**Name of the Student**:_____
**Max. Marks : 27 Marks** **Time : 27 Minutes**

Mark Schemes

## Q1.

(a) (i) distance travelled under the braking force

*accept distance travelled between applying the brakes and stopping*

**1**

(ii) any **one** from:

- icy / wet roads
  *accept weather (conditions)*
- (worn) tyres
- road surface
  *accept gradient of road*
- mass (of car and passengers)
  *accept number of passengers*
- (efficiency / condition of the) brakes.
  *friction / traction is insufficient*

**1**

(iii) greater the speed the greater the braking force (required)

*must mention both speed and force*

**1**

(b) 22.5

*allow **1** mark for showing correct use of the graph with misread figures*

***or***

*for showing e.g. 90÷4*

*an answer 17 gains **1** mark*

*any answer such as 17.4 or 17.5 scores 0*

**2**

(c) (i) momentum before = momentum after

**or**

(total) momentum stays the same

*accept no momentum is lost*

*accept no momentum is gained*

*ignore statements referring to energy*

**1**

(ii) 5

*allow **2** marks for correctly obtaining momentum before as*

*12 000*

***or***

*allow **2** marks for*

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*1500 × 8 = 2400 × v*

***or***

*allow **1** mark for a relevant statement re conservation of momentum*

***or***

*allow **1** mark for momentum before = 1500 × 8*

**3**

(d) the seat belt stretches

**1**

driver takes a longer (*impact*) time to slow down and stop (than a driver hitting a hard surface / windscreen / steering wheel)

**1**

for the (same) change of momentum

*accept so smaller deceleration / negative acceleration*

**1**

a smaller force is exerted (so driver less likely to have serious injury than driver without seat belt)

**or**

the seat belt stretches ***(1)***

*do not accept impact for force*

driver travels a greater distance while slowing down and stopping (than a driver hitting a hard surface / windscreen / steering wheel) ***(1)***

for (same) amount of work done ***(1)***

*accept for (same) change of KE*

a smaller force is exerted (so driver less likely to have serious injury than driver without seat belt) ***(1)***

*do not accept impact for force*

**1**

**[13]**

## Q2.

(a) speed

*must be in correct order*

**1**

direction

**1**

(b)

| Quantity | Scalar | Vector |
|---|---|---|
| Momentum | | ✓ |
| Acceleration | | ✓ |
| Distance | ✓ | |
| Force | | ✓ |
| Time | ✓ | |

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*any three correct scores **2** marks*
*any two correct scores **1** mark*
*only one correct scores zero*

**3**

(c) (i) 16 and 2

*16 **or** 2 scores **2** marks*
*allow 1 mark for correct substitution, ie*
*8 × 2*
***or***
*4 × 0.5*

**3**

kg m / s **or** N s

**1**

(ii) 1.5 (m / s)
**or**
their $p_A + p_B = 12 \times v$ correctly calculated

*allow 2 marks for correct substitution, ie*
*18 = 12 × v*
***or***
*their $p_A + p_B = 12 \times v$*
*18 or their $p_A + p_B$ scores 1 mark if no other mark awarded*

**3**

(iii) 14 (kg m / s)
**or**
their $p_A - p_B$

**1**

16.5 (J)

**1**

**[14]**

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