Q1. (2018)

a)

05.1	the wall has two / three layers cavity wall insulation / brick / block has a low thermal conductivity so less energy is transferred by conduction	allow the wall is thick allow rate of energy transfer is lower ignore any reference to convection and / or radiation	1 1 1	AO1 6.1.2.1

b)

05.2	$T = 17.4 + \left(\frac{(20.8 - 17.4)}{2}\right)$ **or** $T = 20.8 + \left(\frac{(20.8 - 17.4)}{2}\right)$ T = 19.1 (°C)	an answer in the range 18.5–19.1 scores **2** marks	 1 1	AO3 6.1.2.1

Q2. (2019)

a)

05.2	the starting temperature of the water	allow the starting temperature of the kettle	1	AO3.3a 6.2.4.2 WS 2.2	E

b)

05.3	(the heating element of) the kettle took time to heat up		1	AO3.1a 6.2.4.2 WS 3.7	E

c)

05.4	the (rate of) energy transfer (per kg of water) to the surroundings decreases as the mass of water increases **or** the efficiency of the kettle increases as the mass of water increases	allow the (rate of) energy transfer (per kg of water) to the surroundings changes as the mass of water changes allow the efficiency of the kettle changes as the mass of water changes	1	AO3.1b 6.2.4.2 WS 3.7	E

Q3. (2020)

a)

04.3	the chemical store of energy of the wood decreases the internal/thermal store of energy of the pipe increases the internal/thermal store of energy of the water increases	both the store of energy and what happens to the store are required	1 1 1	AO1 6.1.1.1

b)

04.4	energy is dissipated (to the surroundings) at the same rate that energy is transferred to the water	allow energy is transferred/lost to the surroundings	1 1	AO2 6.1.2.1

Q4. (2020)

05.3	metal: has a high thermal conductivity which increases the rate of energy transfer from the mixture plastic: has a low thermal conductivity which reduces the rate of energy transfer from the surroundings (to the liquid coolant at –20°C)	allow ice cream for mixture ignore references to insulation throughout	1 1 1 1	AO2 6.1.2.1

Q5. (2021)

a)

06.5	$0.875 = \frac{\text{useful output energy transfer}}{1\,560\,000}$ useful output energy transfer = 1 365 000(J) $1\,365\,000 = 125 \times c \times (22.1–11.6)$ $c = \frac{1\,365\,000}{125 \times 10.5}$ c = 1040 (J/kg °C) $c = 1.04 \times 10^3$ (J/kg °C)	allow a correct substitution using incorrectly/not converted values of efficiency and/or energy this answer only the equation $\text{efficiency} = \frac{\text{useful output energy transfer}}{\text{total input energy transfer}}$ must have been used to score subsequent marks allow a correct substitution using their calculated value of useful output energy allow a correct re-arrangement using their value of useful output energy allow a correct calculation using with their value of useful output energy this mark can only be awarded for a calculation using the correct equations	1 1 1 1 1 1	AO2 6.1.2.2 6.1.1.3 6.3.2.2

b)

06.6	the advertisement has ignored the energy input from the surrounding air		1	AO3
	so the total energy input is greater than the energy supplied from the electricity	an answer that the total energy input comes from the electricity supply and the air outside the building gains the first two marking points	1	AO2
	the efficiency must be less than 100%		1	AO1 6.1.2.2

Q6. (2022)

a)

03.1		ignore descriptions of energy transfers before the child reaches position A		AO1 6.1.1.1 6.1.2.1
	Child gravitational potential energy decreases		1	
	kinetic energy increases **and** then decreases (to zero)		1	
	Springs elastic potential energy increases	ignore references to kinetic energy of the springs	1	
	Surroundings internal / thermal store of energy increases	allow energy is dissipated allow (average) kinetic energy of the particles increases	1	

b)

03.3	the total energy transferred by the child		1	AO1 6.1.1.4

Q7. (2024)

a)

01.2	power = $\frac{\text{work done}}{\text{time}}$ or $P = \frac{W}{t}$		1	AO1 6.1.1.4

b)

01.3	$92 = \frac{23\,000}{\text{time}}$		1	AO2 6.1.1.4
	$\text{time} = \frac{23\,000}{92}$		1	
	250 (s)		1	

Q8. (2024)

06.1	efficiency = 0.72 × 0.86 efficiency = 0.61(92) 0.62	allow use of percentages if % is seen	1 1 1	AO2 6.1.2.2