GET BETTER AT PHYSICS · MARK SCHEME

Electromagnetic Induction: tiered multiple choice

Edexcel IAL Physics · Unit 4 (WPH14) · Specification points 108–110 · 6 questions · 6 marks

1 mark per correct letter

Worked reasoning for every question

How students did = from Pearson examiner reports, where available

Answer key

Q1	Q2	Q3	Q4	Q5	Q6
A	A	B	A	B	D

Easy

Questions 1–3

1 **A**

Inducing an alternating e.m.f. in a nearby coil · Edexcel IAL October 2022 · Unit 4 · Q10

An e.m.f. is only induced in M while the flux linking it is changing. An alternating current in L produces a continually changing, reversing flux, so it induces an alternating e.m.f. in M. A constant current gives no e.m.f.; a steadily increasing or decreasing current gives an e.m.f. in one direction only.

How students did: 79% of students got this right in October 2022.

2 **A**

Unit of magnetic flux · Edexcel IAL October 2023 · Unit 4 · Q4

Magnetic flux $\varphi = BA$, so its unit is $T \times m^2 = T\ m^2$ (also called the weber, Wb).

How students did: 53% of students got this right in October 2023.

3 **B**

Lenz's law: magnet moving away from a coil · Edexcel IAL January 2024 · Unit 4 · Q8

The S pole of the magnet is moving away from end X. The induced current opposes this motion, so the coil tries to attract the S pole: end X becomes a north pole. The other end of the coil, Y, is then a south pole.

> **Watch out:** Lenz's law: the induced effect always opposes the change causing it, here the magnet moving away.

How students did: 52% of students got this right in January 2024.

Medium

Question 4

4 **A**

Poles of a coil as a magnet falls through · Edexcel IAL October 2020 · Unit 4 · Q10

As the N pole enters at X, the coil opposes the approach by repelling it, so X is a north pole. As the magnet leaves at Y, its S pole is moving away, so the coil opposes this by attracting it: Y becomes a north pole too.

> **Watch out:** Apply Lenz's law separately to entering and leaving: the coil always opposes the change.

How students did: 30% of students got this right in October 2020.

Hard

Questions 5–6

5 **B**

Induced e.m.f. from an alternating current · Edexcel IAL June 2022 · Unit 4 · Q10

The induced e.m.f. in coil 2 is proportional to the rate of change of flux, and so to the rate of change of current in coil 1 (the gradient of the I–t graph). This is greatest where I crosses zero and zero at the peaks of I, so the e.m.f. is a sine wave shifted by a quarter of a cycle from the current, with the same frequency.

Watch out: The e.m.f. follows the gradient of the current graph, not the current itself.

How students did: 25% of students got this right in June 2022.

6 **D**

Change in flux linkage after half a turn · Edexcel IAL October 2021 · Unit 4 · Q5

Rotating the coil through π radians (half a turn) brings it back perpendicular to the field, but with the field passing through it in the opposite direction. The flux linkage goes from +Nφ to −Nφ, a change of 2Nφ.

Watch out: Flux linkage has a sign; turning the coil over reverses it.

How students did: 19% of students got this right in October 2021.

End of mark scheme. Answers from Pearson's published mark schemes; explanations written for this pack. Pearson Edexcel material is © Pearson Education Ltd. More free packs and 1-to-1 tuition: **www.getbetteratphysics.co.uk**

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