Name of the Student:_____
Max. Marks : 19 Marks **Time : 19 Minutes**

Mark Schemes

Q1.

(a) the total amount of energy (of the bumper car and barrier) remains constant.
or
total momentum (of bumper car and barrier) before collision equals total momentum (of bumper car and barrier) after collision
or
the resultant external force acting (on the system) is zero
allow there are no external forces (acting on the system)
1

(b) the force of the car on the barrier is equal to the force of the barrier on the car and in the opposite direction
1

(c) $F = \frac{700}{0.28}$
1

F = 2 500 (N)
1

(d) increases the time taken for the collision to occur
allow increases contact time
*do **not** accept slows down time*
1

(so) the rate of change of momentum decreases
allow reduces acceleration / deceleration
1

reducing the force (on the people)
reduces impact is insufficient
1

(e) $2.5^2 - u^2 = 2 \times 2.0 \times 1.5$
1

$u^2 = 2.5^2 - (2 \times 2.0 \times 1.5)$
1

u = 0.50 (m/s)
allow 0.5 (m/s)
1

[10]

Q2.

(a) independent variable: (type of) insulation / material

do not accept thickness of material

1

dependent variable: time

1

(b) 0.1 (ºC)

1

(c) viewing angle affects measurement

or

parallax error

allow judgement needed in reading the position (of the liquid in the thermometer)

allow the level of the liquid may be between lines

allow number of lines may be miscounted

ignore harder to read

ignore lines are close together

ignore human error

1

(d) E = 10 500(J)

1

$$m = \frac{10\,500}{4200 \times (85\text{-}65)}$$

*allow a correct substitution **and** rearrangement using an incorrectly / not converted value of E*

1

m = 0.125 (kg)

allow a correct calculation using an incorrectly / not converted value of E

1

(e) (same) temperature decrease in a shorter time means a higher thermal conductivity

allow converse answer

1

(because) the rate of energy transfer is higher

1

[9]