1 **(a** **(i)** (a =) v/t **or** 65/26   C1
              2.5 m/s^2 *Unit penalty applies   A1

      (ii) (F =)ma **or** 3.4 × 10^5 × 2.5   ecf from **3(a)(i)**   C1
                8.5 × 10^5 N *Unit penalty applies   ecf from **3(a)(i)**   A1

    (b) **(i)** any <u>two</u> of: KE **or** GPE **or** heat/internal energy/thermal energy   B2

         (ii) chemical energy **not** heat   B1

         (iii) thermal energy/sound is lost (to the atmosphere) **or** KE <u>of air</u>   B1

      (c) perpendicular to path **or** towards centre of circle **or** centripetal   B1   **[9]**

      *Apply unit penalty once onl

2 **(a)** M = V × D in any form OR 10^3 × 10^3 C1
           1 kg   A1

   (b) mgh OR his **(a)** × 10 × 0.8   C1
           8 J (Nm) OR 7.85 J OR 7.84 J e.c.f. from **(a)**   A1

   (c) P = E/t OR (his 8 × 90) / 60 e.c.f. from **(b)**   C1
           12 W (J/s or Nm/s) OR 11.77 W OR 11.76 W   A1

   (d) ρgh in any form, words, letters, numbers   C1
           8000 Pa (N/m^2) OR 7850 Pa OR 7840 Pa   <u>A1</u>   [8]

3	**(a)**	straight vertical arrow upwards to/from rail	F	B1
		arrow to R of centre of rail	F	C1
		arrow at R.H. end of rail (within $2\times$ width of resting block)	F	A1
	(b)	moment ticked	F	B
	(c)	reduce weight/mass OR shorten rail, lighter rail, thinner rail, open sideways, suitable long handle, suitable 2 pulley system	F	<u>B1</u> <u>5</u>

4	**(a)**		attempt to use triangle or parallelogram of forces	**M1**	
			stated scale used	**A1**	
			950 N and 1220 N in correct relative directions	**C1**	
			correct resultant drawn in	**C1**	
			weight = 1785 N [limits 1700 N to 1850 N]	**A1**	**5**
	(b)	**(i)**	work = force x distance or 1500 x 3.0	**C1**	
			work = 4500 J	**A1**	
		(ii)	power = work/time or 4500/2.5	**C1**	
			power = 1800 W	**A1**	**4**
					[9]

5   *Accept* D & E   5 a BD correct, (straight line i.e. constant acceleration)   B1
marked on time   DE correct, (constant speed or slightly reducing speed only)   B1
        axis   EF correct, (speed reduced to zero, gradient steeper than BD)   3   B1   3

No labels −1

b(i) force = 2 (N)   C1
    work = (2 x 0.6) = 1.2 J*   2   A1

(ii) k.e. = 0.5mv^2 C1
    = 0.5 x 0.2 x 2.5 x2.5   C1
    = 0.625 J*   3   A1   5

c   velocity - vector, speed scalar   B1
    direction changes so velocity changes   2   B1   2

d   work done against friction   B1
    (more) friction on EF   B1
    (k)e. changed to heat   B1
    less k.e. changed to p.e.   3   B1 M3