Forces (F= ma/ Resultant forces)

Mark Scheme 1

Level	IGCSE
Subject	Physics
ExamBoard	CIE
Topic	General Physics
Sub-Topic	Forces F=m/a/ Resultant forces
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 1

Time Allowed: **42 minutes**

Score: **/35**

Percentage: **/100**

1 (a (i) ($W = mg = 2.8 \times 10^6 \times 10 =$) 2.8×10^7 N   B

      (ii) $3.2 \times 10^7 - 2.8 \times 10^7$ C1
            4.0×10^6 OR 0.4×10^7 N   A1

      (iii) $F = ma$ in any form OR ($a =$) $F \div m$ OR $4.0 \times 10^6 \div (2.8 \times 10^6)$ C1
             1.4 m/s^2 A1

   (b) Mass of rocket decreases (as fuel is used up)
        OR
        Value of g/gravitational force on rocket decreases as rocket rises   B1
        OR
        Air resistance decreases

                                                                                                                                                                [Total: 6]

2 (a 2 lines at 90° to each other of same length labelled 30 N or 6 cm

      both lines 6.0 ± 0.2 cm.   B1

      arrows on the two lines drawn, either head to tail   B1
      OR a complete square shown with diagonal and arrows on adjacent sides

      resultant in range 40–45 N   B1

   (b) (vertically) upwards   B1

   (c) same as value in **(a)**, only if answer to **(a)** is a force
        OR 40–45 N   B1

                                                                                                                                                                [Total: 6]

3   **(a**   no resultant/net force (acting)   **B1**

        no resultant/net moment (acting)
        OR clockwise moment = anticlockwise moment   **B1**

  (b) **(i)** $W = P + Q$ in any form
            OR (total) upward force = (total) downward force   **B1**

            $P = W - Q$ so P must be less than W
            OR P is not the only upward force   **B1**

     (ii) $P \times$ its distance (from C)$= W \times$ its distance (from C)
            OR P and W have equal moments (about C)
            OR clockwise moment = anticlockwise moment   **B1**

            P is farther from C/pivot (than W so P must be less than W)   **B1**

  (c)   clockwise moment = 75×0.24 **C1**
              anticlockwise moment = $F \times 0.75$ **C1**
              (moments equated gives $F =$) 24 N   **A1**

                                                                             [Total: 9]

4   **(a** **(i)** less (1st box ticked)   **B1**

     (ii) any mention of <u>mass</u>/inertia   **B1**
            well-reasoned explanation involving <u>less mass</u>   **B1**
            special case B2: more weight/heavier **AND** more friction

  (b) (resultant force =) 4000 N   **C1**
         ($M = 50\,000/10 =$) 5000 kg   **C1**
         ($a = 4000/5000 =$) $0.80 \, \text{m/s}^2$ e.c.f previous lines, accept 1 sig. fig.   **A1**

                                                                             [Total: 6]

5   **(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 (Δ)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]