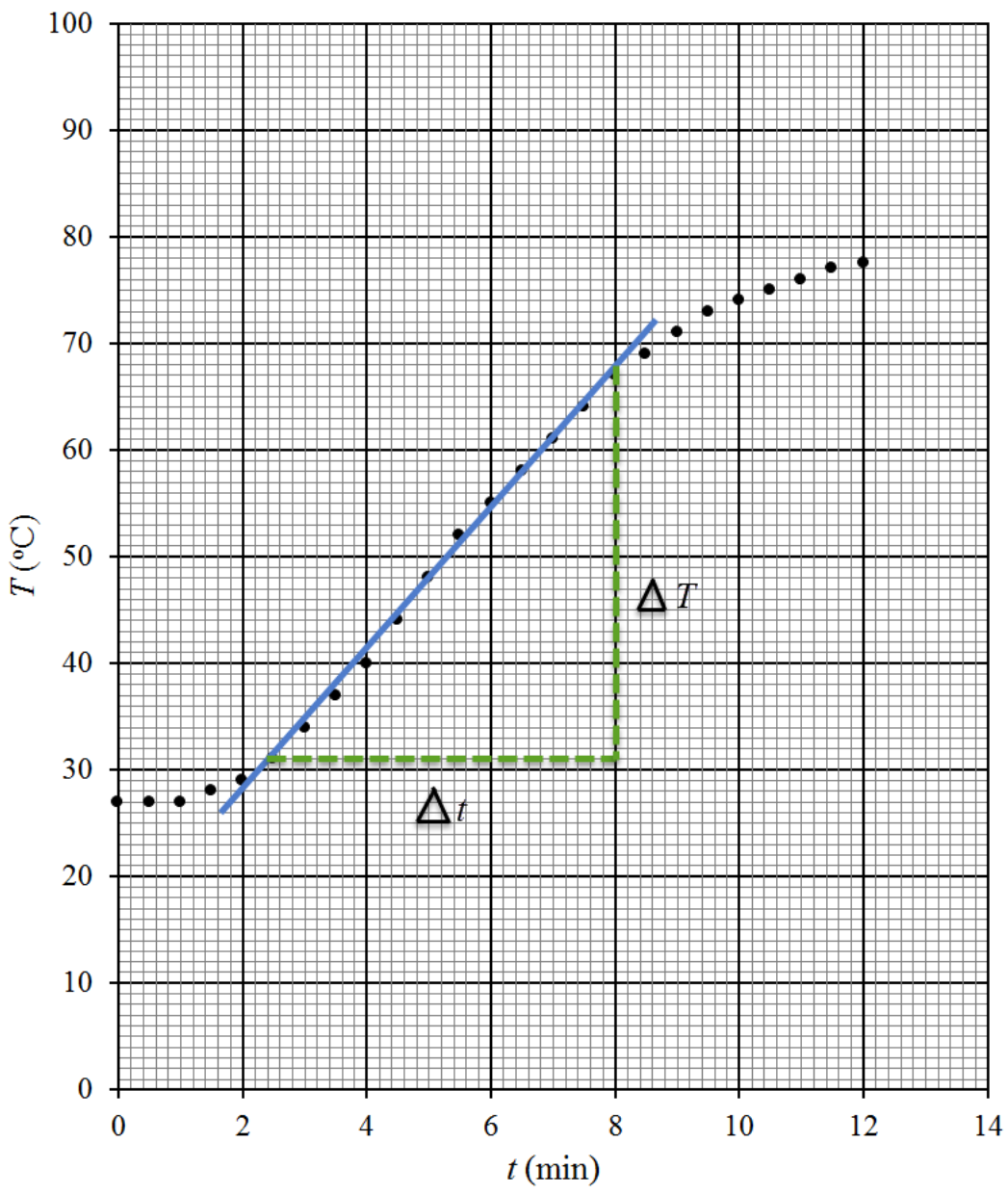
PART ONE: Physics, The effectiveness of energy absorption by water [13.0 points]										
Experimental Data										
	t(min)	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0
	T (°C)	27	27	27	28	29	31	34	37	40
	t(min)	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5
	T (°C)	44	48	52	55	58	61	64	67	69
	t(min)	9.0	9.5	10.0	10.5	11.0	11.5	12.0		
	T (°C)	71	73	74	75	76	77	77.5		

Question (Points)	Graph
Ph-1 (3.0)	

Question	Make a graph of the temperature of water as a function of time!	Points	Max
Ph-1			
	Name of both axis	0.5	3.0
	Unit of axis	0.5	
	Accuracy point positions of data (correctness of the data plotting)	2.0	
Question	Determine the linear range of water temperature change (ΔT) and time change (Δt)!	**Points**	**Max**
Ph-2 (1.5)	ΔT in the linear part	0.75	1.5
	Δt in the linear part	0.75	
	No answer or any other value	0.0	0.0
Question	Calculate the rate of water temperature change (in °C /s) with respect to time by using the linear part of the graph(which means linear process in water)!	**Points**	**Max**
Ph-3 (2.0)	Slope = (depending on the linear part of the graph)		2
	No answer or any other value		0.0
Question	Calculate how much electrical energy (in joule) is used within the linear part of the graph (electric power used by the stove is 600W)!	**Points**	**Max**
Ph-4 (2.0)	Electric energy = $E_E = P \times \Delta t$		
	E_E = (600W) x (Δt [in minute])x (60s), (Δt depends on student's linear part of graph) Correct formula = 1.0 point	1	2.0
	Correct calculation (in joule) = 1.0 point (units may not be stated)	1	
	E_E = (600W)x (Δt[in minute]), (Δt depends on student's linear part of graph) Correct calculation	0.5	1.0
	Correct formula	0.5	
	(units may not be stated)		

Question	Calculate how much heat (in joule) is received by water within the linear part of the graph! (Note that $c_{water} = 4180\,\text{J/kg.°C}$).	Points	Max
Ph-5 (1.5)	$\rho_{\text{water}} = 1\,\text{g/cm}^3$ $c_{\text{water}} = 4180\,\text{J/kg.°C}$ $V_{\text{water}} = 400\ \text{mL}$ $m_{\text{water}} = \rho_{\text{water}} \times V_{\text{water}} = (1)\times(400) = 400\text{g} = 0.4\text{kg}$ $Q_{water} = m_{water} \times c_{water} \times \Delta T$		
	Correct formula	0.5	1.5
	Correct calculation (in joule)	1.0	
	Correct calculation (units may not be stated)	0.5	1.0
	Correct formula	0.5	
	No answer or any other value	0.0	0.0
Question	Calculate how much heat (injoule) is released into the environment during thelinear partof the graph!	**Points**	**Max**
Ph-6 (1.5)	$\Delta Q = E_E - Q_{water}$		
	Correct formula	0.75	1.5
	Correct calculation (in joule)	0.75	
	Correct calculation (units may not be stated)	0.5	1.0
	Correct formula	0.5	
	No answer or any other value	0.0	0.0

Question	Calculate the percentage of energy absorbed by water with respect to the total energy of the stovewithin the linear part of the graph!	Points	Max
Ph-7 (1.5)	$\eta = (mc\Delta T) \div (P\Delta t) \times 100\%$		
	Correct formula	0.5	1.5
	Correct calculation (in joule)	1.0	
	Correct calculation (units may not be stated)	0.5	1
	Correct formula	0.5	
	No answer or any other value	0.0	0.0