

1)

(a)	(i)	vector has direction and a scalar does not ✓	4
	(ii)	scalar examples; any two e.g. speed, mass, energy, time, power vector examples; any two e.g. displacement, velocity, acceleration, force or weight ✓✓✓ for 4 correct, ✓✓ for 3 correct, ✓ for 2 correct	
(b)	(i)	horizontal component (= 2.8 cos 35) = 2.3 (kN) (2293.6) ✓ vertical component (= 2.8 sin 35) = 1.6 (kN) (1606.0) ✓	5
	(ii)	power = force × velocity or 2.3 kN × 8.3 ms ⁻¹ ✓ (ecf from 2 (b)(i)) = 1.9 × 10 ⁴ (19037 or 19100) ✓ ecf W (or Js ⁻¹) ✓ (or 19 W (or kJs ⁻¹))	
(c)		(area of cross-section of cable =) $\pi \times (\frac{1}{2} 0.014)^2$ ✓ = 1.5(4) × 10 ⁻⁴ (m ²) ✓ stress (= F/A) = $\frac{2800\text{N}}{1.54 \times 10^{-4}\text{m}^2}$ (allow ecf here if attempt to calculate area) ✓ = 1.8(2) × 10 ⁷ ✓ ecf Pa (or Nm ⁻²) ✓	5
Total			14

2)

a	i	two from: velocity, acceleration, force etc ✓	1
a	ii	two from: speed, distance, mass etc ✓	1
b	i	B: drag / air resistance ✓ C: weight ✓	2
b	ii	closed triangle (of vectors) ✓ so forces are in equilibrium / resultant force is zero / forces balance (so moving at constant velocity) ✓	2
c		$W = 9500 \sin 74$ ✓ = 9100 ✓ (9132) 2 sf ✓	3

3)

a	i	1000(N) AND 6000(N) seen OR $F = \sqrt{(1000)^2 + (6000)^2}$ ✓ allow incorrect values seen = 6083 (N) (= 6100) ✓ More than 2 sf seen	2	Independent marks Allow full credit for appropriate scale drawing Ignore rounding errors in 3 rd sig fig.
a	ii	$\tan\theta = 1000/6000$ or correct use of sin or cos ✓ $\theta = 9.5$ (9.46°) ✓ Allow range 9.4 – 10.4	2	Use of cos yields 10.4 Allow use of 6100 Some working required for 2 marks. Max 1 mark for correct calculation of vertical angle (range 79.6 – 80.6) some working must be seen

4)

b	i	ball exerts force on ground and ground exerts force (on ball)/reaction ✓ and these forces are equal and opposite ✓	2
(b)	ii	recognise that the downward force is the weight of the ball (accept gravity) ✓ recognition that the upward/reaction force (on the ball) is greater than the downward force on the ball ✓	2