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) random

allow all / any

ignore many different

1

(b) more (air) particles (in the tyre)

1

greater number of collisions with tyre (walls) per second

allow collisions with tyre (walls) are more frequent

allow greater rate of collisions with tyre (walls)

*do **not** credit MP2 if linked to an increased air temperature or increased speed / E_k of particles*

ignore greater force per m^2

1

(c) (as temperature increases the) air particles have greater (mean) kinetic energy

allow particles move with greater speeds (on average)

1

(so) more collisions with tyre (walls) per second

allow collisions with tyre (walls) are more frequent

allow greater rate of collisions with tyre (walls)

1

(and) greater force in each collision

allow greater rate of change of momentum in each collision

1

greater (mean) force per square metre causes greater pressure (on wall of tyre)

allow 'on a given area' for 'per square metre'

1

[7]