

Q1. (2019)

a)

04.1			1	AO1 6.7.2.2	A
------	---	--	---	----------------	---

b)

04.2	reverse the direction of the current		1	AO1 6.7.2.2	E
	reverse the direction of the magnetic field		1		

c)

04.3		an answer of 4.0 (A) scores 4 marks		AO2 6.7.2.2	E
	$B = 0.360 \text{ (T)}$		1		
	$0.072 = 0.360 \times I \times 0.050$	allow a correct substitution using an incorrectly / not converted value of B	1		
	$I = \frac{0.072}{(0.360 \times 0.050)}$	allow a correct rearrangement using an incorrectly / not converted value of B	1		
	$I = 4.0 \text{ (A)}$	allow a correct calculation using an incorrectly / not converted value of B	1		

d)

04.4	there is a magnetic field (due to the permanent magnet) and current in a wire causes a magnetic field		1	AO1 6.7.2.3	E
	current is in opposite directions in each side of the coil		1		
	so forces act in opposite directions on either side of the coil		1		
	(the split ring ensures that) the current in the left / right side of the coil is always in the same direction	allow (the split ring ensures that) the force in the left / right side of the coil is always in the same direction	1		
		allow the current reverses each half rotation			

Q2. (2020)

a)

07.1	the downward force on the balance increased	allow when there is a current in the wire there is a magnetic field around the wire (which causes a magnetic force)	1	AO3 6.7.2.2 6.5.4.2.3	
	therefore the wire must experience an equal and opposite force (which is upwards)		1		

b)

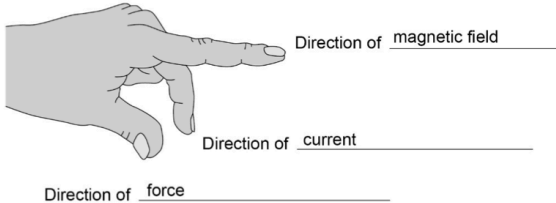
07.2	calculate the difference between the two mass readings	allow $254.8 - 252.3 = 2.5$	1	AO1 6.7.2.2
	convert to kg and multiply by gravitational field strength	allow $(2.5 / 1000) \times 9.8 = 0.02375 \text{ (N)}$	1	
c)				
07.3	gradient = $\frac{(0.0210 - 0.0)}{(0.70 - 0.02)}$		1	AO3
	gradient = 0.031	allow answer correctly given to any number of significant figures	1	AO3
	$0.031 = B \times 0.125$	allow correct substitution using correctly calculated value given to any number of significant figures	1	AO2
	$B = 0.25 \text{ T}$	allow answer correctly given to any number of significant figures	1	AO2
		any rounding must be correct for subsequent marks to be awarded. max 2 marks if a pair of readings from the graph are used instead of gradient calculation		6.7.2.2

Q3. (2021)

a)

04.6	$L = 0.120 \text{ m}$		1	AO2 6.7.2.2
	$0.36 = B \times 4.0 \times 0.120$	allow a correct substitution of an incorrectly / not converted value of L	1	
	$B = \frac{0.36}{(4.0 \times 0.120)}$	allow a correct rearrangement using an incorrectly / not converted value of L	1	
	$B = 0.75$	allow a correct calculation using an incorrectly / not converted value of L	1	
	T		1	

b)

04.7		2	AO1 6.7.2.2
	allow 1 mark for 1 or 2 correct		

Q4. (2022)

a)

04.1	there is a magnetic field due to the (permanent) magnets		1	6.7.2.1 AO1
	and the current in the wire produces a magnetic field		1	

b)

04.2	use (Fleming's) left hand rule	allow place first two fingers and thumb of left hand at right angles to each other	1	6.7.2.2 AO1
	place first finger in direction of the field lines and place second finger in direction of current		1	
	then thumb will show direction of the force	allow thumb points downwards allow force is downwards	1	

Q5. (2022)

04.3	any one from: • more turns of the wire on the coil • increase the current in the coil	allow use a cell with a greater potential difference	1	6.7.2.3 AO1
	• stronger magnet	allow move the coil closer to the magnet ignore bigger magnet	1	
	this will increase the force on the coil (due to the motor effect)			

Q6. (2023)

a)

04.2	→		1	AO2 6.7.2.2
------	---	--	---	----------------

b)

04.3	increase the current	allow use a stronger magnet	1	AO1 6.7.2.2
	so that the (resultant) force increases		1	

Q7. (2024)

a)

04.1	into the page		1	AO2 6.7.2.2
------	---------------	--	---	----------------

b)

04.2	$0.092 = B \times 4.6 \times 0.080$		1	AO2 6.7.2.2
	$B = \frac{0.092}{4.6 \times 0.080}$	allow a correct rearrangement using an incorrectly / not converted value of l	1	
	$B = 0.25$	allow a correct calculation using an incorrectly / not converted value of l	1	
	tesla or T		1	

Q8. (2024)

a)

04.3	Newton's third law		1	AO1 6.5.4.2.3
------	--------------------	--	---	------------------

b)

04.4	any two from:		2	AO1 6.7.2.1
	<ul style="list-style-type: none"> move the electromagnet closer to the permanent magnet add more turns to the coil / electromagnet increase the current (in the coil / electromagnet) 	allow increase the potential difference (across the coil / electromagnet)		

c)

04.5	any two from		2	AO1 AO3 6.7.2.1
	<ul style="list-style-type: none"> reverse the current in the coil / electromagnet turn the electromagnet around (to reverse the poles) wrap the coil (around the iron core) in the opposite direction 			