Question	Answer	Marks	AO Element	Notes	Guidance
1	distance = area under graph stated in any form (1) (distance = $\dfrac{0.5 \times 0.75}{2}$ =) 0.19 m (1)	2			
2	(average speed =) $\dfrac{initial\ speed\ +\ final\ speed}{2}$ words, symbols or numbers **OR** (average speed =) $\dfrac{distance\ (from\ area)}{time}$ words, symbols or numbers (1) (average speed = 40 / 2 =) 20 m / s **OR** (average speed = 80 / 4 =) 20 m / s (1)	2			
3	any **three** from : initially velocity increases **OR** the metal ball is accelerating **OR** (downwards) resultant force resistance (of liquid) has increased (as velocity increases) downwards force (on metal ball) = upwards force (on metal ball) (at point X) (metal ball) travels at constant velocity / speed	3			

Question	Answer	Marks	AO Element	Notes	Guidance
4	P – (constantly) accelerates (from 5 m/s) (1) Q – constant speed (of 17.5 m/s) (1) R – (non-constant) decelerates (from 17.5 m/s to rest) (1) S – at rest or stationary (1)	**4**			
5	(d =) $\frac{1}{2}$ × (a + b) × t **OR** area under graph (1) $\frac{1}{2}$ × (24 + 30) × 2.5 **OR** (24 × 2.5) + ($\frac{1}{2}$ × 6 × 2.5) (1) 67.5 (m)(1)	**3**			
6	first section and third section horizontal straight lines (1) second section line with negative gradient (1) first section horizontal line at 16 m/s **AND** third section horizontal line at 13 m/s at correct times (1)	**3**			

Question	Answer	Marks	AO Element	Notes	Guidance
7	(s =) d ÷ t **OR** s = d ÷ t in any form (1) (average speed =) 30 ÷ 5.4 (1) 5.6 (m / s) (1)	3			
8(a)	s = vt in any form **OR** (s =) vt **OR** relates distance to area (under graph) (1) 5 × 20 ÷ 60 **OR** 40 × 20 ÷ 60 **OR** 6 × 22 ÷ 60 (1) (s = 1.667 + 13.333 + 2.2 =) 17 km (1)	3			
8(b)	average speed = candidate's (a) / time (1) (average speed = 17 × 60 / 74 =) 14 km / h (1)	2			
9	0 (1) (constant) gradient = 0 **OR** speed constant (1)	2			
10(a)	deceleration (1) constant deceleration (1)	2			

Question	Answer	Marks	AO Element	Notes	Guidance
10(b)	acceleration (1) increasing acceleration (1)	**2**			
10(c)	decreasing speed / velocity **OR** deceleration	**1**			
10(d)	constant speed	**1**			
11	line from **T–U** to decreasing acceleration (1) line from **U–V** to moving with constant speed (1)	**2**			
12(a)	(distance travelled =) area under the graph (1) 2 × 20 (1) 40 (m) (1)	**3**			
12(b)	20 **OR** **(a)** ÷ 2	**1**			
13(a)	straight line from (0,0) to (8,120)	**1**			
13(b)	(h = A =) ½ × 120 × 8 (1) (h=) 480 m (1)	**2**			

Question	Answer	Marks	AO Element	Notes	Guidance
13(c)	rising <u>curve</u> from 8 s to 20 s(1) decreasing gradient from 8 s to 20 s (1) horizontal from 20 s to 25 s **AND** below 200 m/s, **AND** above 120 m/s (1)	3			
14	(a=) $\Delta v / \Delta t$ in any form **OR** (a=) $\Delta v / \Delta t$ **OR** (a=) 120/8 (1) (a) = 15 m/s^2 (1)	2			
15	distance = area under graph **OR** ½ × breadth × height (1) 0.5 × 1.5 × 15 (1) 11.25 (m) (1)	3			
16	drops are accelerating **OR** moving with increasing speed	1			
17(a)	speed = distance ÷ time in any form (1) 500 ÷ 1.6 (1) 312.5 (m/s) (1)	3			
17(b)	it is windy owtte **OR** reaction times to start / stop watch	1			

Question	Answer	Marks	AO Element	Notes	Guidance
18	distance = area under graph **OR** area = ½ × base × height (1) ½ × 3.0 × 4.0 (1) 6(.0) (m) (1)	3			
19	accelerating **OR** speed / velocity increasing (1) at a decreasing rate **OR** acceleration decreasing (1) gradient (of graph is positive and) decreasing (1)	3			
20(a)	A accelerating (uniformly) / speeding up (1) B steady / constant / uniform speed (1) C deceleration (non-uniform) / slowing down (1) D at rest / stopped / stationary / not moving (1)	4			
20(b)	distance = area under graph **OR** area = ½ × base × height (1) 0.5 × 3.5 × 5 (1) 8.75 (m) (1)	3			

Question	Answer	Marks	AO Element	Notes	Guidance
21(a)	10 (km)	1			
21(b)	1.5 (hours)	1			
21(c)	speed = distance ÷ time in any form (1) 10 ÷ 1.5 (1) 6.7 (km/h) (1)	3		allow 6.67 (km/h)	
22	speed = distance ÷ time in any form **OR** (t =) distance ÷ speed (1) 11 ÷ 16 (1) 0.69 (s) (1)	3			
23	change of velocity per unit time **OR** $\dfrac{v-u}{t}$	1			

Question	Answer	Marks	AO Element	Notes	Guidance
24	(average) speed = distance/time **OR** $v = s/t$ in any form **OR** ($s =$) (average) speed × time **OR** $v \times t$ **OR** area under graph stated or used (1) ($s =$) 23 × 2/60 (1) 0.77 km (1)	3		round candidate response to two sig. figs.	
25	v = gradient **OR** $\dfrac{dis\tan ce}{time}$ **OR** $\dfrac{160}{100}$ **OR** evidence of use of gradient (1) ($v =$) 1.6 m / s (1)	2			
26	(A and B) decreasing acceleration (1) (B and C) moving forwards at constant speed (1) (C and D) constant acceleration (1)	3			

Question	Answer	Marks	AO Element	Notes	Guidance
27	_Q and R:_ constant velocity / speed (1) _R and S:_ deceleration / negative acceleration (1) _S and T:_ stationary (1)	3			
28	horizontal line starting at t = 2.0 min **AND** at speed = 0 for 1 minute (1) line of constant positive gradient starting at t >= 2.0 min (1) for 30 seconds line continuously rising (1)	3		**NOT** wrong labels X or Y	
29	line starts from 0 on y-axis (1) straight diagonal line to 10 m/s (1) line parallel to time axis (1) straight diagonal line to x-axis at greater time (from horizontal section) (1) line drawn to time axis at (85, 0) (1)	5			
30	total distance ÷ total time **OR** 300 ÷ 40 (1) 7.5 m/s (1)	2			

Question	Answer	Marks	AO Element	Notes	Guidance
31	**1.** acceleration **OR** increasing speed **OR** going faster (1) **2.** constant speed **OR** steady speed (1) **3.** deceleration **OR** decreasing speed **OR** slowing down (1)	3			
32	distance travelled = area under graph **OR** counting squares (1) 4.5 × 0.75 (1) 3.375 **OR** 3.4 (1)	3			
33	distance = area under graph (1) 20 × 4 × 0.5 or area = ½ × base × height (1) 40 (m) (1)	3			
34	(average speed =) total distance ÷ total time (1) (630 + 254) ÷ (130 + 40) **OR** 884 ÷ 170 (1) 5.2 (m / s) (1)	3			

Question	Answer	Marks	AO Element	Notes	Guidance
35(a)	middle row: Y Z (1) bottom row: X Y (1)	**2**			
35(b)	area under graph (1) 0.5 × 20 × 40 **OR** ½ base × height (1) 400 (m) (1)	**3**			
35(c)	(WX or acceleration has) steeper line / gradient	**1**			
36	gradient decreasing (1) smooth transition to horizontal **AND** line not too thick (1) horizontal to (60 s, 400 m) (1)	**3**			
37(a)	(*v* =) gradient **OR** 150 / 30 **OR** appropriate division using other points (1) 5.0 m / s (1)	**2**			
37(b)	(*v* =) *x* / *t* **OR** (300 – 150) / (45 – 30) **OR** 150 / 15 (1) 10 m / s (1)	**2**			

Question	Answer	Marks	AO Element	Notes	Guidance
38	speed / velocity decreases (with time) or negative acceleration or deceleration (1) to zero (speed) / stationary (1)	2			
39	P marked on line between $t = 0\,s$ and $t = 30\,s$	1			
40	$(v =)\ d / t$ **OR** (average speed =) d / t **OR** $(2700 - 1800) / (120 - 60) = 900 / 60$ (1) $(v =)\ 15\,m/s$ (1)	2			
					[Total: 128]