

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

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

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 $s = \frac{1}{2}at^2$
	$t = \sqrt{(2 \times 14 / 9.81)}$
	$t = 1.7 \text{ s}$
	OR
	$v = \sqrt{(0^2 + 2 \times 9.81 \times 14)}$ $v = 17 \text{ (m s}^{-1}\text{)}$ $17 = (0 + 9.81) \times t$ or $17 = 9.81 \times t$ or $14 = \frac{1}{2} \times (0 + 17) \times t$ or $14 = \frac{1}{2} \times 17 \times t$
	$t = 1.7 \text{ s}$
1(b)(ii)	$s = ut + \frac{1}{2}at^2$
	$u = (3.6 - \frac{1}{2} \times 9.81 \times 1.7^2) / 1.7$
	$u = (-) 6.2 \text{ m s}^{-1}$
	OR
	$v = (3.6 + \frac{1}{2} \times 9.81 \times 1.7^2) / 1.7$ $v = 10 \text{ (m s}^{-1}\text{)}$ $10 = u + 9.81 \times 1.7$ or $10^2 = u^2 + (2 \times 9.81 \times 3.6)$ or $3.6 = \frac{1}{2} \times (u + 10) \times 1.7$
	$u = (-) 6.2 \text{ m s}^{-1}$
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)	$a = (v^2 - u^2) / 2s$
	$= (22^2 - 13^2) / (2 \times 180)$
	$= 0.88 \text{ m s}^{-2}$
	OR [$t = (180 \times 2) / (22 + 13) = 10.3$] $180 = 13 \times 10.3 + \frac{1}{2} a \times 10.3^2$ or $180 = 22 \times 10.3 - \frac{1}{2} a \times 10.3^2$ or $22 = 13 + a \times 10.3$
	$a = 0.88 \text{ m s}^{-2}$
3(a)(ii)	$(\Delta)E = \frac{1}{2}m(\Delta)v^2$
	gain in KE $= \frac{1}{2}m(v^2 - u^2)$
	$= \frac{1}{2} \times 9400 \times (22^2 - 13^2)$
	$= 1.5 \times 10^6 \text{ J}$
	OR $W = Fs$ $= ma \times d$
	gain in KE $= 9400 \times 0.88 \times 180$
3(b)(i)	$= 1.5 \times 10^6 \text{ J}$
3(b)(i)	rate of change of momentum
3(b)(ii)	(Force $\Rightarrow$) $(2.5 \times 10^4 - 21 \times 10^4) / 15 = -1.2 \times 10^4 \text{ (N)}$
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 $(-21 \times 10^4 / 23 \Rightarrow) 0.91 \times 10^4 \text{ N}$ 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 $(-21 \times 10^4 / 1.2 \times 10^4 \Rightarrow) 17.5 \text{ s}$ (and time for R to come to rest is 23 s)
	(S comes to rest in) less time (than R).