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IGCSE PHYSICS 0625 · TOPICAL PAST PAPERS

Electromagnetism — Paper 1

Worked Answer Key (Multiple Choice)

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Electromagnetism — Paper 1 · Worked Answer Key

These are **Megalecture worked answers** for the topical multiple-choice compilation on **Electromagnetism (IGCSE Physics 0625, Paper 1)**. Every answer below was solved from first principles by the Megalecture team. The key technique throughout is **Fleming's left-hand rule** for the motor effect: stretch the thumb, first finger and second finger of the left hand at right angles — **F**irst finger = **F**ield (N→S), se**C**ond finger = **C**urrent (conventional, i.e. opposite to electron flow), and the thu**M**b = **M**otion / force. Remember the size of the force grows with a *stronger field*, a *larger current* and *more turns*. The compilation is organised into two parts — keep your eye on the part heading, as the exam-paper question numbering restarts in each part.

Part A · Force on a Current-Carrying Conductor

Q #	Exam reference	Answer	Brief working / reason
A1	M/J 16 P12	**B**	Field runs N (top) → S (bottom), i.e. downwards; current flows P→Q, i.e. to the right. Fleming's left-hand rule (field down, current right) gives the force pointing **out of the page**.
A2	M/J 18 P11	**A**	Field runs N (top) → S (bottom) = downwards. Electrons move to the right, so the conventional current is to the **left**. Fleming (field down, current left) gives a force **into the page**.
A3	M/J 19 P11	**D**	Electrons travel to the right, so the conventional current points to the **left** (←). The field runs from the N-pole (bottom) to the S-pole (top), i.e. **upwards** (↑). Current ← and field ↑ matches row **D**.
A4	M/J 20 P11	**D**	The varying current makes the coil experience a varying force (motor effect); the coil is attached to the cone, so it drives the cone in and out. With the magnet clamped, the parts that move are the **coil and cone**.
A5	O/N 16 P11	**B**	Field runs N (left) → S (right), i.e. to the right; the current flows downwards. Fleming (field right, current down) gives a force pointing **out of the plane of the paper**.
A6	O/N 17 P12	**B**	In a magnetic field, γ (no charge) passes **straight through**; α and β carry opposite charges so curve in opposite directions, and β (far smaller mass) curves much more sharply than α. Only diagram **B** shows γ undeflected with α and β deflecting oppositely and by very different amounts.
A7	O/N 18 P11	**C**	Reversing the current (B) or reversing both (A) only changes the *direction* of the force, not its size; thickness of wire (D) does not affect F = BIL. Using a **stronger magnet** increases B and so increases the force.

Part B · The D.C. Motor

Q #	Exam reference	Answer	Brief working / reason
B1	M/J 16 P11	**B**	The split-ring commutator swaps the connections to the coil once each **half turn**, reversing the current so the coil keeps rotating the same way.
B2	M/J 16 P12	**D**	To turn the *opposite* way you must reverse the force, done by **reversing the magnetic field** (or the current, but not both). To turn *faster* you need a bigger force, so **increase the current**. Reverse field + increase current = row **D**.
B3	M/J 17 P12	**D**	A split-ring commutator does not change the current size or generate anything; its job is to **reverse the direction of the current in the coil** every half turn so rotation continues in one direction.
B4	M/J 19 P11	**C**	Frequency of rotation falls when the turning force is reduced. A **lower voltage supply** drives a smaller current, giving a smaller force and slower rotation. (More turns, stronger magnet and larger current all speed it up.)
B5	M/J 20 P12	**C**	The question asks which does **not** increase the turning effect. More current in either coil, or more turns, all increase it. **Reversing the current in the electromagnet** only changes the direction of the force — the magnitude of the turning effect is unchanged.
B6	O/N 16 P11	**D**	Coil Q uses twice the length of identical wire (2L), so it has **greater resistance**. With the same current I, the turning effect grows with the number of turns, and Q has 2N turns, so **Q** also has the greater turning effect. Greater resistance Q, greater turning effect Q = row **D**.
B7	O/N 17 P12	**D**	The soft-iron cylinder (core) becomes strongly magnetised by the coil, concentrating the field lines and **strengthening the magnetic field**, which increases the turning force on the coil.

Note from Megalecture. The reliable routine for every "direction of force / deflection" item in Part A is: (1) fix the field direction N→S, (2) convert any electron beam to *conventional* current (opposite direction), then (3) apply Fleming's left-hand rule. These are original Megalecture worked solutions prepared for revision use.