Multiple Choice Answers

Q5: D
Q6: D
Q7: B

Multiple Choice Answers

Q5: B
Q6: B

1(a)	rate of change of velocity
1(b)(i)	acceleration = 320 / 20
	= 16 m s^{-2}
1(b)(ii)	$s = \frac{1}{2}((u) + v)t$ **or** distance = area under graph
	(height) = $\frac{1}{2} \times 20 \times 320 = 3200$ m **or** 3.2 km
1(c)(i)	$(\Delta E_P) = mg\Delta h$
	$= 2.9 \times 10^6 \times 9.81 \times 3200$
	$= 9.1 \times 10^{10}$ J
1(c)(ii)	$(\Delta E_K) = \frac{1}{2} m\Delta(v^2)$
	$= \frac{1}{2} \times 2.9 \times 10^6 \times 320^2$
	$= 1.5 \times 10^{11}$ J
1(c)(iii)	(power =) work done / time
	power = $((1.5 + 0.91) \times 10^{11}) / 20$
	= 1.2×10^{10} W

1(a)(i)	$v_H = 28 \times \cos 34°$
	= 23 m s^{-1}
	$v_V = 28 \times \sin 34°$
	= 16 m s^{-1}
1(a)(ii)	time = 16 / 9.81 = 1.6 s
1(a)(iii)	horizontal straight line at $v = 23$ m s^{-1} from $t = 0$ to $t = 3.2$ s
1(a)(iv)	straight diagonal line starting at a positive velocity from $t = 0$ to $t = 3.2$ s, crossing the time axis
	line starting at $v = 16$ m s^{-1} and ending at $v = -16$ m s^{-1}
	line passing through $v = 0$ at $t = 1.6$ s
1(b)(i)	product of mass and velocity
1(b)(ii)	$F = \Delta p / t$
	= 13 / 3.2
	= 4.1 N
1(b)(iii)	$m = \Delta p / v$
	$= 13 / (2 \times 16)$
	= 0.41 kg
	or
	$m = F / g$
	= 4.06 / 9.81
	= 0.41 kg

Multiple Choice Answers

Q7: C
Q8: A

1(a)	rate of change of velocity
1(b)(i)	$s = ut + \frac{1}{2}at^2$ **and** $u = 0$ or $s = \frac{1}{2}at^2$ $t = \sqrt{(2 \times 14 / 9.81)}$
	$t = 1.7$ s
	OR $v = \sqrt{(0^2 + 2 \times 9.81 \times 14)}$ $v = 17$ (m s^{-1}) $17 = (0 + 9.81) \times t$ **or** $17 = 9.81 \times t$ or $14 = \frac{1}{2} \times (0 + 17) \times t$ **or** $14 = \frac{1}{2} \times 17 \times t$
	$t = 1.7$ s
1(b)(ii)	$s = ut + \frac{1}{2}at^2$ $u = (3.6 - \frac{1}{2} \times 9.81 \times 1.7^2) / 1.7$
	$u = (-) 6.2$ m s^{-1}
	OR $v = (3.6 + \frac{1}{2} \times 9.81 \times 1.7^2) / 1.7$ $v = 10$ (m s^{-1}) $10 = u + 9.81 \times 1.7$ or $10^2 = u^2 + (2 \times 9.81 \times 3.6)$ or $3.6 = \frac{1}{2} \times (u + 10) \times 1.7$
	$u = (-) 6.2$ m s^{-1}
1(c)(i)	Less time (as it reaches a lower height)
	(because) the initial <u>vertical</u> (component of the) velocity is smaller (than in part **(b)**)
1(c)(ii)	The (total) initial energy is the same (as in part **(b)**)
	change in gravitational potential energy is same, so speed is the same

Multiple Choice Answers

Q4: A

3(a)(i)	$a = (v^2 - u^2) / 2s$ $= (22^2 - 13^2) / (2 \times 180)$
	$= 0.88$ m s^{-2}
	OR [t = (180 × 2) / (22 + 13) = 10.3] $180 = 13 \times 10.3 + \frac{1}{2} a \times 10.3^2$ or $180 = 22 \times 10.3 - \frac{1}{2} a \times 10.3^2$ or $22 = 13 + a \times 10.3$
	$a = 0.88$ m s^{-2}
3(a)(ii)	$(\Delta)E = \frac{1}{2}m(\Delta)v^2$
	gain in KE $= \frac{1}{2}m(v^2 - u^2)$ $= \frac{1}{2} \times 9400 \times (22^2 - 13^2)$
	$= 1.5 \times 10^6$ J
	OR $W = Fs$ $= ma \times d$
	gain in KE $= 9400 \times 0.88 \times 180$
	$= 1.5 \times 10^6$ J
3(b)(i)	rate of change of momentum
3(b)(ii)	(Force =) $(2.5 \times 10^4 - 21 \times 10^4) / 15 = -1.2 \times 10^4$ (N)
3(b)(iii)	The change of momentum (for S and R to come to rest) is the same
	(Average) force on R (to come to rest) is $(-21 \times 10^4 / 23 =) 0.91 \times 10^4$ N **or** (Average) force on R (to come to rest) is less than the force on S / less than F
	(S will come to rest in) less time (than R).
	OR The change of momentum (for S and R to come to rest) is the same
	Time for S to come to rest is $(-21 \times 10^4 / 1.2 \times 10^4 =) 17.5$ s (and time for R to come to rest is 23 s)
	(S comes to rest in) less time (than R).