M1. (a) (i) **E-F** (ticked)  

(ii) **B-C or D-E**  
*accept both answers*  

(b) **fast(er)**  
*accept downhill*  

**slow(er)**  

**force**  
*do not accept distance*  

[5]
M2. (a) \[53\text{ (m)}\]

(b) (i) Similar shape curve drawn above existing line going through \((0, 0)\)

 allowances mark for any upward smooth curve or straight upward line above existing line going through \((0, 0)\)

(ii) rain on road

   car brakes in bad condition

(c) (i) all three lines correctly labelled

 allowances mark for one correctly labelled

 top line – C

 accept 1.2

 middle line – B

 accept 0.9

 bottom line – A

 accept 0.7

(ii) any two from:

   • (table has) both variables are together

     accept tired and music as named variables

   • both (variables) could/ would affect the reaction time

   • cannot tell original contribution

     accept cannot tell which variable is affecting the drive (the most)

   • need to measure one (variable) on its own

     accept need to test each separately

   • need to control one of the variables

[9]
M3. (a) MN

    accept 5.8, 8 seconds must include unit

(b) LM

    accept 0.8, 5.8 seconds must include unit

(c) (i) 0.8

    (ii) drinking alcohol

(d) straight (by eye) line starting at 0.8 seconds

    line drawn steeper than LM starting before L

    ignore lines going beyond 2 seconds but line must exceed 2.5 metres per second before terminating
M4. (a) time

force

(b) any three from

- driver’s reactions are slow(er)
  
  accept driver could have taken drugs or alcohol or due to tiredness or distractions

- poor weather conditions
  
  accept raining or snowing or fog / mist (poor visibility)

- greater mass or weight

- poor road conditions
  
  oil / gravel / mud / leaves / wet / icy going downhill

- poorly maintained brakes
  
  do not accept driver’s weak foot force

- worn tyres
M5. (a) 96 (m)

(b) (i) similar shape curve drawn above existing line going through (0,0)
allow 1 mark for any upward smooth curve or straight upward line above existing line going through (0,0)

(ii) Rain on the road

(c) (i) all three lines correctly labelled
allow 1 mark for one correctly labelled

  top line – C
  accept 1.2

  middle line – B
  accept 0.9

  bottom line – A
  accept 0.7

(ii) any two from:
• (table has) both variables are together
  accept tired and music as named variables

• both (variables) could / would affect the reaction time
  accept cannot tell which variable is affecting the drive (the most)

• cannot tell original contribution

• need to measure one (variable) on its own
  accept need to test each separately

• need to control one of the variables
  fair test is insufficient
M6. (a) (i) constant 1
      (ii) heat 1

(b) (i) 3 links correct

allow 1 mark for 1 correct link
if more than one line is drawn from a condition mark all lines from that condition incorrect 2

(ii) increased 1

[5]
M7. (a) distance travelled under the braking force
    accept braking (distance)

(b) (directly) proportional
    accept a correct description using figures
    or
    increase in the same ratio
    eg if speed doubles then
    thinking distance doubles
    accept for 1 mark positive correlation
    accept for 1 mark as speed
    increases so does thinking distance
    accept as one increases the other increases
    accept as thinking distance increases speed increases

(c) (i) control variable

(ii) experiment done, student listens to music / ipod (etc)

experiment (repeated), student not listening to music
    for both marks to be awarded there must be a comparison

(d) increase it
    accept an answer which implies reactions are slower
    do not accept answers in terms of thinking distance only

(e) Y
M8. (a) The driver has been drinking alcohol. 

reason only scores if this box is ticked

- driver's reaction time increases 
  - accept slower reactions 
  - accept slower reaction time
- thinking distance / stopping distance increases 
  - do not accept braking distance increases
- driver less alert 
  - accept driver may fall asleep / be tired

(b) they are all variables that could affect outcome / results

- accept specific effect of changing one of the variables
- accept to make the test valid
- ignore reliable

- so data / barriers can be compared
  - accept to see which is / works best / safest
  - do not accept fair test on its own

(c) ticks in both the top and middle boxes
M9. (a) time
   correct order only

   force

(b) The car tyres being badly worn

(c) (i) braking distance increases with speed
   accept positive correlation
   do not accept stopping distance for braking distance

   relevant further details, eg
   • but not in direct proportion
   • and increases more rapidly after 15 m/s
   accept any speed between 10 and 20
   accept numerical example
   • double the speed, braking distance increases × 4

(ii) line drawn above existing line starting at the origin
   as speed increases braking distance must increase
   each speed must have a single braking distance

(d) (i) reaction time / reaction (of driver) does not depend on speed (of car)

(ii) (on the reduced speed limit roads) over the same period of time
   accept a specific time, eg 1 year
monitor number of accidents before and after (speed limit reduced)

\textit{allow 1 mark only for record number of vehicles / cars using the (20 mph) roads or collect data on accidents on the (20 mph) roads}

to score both marks the answer must refer to the roads with the reduced speed limit