A-Level Physics: **w25 12**

Multiple Choice Answers

Q7: A

A-Level Physics: **w25 13**

Multiple Choice Answers

Q5: D
Q6: D
Q7: B

A-Level Physics: **w25 14**

Multiple Choice Answers

Q4: C

A-Level Physics: **w25 23**

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 $= ((1.5 + 0.91) \times 10^{11}) / 20$ $= 1.2 \times 10^{10}$ W

A-Level Physics: **s25 23**

1(a)	Rate of change of displacement
1(b)	For object A: $s = ut + \frac{1}{2}at^2$ so $t = \sqrt{\frac{2 \times 10}{9.81}}$ =1.4
	Then for object B: $s = ut + \frac{1}{2}at^2$ $h = -(3 \times 1.4) + (0.5 \times 9.81 \times 1.4^2)$
	= 5.7 m
	OR $h = -(3 \times 1.4) + 10$
	= 5.7 m
1(c)(i)	time taken (to reach the ground is) same
	The <u>initial</u> <u>vertical</u> (component of the) velocity is the same (as in part **(1b)**)
1(c)(ii)	The (total) initial energy is greater (than in part **(1b)**)
	change in gravitational potential energy is same, so speed is greater

A-Level Physics: **s25 52**

1	**Defining the problem**
	vary *m* and measure *v* **or** *m* is the independent variable and *v* is the dependent variable
	keep *h* <u>constant</u>
	Methods of data collection
	labelled diagram of workable experiment including: • axle resting on support(s) (on stands) • supports placed on bench • light gate (connected to timer) positioned at a distance *h* • light gate labelled and *h* indicated
	vertical metre rule <u>clamped to a stand</u> in a position close to block to measure *h*
	method to determine *v* using an interrupt length, e.g. *v* = length of block / time recorded by the timer
	method to measure *m*, e.g. use a (top-pan) balance
	Method of analysis
	plot a graph of $\frac{1}{v^2}$ against $\frac{1}{m}$ or equivalent Do not accept logarithms.

1	$\frac{1}{v^2}$ against $\frac{1}{m}$: $P = \frac{1}{h \times y\text{-intercept}}$ $\frac{1}{m}$ against $\frac{1}{v^2}$: $P = -\frac{\text{gradient}}{y\text{-intercept} \times h}$ **or** $P = \frac{\pi r^2 z \times \text{gradient}}{2Qh}$
	$\frac{1}{v^2}$ against $\frac{1}{m}$: $Q = \frac{\pi r^2 z}{2Ph \times \text{gradient}}$ **or** $Q = \frac{\pi r^2 z \times y\text{-intercept}}{2 \times \text{gradient}}$ $\frac{1}{m}$ against $\frac{1}{v^2}$: $Q = -\frac{\pi r^2 z \times y\text{-intercept}}{2}$
	Additional detail including safety considerations
	D1 precaution linked to falling block resulting in damage to block / bench, e.g. use a cushion / sand tray to prevent damage to bench **or** precaution linked to stands falling, e.g. clamp stand(s) to the bench prevent stand falling
	D2 keep *r* **and** *z* constant
	D3 method to determine *r* e.g. use calipers / ruler to measure diameter *d* **and** *r* = *d* / 2
	D4 measure *z* with a micrometer / calipers

1	D5 set square correctly positioned between rule and bench to ensure that rule to measure *h* is vertical
	D6 method to keep *h* constant by identifying constant initial position of the bottom of the block, e.g. clamped pin / rod to indicate the starting point each time or (fiducial) marker on rule
	D7 description of method to ensure that axle can rotate, e.g. axle is lubricated at the supports to enable axle to rotate, axle is not fixed at the supports so axle can rotate
	D8 use a large length of block to reduce (percentage) uncertainty in interrupt time or increase the time light gate is interrupted
	D9 repeat experiment for the same value of *m* **and** determine the average *v*
	D10 relationship valid if a straight line is produced (with *y*-intercept = $\frac{1}{hP}$). Do not accept line passing through the origin.