1 (a (i) 18 m/s B1

    (ii) (0.90 s is) driver's time to react B1

  (b) (i) (a =) (v – u)/t OR Δv/t OR either in words OR (18 – 0)/3.1 OR 18/3.1
       5.8 m/s^2 A1
       OR
       Values from any correct points on graph (C1)
       Answer dependent on accuracy of chosen points (A1)

    (ii) Evidence of use of: (distance =) area under graph e.g. 1/2bh
       (18 × 0.9) + (0.5 × 3.1 × 18) C1
       44 m A1

  (c) (Without seat belt, driver:) e.g. keeps moving (forwards)/does not stop/has
    inertia/has momentum B1

    (Driver) hits steering wheel/windscreen/dashboard

[Total: 9]

2 **(a** dots farther apart (in 2nd time interval) owtte B1

  (b) (i) (average speed =) $d \div t$, in any form, e.g. words, symbols, numbers C1

      0.095 m/s A1

    (ii) (average speed =) 0.29 m/s B

  (c) (a =) (v – u) ÷ t C1

    = (candidate's **(b)(ii)** – candidate's **(b)(i)**) ÷ 0.02 C1

    correct value calculated from candidate's values in **(b)(i)(ii)**, expect 9.5 m/s^2 A1

3   (a metre rule, tape measure, (surveyor's) laser measurer, trundle wheel
        tape is too vague,   accept rule(r)   B1

    (b) $M = \rho V$ in any form or ρV in words, symbols or numbers   C1

         (mass = $1.2 \times 76.4 =$) 92 kg   A1

    (c) mass (of air) in room decreases   B1

         (because) air expands/vol of air increases/density of air decreases/
         appropriate use of $pV = nRT$ OR pressure argument e.g. pressure would have
         increased (with constant volume) if mass constant   B1

         any ONE from: B1
         some air leaves room
         molecules collide harder or more (often)
         molecules move faster/have more energy
         molecules move further apart   NOT molecules expand

                                                                        [Total: 6]

4   (a Period: 1.81 s OR 1.8 s as mean value
        OR 1.8 s as most common reading / the mode   B1

    (b) Time a minimum of 2 (successive) oscillations   B1
         Divide result by the number of oscillations   B1
         OR
         Count no. of oscillations in at least 20 s   (B1)
         Divide the time by the number of oscillations
         OR Divide no. of oscillations by time and find reciprocal   (B1)
         2 of:
         Repeat (several times) <u>and</u> find mean
         Time with reference to fixed / fiducial point or top or bottom of oscillation
         Check / set zero of stop-watch   B2
         Show knowledge of what is meant by one oscillation

                                                                        [Total: 5]

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5   **(a)** scalar, vector, scalar, vector, scalar   B3

     (b)   (average speed) = distance / time OR 18/1.2   C1
                       = 15 m / s   A

       (ii) (time =) (total) distance / speed OR 21/15   C1
                   = 1.4 s   A1

      (iii) air resistance / friction / force opposing motion   B1

      (iv) velocity changes because direction changes   B1   [9]