01. 0625_w23_ms_42 Q: 3

Question	Answer		Marks
(a)(i)	force × time (for which force acts)		**B1**
(a)(ii)	0.056 Ns		**A3**
	$v = s / t$ OR $v = 0.67 / 0.18$ (m / s)		C1
	(impulse =) $\Delta\{mv\}$ **OR** (impulse =) $0.015 \times 0.67 / 0.18$ **OR** (impulse =) $15 \times 0.67 / 0.18$ **OR** (impulse =) 5.6×10^{N}		C1
(a)(iii)	(momentum is conserved as) air released from the balloon moves in the opposite direction to the balloon		**B1**
	momentum of balloon (and straw) is equal in size to momentum of air		**B1**
(b)	resultant force = 0.84 N	resultant force = 0.84 N	**A2**
	correct vector triangle or rectangle drawn	use of Pythagoras' theorem e.g. $a^2 + b^2 = c^2$ OR (force =) $\sqrt{(0.40^2 + 0.74^2)}$	C1
	direction 62° (below the horizontal)	direction 62° (below the horizontal)	**A2**
	correct resultant force vector with correct arrows on all vectors	use of trigonometry to find angle e.g. $\tan\theta = 0.74 / 0.40$	C1

02. 0625_w21_ms_42 Q: 3

Question	Answer	Marks
(a)	momentum before collision = momentum after collision	**B1**
	(initial momentum (p) =) 800×2 OR 1600 (kg m / s)	**B1**
	(v =) (1600 – 1300) / 800 OR 300 / 800 OR 0.38 (m / s)	**B1**
(b)(i)	(impulse =) change in momentum	**C1**
	1300 Ns	**A1**
(b)(ii)	same value as **(b)(i)** OR 1300 (Ns)	**B1**

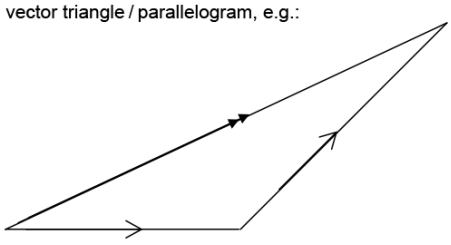
03. 0625_m20_ms_42 Q: 2

(a)	(impulse =) change of momentum	C1
	(impulse =) 71(10 – 4)	C1
	(impulse =) 430 N s	A1
(b)(i)	(impulse =) force × time	B1
(b)(ii)	(av F =) impulse / time (= 430 / 1.2)	C1
	(av F =) 360 N	A1
(c)	F= ma in any form OR (F =) ma OR 71 × 6.4	C1
	(F=) 450 N	A1

04. 0625_s20_ms_42 Q: 2

(a)	impulse OR $\Delta p = m(v - u)$ in any form	C1
	(impulse =) 750 000 (84 – 42)	C1
	(impulse =) 3.2×10^7 N s or m kg / s	A1
(b)	Ft = impulse OR Δp in any form OR (F =) (impulse OR Δp) / t	C1
	(F = 3.2 x 10^7 / 80 =) 3.9×10^5 N	A1
(c)	reduces drag / air resistance (experienced by the train) / more streamlined	B1
(d)	less drag / air resistance (at slower speeds)	B1
(e)	(maximum) friction (force) between rails and train reduced / train may slide	B1

05. 0625_w20_ms_41 Q: 1

Question	Answer	Marks
(a)	(p =) mv (in any form) **or** 0.16 × 15	C1
	2.4 kg m / s	A1
(b)(i)	3.0 N s **and** at 45° to the original direction	B1
(b)(ii)	vector triangle / parallelogram, e.g.: 	B1
	scale indicated **or** correct triangle / parallelogram	B1
	4.8 kg m / s ⩽ magnitude ⩽ 5.2 kg m / s	B1
	22° (to original direction) ⩽ direction ⩽ 28°(to original direction)	B1

06. 0625_s19_ms_41 Q: 1

(a)	change of velocity per unit time **OR** $\frac{v-u}{t}$	**B1**
(b)	line starts at origin **and** is asymptotic to *x*-axis	**B1**
	increasing gradient initially **and** no decrease	**B1**
	constant **and** clearly positive gradient finally	**B1**
(c)(i)	no external forces **OR** isolated system	**B1**
	sum of momenta / (total) momentum remains constant	**B1**
(c)(ii)	rocket gains (upward) momentum	**B1**
	(ejected) gas gains equal (quantity of) momentum in opposite direction **OR** momentum of gas decreases by equal amount	**B1**

07. 0625_s19_ms_42 Q: 2

(a)	(Δ) p=mv in any form OR ((Δ)p=) mv OR 0.8 × 0.72	**C1**
	(Δp=) 0.58 kg m/s	**A1**
(b)	Ft= Δp in any form OR (F=) Δp/t OR 0.58/6	**B1**
	(F=) 0.096 N accept rounding if 0.096 seen	**B1**

(c)	Statement: (acceleration is) to right/backward	**B1**
	Explanation: force (from water OR on model) to right /backwards OR acceleration in same direction as force (from water OR on model)	**B1**
(d)	(acceleration) more (when empty)	**B1**
	mass less (and force is constant)	**B1**
	meaningful reference to F=ma / Newton's 2nd law / change in momentum	**B1**