Name of the Student:_____
Max. Marks : 22 Marks **Time : 22 Minutes**

Mark Schemes
Q1.

Question Number	Acceptable answers	Additional guidance	Mark
(a)	• use of $W = VIt$ (1) • use of $\Delta E = mc\Delta\theta$ (1) • use of efficiency = useful power output / total power input (1) • efficiency = 0.90 Or 90% (1)	Example of calculation: W = 247 V × 11.8 A × 172 s = 501 000 J ΔE = 1.20 kg × 4180 J kg^{-1} K^{-1} × (101 - 11) K = 451 000 J Efficiency = 451 000 / 501 000 = 0.90	**(4)**

Question Number	Acceptable answers	Additional guidance	Mark
(b)	• calculates area of sphere of radius 30 cm = 1.13 m^2 (1) • use of $I = P/A$ (1) • use of $W = Pt$ (1) • W = 2.0 J (1)	Example of calculation: Area = 4π × (0.3 m)^2 = 1.13 m^2 P = 10.5 × 10^{-3} W m $^{-2}$ × 1.13 m^2 = 1.19 × 10^{-2} W W = 1.19 × 10^{-2} W × 172 s = 2.0 J	**(4)**

Question Number	Acceptable answers	Additional guidance	Mark
(c)	An explanation that makes reference to the following: • the quiet boil electric kettle is more efficient, but only by 3% which isn't 'much' (1) • the energy transferred by sound is very small, so it is not the reason for the difference (1)	Allow 1 mark if the student gives a comment that the uncertainties are too high to draw a valid conclusion without reference to the data in the question, the candidate's calculations may be awarded one mark	**(2)**

Q2.

Question Number	Answer		Mark
(a)	The capacitor stores charge **Or** capacitor charges from the supply The idea that the capacitor doesn't fully discharge before being recharged.	**(1)** **(1)**	**2**
(b)(i)	$(6.4 + 4.4)/2 = 5.4$ V	**(1)**	**1**
(b)(ii)	Use of $V = IR$ Average $I = 5.4$ V/$(2.2 \times 10^3 \Omega) = 2.5 \times 10^{-3}$ A ecf value form (b)(i)	**(1)** **(1)**	**2**
(b)(iii)	Time = 17 ms or 17.5 ms	**(1)**	**1**
(b)(iv)	Use of $Q = It$ Use of $C = Q/V$ Use of $\Delta V = 2.0$ V $C = 21$ μF (ecf values of I and t from above) <u>Example of calculation</u> $Q = 2.5 \times 10^{-3}$ A $\times 17 \times 10^{-3}$ s $= 4.25 \times 10^{-5}$ C $C = 4.25 \times 10^{-5}$ C / 2.0 V $C = 21$ μF	**(1)** **(1)** **(1)** **(1)**	**4**
(c)	Uses a larger capacitance Because a larger time constant is needed **Or** stores more charge **Or** less $\Delta V \rightarrow \Delta Q/C$	**(1)** **(1)**	**2**
	Total for question		**12**