

Name of the Student: _____

Max. Marks : 26 Marks

Time : 26 Minutes

Mark Schemes

Q1.

- (a) the kinetic energy (and the potential energy) of the particles increases

allow the speed of the particles increases

1

so the internal energy increases because it is the sum of kinetic and potential energy (of the particles)

1

- (b) latent heat (of vaporisation)

allow specific latent heat (of vaporisation)

1

- (c) stays the same

1

- (d) more collisions per second

1

a greater force per collision

1

- (e) $0.875 = \frac{\text{useful output energy transfer}}{1\,560\,000}$

allow a correct substitution using incorrectly/not converted values of efficiency and/or energy

1

useful output energy transfer = 1 365 000(J)

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

1

$1\,365\,000 = 125 \times c \times (22.1 - 11.6)$

allow a correct substitution using their calculated value of useful output energy

1

$$c = \frac{1\,365\,000}{125 \times 10.5}$$

allow a correct re-arrangement using their value of useful output energy

$$c = 1040 \text{ (J/kg } ^\circ\text{C)}$$

allow a correct calculation using with their value of useful output energy

1

$$c = 1.04 \times 10^3 \text{ (J/kg } ^\circ\text{C)}$$

this mark can only be awarded for a calculation using the correct equations

1

- (f) the advertisement has ignored the energy input from the surrounding air

1

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

the efficiency must be less than 100%

1

[15]

Q2.

- (a) electrons collide with particles in the heating element

allow there is a current in the heating element

1

which increases the (kinetic) energy of the particles (in the heating element)

allow internal store of energy increases

allow the particles (in the heating element) vibrate more rapidly

1

- (b) the starting temperature of the water

allow the starting temperature of the kettle

1

- (c) (the heating element of) the kettle took time to heat up

1

- (d) the (rate of) energy transfer (per kg of water) to the surroundings decreases as the mass of water increases

allow the efficiency of the kettle changes as the mass of water changes

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

1

- (e)

an answer of 4800 (J/kg °C) scores 6 marks

a correct answer given to more than 2 s.f. scores 5 marks

$$E = 2600 \times 120$$

allow a correct substitution of an incorrectly/not converted value of P and/or t.

1

$$E = 312\,000 \text{ (J)}$$

this answer only

the equation $E = Pt$ must have been used to score subsequent marks.

1

$$312\,000 = 0.80 \times c \times (100-18)$$

or

$$312\,000 = 0.80 \times c \times (82)$$

allow use of their value of E calculated using $E = Pt$ for this and subsequent steps

1

$$c = \frac{312\,000}{0.80 \times 82}$$

1

$$c = 4\,756$$

1

$$c = 4\,800 \text{ (J/kg } ^\circ\text{C) (2 s.f.)}$$

this mark can only be scored for a correct rounding of a value of c calculated using correct equations

1

[11]