Answers - Revision - Projectiles 1

1.

(a)(i)	horizontal distance = (4.0 x 20) = 80 (m)	A1
(ii)	vertical fall: $s = ut + \frac{1}{2}at^2$ $= 0 + 0.5 \times 9.8\ (4.0)^2$ = 78 (m)	C1 C1 A1
(iii)	horizontal component = 20 (m s^{-1})	A1
(iv)	vertical component: $v = u + at$ $= 0 + 9.8 \times 4$ = 39 (m s^{1})	 C1 A1
(b)(i)	friction/air resistance lift weight / force due to gravity **any 2**	B2
(ii)	(gravitational) potential converted to kinetic energy and thermal energy / heat / work done against friction	B1 B1 B1
	two methods and two explanations or four methods e.g. increase speed down runway larger surface area of skis point skis upwards lie as flat as possible / streamlining	B4

2.

(a)		Downward arrow at **P**	**B1**
(b)		From <u>gravitational</u> potential (energy) to kinetic (energy) / KE / E_k (wtte) Any further detail: KE maximum at bottom / Zero (G)PE at bottom / (G)PE is maximum at top / (G)PE and KE at top (wtte)	**B1** **B1**
(c)		The acceleration / force / weight is at right angles to horizontal motion / velocity (wtte)	**B1**
(d)		time = $\frac{3.6}{7.0}$ (= 0.514 s)	**B1**

(e)		$u = 0$ and $v = u + at$ or $v^2 = u^2 + 2as$	C1
		'vertical' velocity = $9.81 \times 0.5(14)$ or 'vertical' velocity = $\sqrt{2 \times 9.81 \times 1.3}$	
		'vertical' velocity = 5.0 (m s^{-1})	C1
		$v^2 = 7.0^2 + 5.0^2$	C1
		$v = 8.6$ (m s^{-1})	A0

3.

a	time = 1.2/8.0	M1
	time = 0.15 (s)	A0
b	$s = ut + \frac{1}{2}at^2$ and $u = 0$ / $s = \frac{1}{2}at^2$ / $h = \frac{1}{2} \times 9.81 \times 0.15^2$	C1
	$h = 0.11$ (m)	A1
c	They both have same (vertical) acceleration / same acceleration of free fall / acceleration of 9.8 ms^{-2} (and zero initial vertical velocity)	B1

4.

(a)		vertically down(wards) / vertically towards the ground	B1
(b)		horizontal velocity = 24 × cos30 = 21 (m s^{-1})	B1
		vertical component = 24 × sin30 = 12 (m s^{-1})	B1
(c)		The ball is (still) moving at **B** / has horizontal motion at **B** / has horizontal velocity (of 20.8 m s^{-1}) at **B** / has KE at **B**	B1
(d)		$v^2 = u^2 + 2as$	
		Using the vertical component 12 (m s^{1}) $0 = 12^2 - 2 \times 9.81 \times h$ $h = 7.3$ (m)	C1 C1 A1

5.

(a)	(i)	There is only a vertical force / weight is vertical / no horizontal force(s) / acceleration is vertical	B1
	(ii)	1 Correct sketch of the rebound path.	B1
		2 The time is the same. For both, the height / vertical distance and (vertical) acceleration are the same.	M1 A1
(b)		Drop the ball from a given height **and** measure time of fall.	B1
		$s = ut + ½ at^2$ **and** $u = 0$ or $s = ½ at^2$	B1
		(The acceleration of free fall is determined using) $a = 2s/t^2$	B1
(c)	(i)	<u>Constant</u> deceleration or <u>uniform</u> deceleration or <u>constant negative</u> acceleration or <u>constant</u> rate (of change) of velocity	B1
		(Momentarily) stops at 1.5 (s) or reaches maximum height at 1.5 (s)	B1
		Clear idea of returning back. (AW)	B1
	(ii)	distance = ½ × 4.0 × 1.5	C1
		distance = 3.0 (m)	A1