

Question number	Answer	Notes	Marks
9 (a) (i)	Current – 2(.0) (A); Voltage – 12(.0) (V);		1 1
(ii)	Using $E = V \times I \times t$ (formula given on sheet) Time conversion; Substitution; Answer; e.g. $20 \text{ minutes} = 20 \times 60 \text{ seconds} = 1200 \text{ seconds}$ $E = 12 \times 2 \times 1200$ 28 800 (J)	ecf from a i If time conversion not done / incorrect then ALLOW $E = V \times I \times 20$ with subs of V and I for 1 mark ALTERNATIVE APPROACH (using power) Calculate power of heater = $V \times I$; Calculate $30000 \div (20 \times 60)$; to show comparability;	1 1 1

Question number	Answer	Notes	Marks
9 (b) (i)	Efficiency = useful energy output / total energy input;		1
(ii)	Substitution into correct equation; Calculation; e.g. $22\,000 / 30\,000$ $= 0.73$	ALLOW values calculated using their answer to (a) (ii) e.g. $22\,000 / 28\,800 = 0.76$ ALLOW percentages	1 1
(iii)	Calculation of useful energy doesn't allow for energy lost;		1
(iv)	Insulate the block (to reduce energy loss);		1
(c) (i)	Energy raising temperature of the <u>heater</u> / Time for energy to transfer between heater and thermometer;		1
(ii)	Heat transfers through block by <u>conduction</u> ; input (energy) greater than output (energy);		1 1
(iii)	ANY TWO of Energy lost to surroundings; by radiation; at higher rate; most of the heat supplied is lost / energy input and output nearly equal;		2
		Total	15