Mark schemes

Q1.

(a) (air) particles are closer together

ignore reference to kinetic energy of particles

ignore reference to concentration of air particles

1

(so) frequency of collision between air particles and syringe walls increased

do not credit MP2 if linked to an increase in kinetic energy

1

larger (total) force on a smaller (surface) area

allow larger force per unit area

if no other marks score allow 1 mark for pressure increases because volume decreases and pV = constant

1

(b) the mean kinetic energy of the particles increases

1

(c) c = 1010 (J/kg °C)

allow full credit for a correct method using E = 0.0000130 (kJ)

1

$0.0130 = 2.60\times10^{-8} \times 1010 \times \Delta\theta$

allow a correct substitution of an incorrectly / not converted value of c

1

$$\Delta\theta = \frac{0.0130}{(2.60 \times 10^{-8} \times 1010)}$$

allow a correct rearrangement of an incorrectly / not converted value of c

1

$\Delta\theta$ = 495 (°C)

allow an answer consistent with an incorrectly / not converted value of c

allow a correct answer given to more than 3 sig figs

1

[8]

Q2.

(a) L = 60 000 (J/kg)

allow full credit for a correct method using E = 0.00102 (kJ)

1

1.02 = m × 60 000

allow a correct substitution of an incorrectly / not converted value of L

1

$$m = \frac{1.02}{60\,000}$$

allow a correct rearrangement using an incorrectly / not converted value of L

1

m = 1.7 × 10^{-5} (kg)

allow an answer consistent with an incorrectly / not converted value of L

1

(b) time taken would increase

1

more energy would need to be transferred (in total)

MP2 dependent on scoring MP1

1

[6]

Q3.

(a) measuring cylinder

allow burette

allow beaker with scale / graduations

1

(b) boiling water

1

(c) change in mass = 0.009 (kg)

1

25 200 = 0.009 *L*

allow a correct substitution using an incorrectly calculated value of m

1

$$L = \frac{25\,200}{0.009}$$

allow a correct rearrangement using an incorrectly calculated value of m

1

$L = 2.8 \times 10^6$
or
$L = 2\,800\,000$

allow a correctly calculated answer using an incorrectly calculated value of m

1

J/kg

if a unit other than J/kg is given it must match the numerical answer

1

(d) less energy (than 25 200 J) was transferred to the water

1

(so) student's value of *L* is too high

2nd mark conditional on scoring 1st mark

1

(e) the measured change in mass is too high (for the energy supplied)

allow a smaller mass of water actually changed state at boiling point

1

(so) student's value of *L* is too low

2nd mark conditional on scoring 1st mark

1

[11]