Q1. (2018)

a)

03.1	momentum = mass × velocity	allow p = mv	1	AO1 6.5.5.1

b)

03.2		an answer of 63 (kg) scores **3** marks		AO2 6.5.5.1
	200 = m × 3.2		1	
	$m = \frac{200}{3.2}$		1	
	m = 63 (kg)	allow 62.5 (kg)	1	

c)

03.3	(total) momentum before (collision) = (total) momentum after (collision)		1	AO1 6.5.5.2
	either momentum of skater A decreases and momentum of skater B increases	allow (total) momentum is shared between skater A and skater B	1	
	velocity of skater A decreases and velocity of Skater B increases		1	
	or momentum of skater A decreases and so velocity of skater A decreases (1) momentum of skater B increases and so velocity of skater B increases (1)			

Q2. (2019)

a)

03.3	any **two** from: • mass • velocity • friction • power of the motor	 allow weight allow speed or direction allow air resistance or drag	2	AO1 6.5.5.2	E

b)

03.4	total momentum is zero after the collision (because the bumper cars are stationary) because the momentum of each car before the collision was equal (in magnitude) and opposite (in direction) so the total momentum of the bumper cars was zero before the collision and momentum is conserved **OR** total momentum is zero after the collision (because the bumper cars are stationary) (1) because the momentum of each car before the collision was equal (in magnitude) and opposite (in direction) (1) both cars exert an equal and opposite force on each other (for equal periods of time) (1) so the cars accelerate (in opposite directions) (1)		1 1 1 1	AO3 5.5.5.2	E

Q3. (2020)

a)

04.3	momentum = mass × velocity or p = mv		1	AO2 6.5.5.1	

b)

04.4	26 = m × 5.0 $m = \frac{26}{5.0}$ 5.2 (kg)		1 1 1	AO2 6.5.5.1	

c)

04.5	momentum is conserved in the collision (assuming no external forces) momentum of the pin increases therefore the momentum of the ball must decrease.	if no other mark is awarded, allow **1** mark for when the ball exerts a force on the pin, the pin	1 1 1	AO1 6.5.5.2	

Q4. (2022)

a)

03.1	$m = 0.180$		1	AO2 6.5.5.1
	$0.216 = 0.180 \times v$	allow a correct substitution using an incorrectly / not converted value of m	1	
	$v = \frac{0.216}{0.180}$	allow a correct rearrangement using an incorrectly / not converted value of m	1	
	$v = 1.2$ (m/s)	allow a correct calculation using an incorrectly / not converted value of m	1	

b)

03.2	(total) momentum is conserved in the collision	allow (total) momentum before collision = (total) momentum after collision	1	AO1 6.5.5.1
	during the collision the momentum of carriage increases		1	
	so the momentum of train decreases		1	
	since momentum = mass × velocity, velocity (of train) decreases	allow since mass (of train) is constant, velocity (of train) decreases	1	

Q5. (2024)

05.4	$6250 = m \times 5.0$		1	AO2 6.5.4.2.2
	$m = \frac{6250}{5.0}$		1	6.5.5.1
	$m = 1250$ (kg)		1	
	$v = 12$ (m/s)		1	
	$p = 1250 \times 12$	allow a substitution using a value of v in the range 11.8 to 12.2 allow a correct substitution using their incorrectly calculated value for m using the correct equation	1	
	$p = 15\,000$ (kgm/s)	allow a calculation using a value of v in the range 11.8 to 12.2 allow a correct calculation using their incorrectly calculated value for m using the correct equation	1	