Motion

Mark Scheme 8

Level	IGCSE
Subject	Physics
ExamBoard	CIE
Topic	General Physics
Sub-Topic	Motion
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 8

Time Allowed: 84 minutes

Score: /70

Percentage: /100

1 **(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 B1

(c) $(a =) (v - u) \div t$ 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

2 **(a** evidence of division of 12 mm by 0.080 s C

$(v =)$ 0.15 m/s or 150 mm/s C

uses t = his $(\Delta)v/a$ in any form C1

$(t = [0.15 - 0]\, / \,0.03 = 0.15 / 0.03) = 5(.0)$ s   accept 1sig. fig.
allow e.c.f. from clearly identifiable wrong speed A1   [4]

(b) use of $F\,/\,a$ OR $F = ma$ in any form, numbers or symbols, ignore g C1

(0.06/0.03=) 2(.0) kg   accept 1 significant figure A1   [2]

(c) greater M1

because mass is less, ignore comments about force A1   [2]

[Total: 8]

3 **(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]

4 **(a**   acceleration = $\underline{v - u}$ OR $\underline{\Delta v}$ (symbols used to be explained)
                          t t
           OR   change of velocity ÷ time
           OR   rate of change of velocity
           OR   change of velocity per second / in 1 sec (allow 'in a certain time')   B1
           accept speed for velocity

   (b)   use of any area under graph   C1
                  750 m   A1

      (ii)   time = change of speed ÷ acceleration   OR   30/0.60   C1
                    = 50 (s)   A1
                 if working for t = 50 s not shown, allow 2 marks for correct use of 50 s
                 graph: along y-axis to 180 s / rise starts at 180 s   B1
                        from x-axis rises to 30 m/s at 230 s / candidate's calculated time   B1
                        horizontal from top of slope to 280 s   B1   [8]
                 allow ½ square tolerance at 180 s where relevant
                 allow ecf from wrong t

5   **(a**   **(i)**   <u>use of</u> $a = \Delta v/t$ in any form   C1
                      $23.3\,\text{m/s}^2$ ignore sign   A1   [2]

         (b)   **(i)**   336 000 J   B   [1]

             (ii)   <u>use of</u> power × time   C1
                       = 180 000 J   A   [2]

            (iii)   54% OR   0.54
                      ecf from **(i)** and **(ii)**   B1   [1]
                      accept (= 180 000/840 000) 21%   OR   0.21

         (c)   anything sensible for a moving vehicle, e.g. flywheel / capacitor / battery   M1
                  appropriate change <u>for this device</u>, for example:
                  flywheel: speed or kinetic energy
                  capacitor: voltage or charge or electrical energy
                  battery: voltage or charge or electrical or chemical energy   A1   [2]

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6   **(a**   all points plotted correctly ±½ small square   B1
              smooth curve through points, by eye   B1

         (b)   decreasing OR idea of greater at greater heights   NOT decelerating   B1

            (ii)   increasing OR idea of slower at greater heights   NOT accelerating   B1

         (c)   idea of resultant force becomes zero   B1

         (d)   decreasing/slowing down, ignore deceleration   NOT accelerating   B1

         (e) $F = ma$ in any form, letters, words, numbers   C1
              $(a =)$ $3.6\ (\text{m/s}^2)$ c.a.o.   C1
              $(F =)$ 216 N / 220 N   A1

                                                                 [Total: 9]

7 **(a)** **(i)** any mention of force or weight   ignore mass   C1
Force to left > force to right   )
OR <u>resultant</u> force   ) any 1   A1
OR unbalanced force   )
OR weight > friction   )

    (ii) to overcome/compensate for friction/resistance   B1

(b) 2/2.5 or 4/5 etc. or F/a or F = ma   C1
0.8 kg

(c) 0.7/0.8   e.c.f. from **(b)**   B1
0.875 (m/s^2) e.c.f. from **(b)**   could be scored on table (no unit needed)   B1

(d) **(i)** v = at or 0.5 × 1.2   C1
0.6 m/**s**

    (ii) any velocity × time or speed × time   C1
0.36 m c.a.o.   (note: 0.72 m gets C1, A0)   A1   [11]

8 **(a** **(i)** straight arrow towards centre, by eye   B1   [1]

    (ii) force larger   B1   [1]

(b) **(i)** straight arrow along tangent at P clockwise, by eye   B1   [1]

    (ii) <u>friction</u> between tyres and track provide centripetal force   B1

     <u>friction</u> too small (to provide required force)   B1   [2]

(c) **(i)** constant speed/velocity OR uniform motion OR no acceln.   B1   [1]
NOT constant motion

    (ii) (3 × 25)/2 + (7 × 25) OR area under graph   C1

     212.5 cm any no s.f. ⩾ 2   A1   [2]

    (iii) 25/3 or increase in speed/time   C1

     8.33 cm/s any no s.f. ⩾ 2 OR 8⅓ cm/s accept cm/s^2 A1   [2]

[Total: 10]