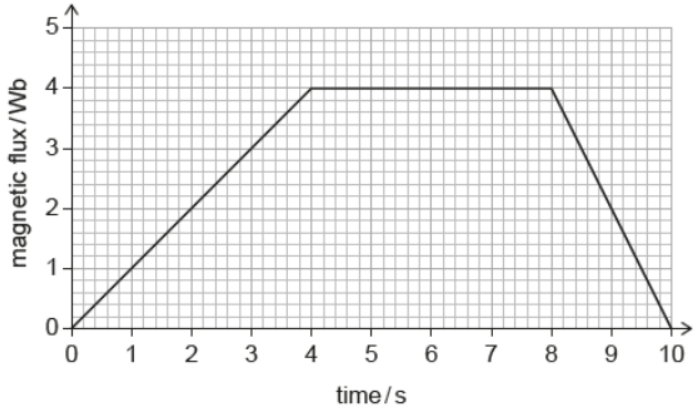
Homework — Part 2: Exam practice (IB past papers)

10 real IB questions: Paper 1A (multiple choice) and Paper 2, mixed. Total: **31 marks**. Use the data booklet. For Paper 1A, write the letter and a short reason. In Paper 2, some parts of the original question are left out (we have not studied them yet).

Useful: $\Phi = BA\cos\theta$ (θ from the **normal**), flux linkage $= N\Phi$, $\varepsilon = -N\dfrac{\Delta\Phi}{\Delta t}$. Scoring words: *rate of change of flux linkage*, *opposes the change*.

1. Paper 1A IB November 2025

The graph shows how the magnetic flux linked through a conducting coil varies with time. The coil has only one turn.



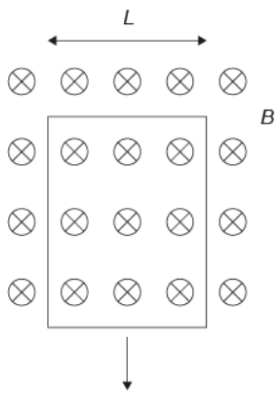
What is the maximum emf induced in the coil?

A. 0.40 V B. 1.0 V C. 2.0 V D. 4.0 V

[1]

2. Paper 2 IB May 2023 (one part)

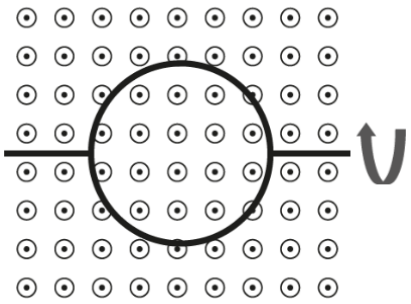
A vertical rectangular loop of conducting wire is dropped in a region of horizontal magnetic field. The diagram shows the loop as it leaves the region of the magnetic field.



Explain, by reference to Faraday's law of electromagnetic induction, why there is an electromotive force (emf) induced in the loop as it leaves the region of magnetic field. [2]

3. Paper 1A IB May 2026

A ring with a radius of 5 cm rotates about a horizontal axis in a uniform magnetic field of 0.5 T.



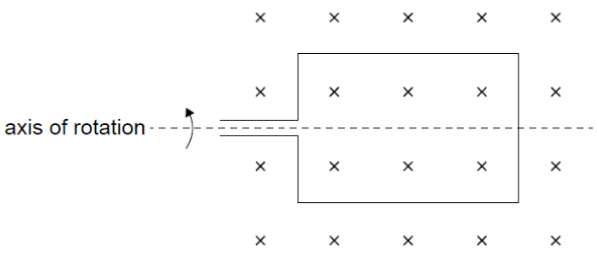
What is the angle of rotation measured from the horizontal when the magnetic flux through the ring is 2.0 mWb?

A. 60° B. 75° C. 85° D. 89°

[1]

4. Paper 2 IB May 2026 (one part)

An electric generator consists of a rectangular coil rotating in a uniform magnetic field.



(a) **Explain** how an emf is induced in the coil. [3]

At $t = 0$ the coil is perpendicular to the magnetic field, as shown in the diagram. At $t = 7.0 \times 10^{-3}$ s the coil has rotated through an angle of 120°. The following data are given:

surface area of the coil = 5.0×10^{-2} m^2

number of turns of the coil = 1500

magnetic field strength = 0.040 T

(b) **Determine** the average emf induced in the coil between $t = 0$ and $t = 7.0 \times 10^{-3}$ s. [2]

5. Paper 1A IB May 2025

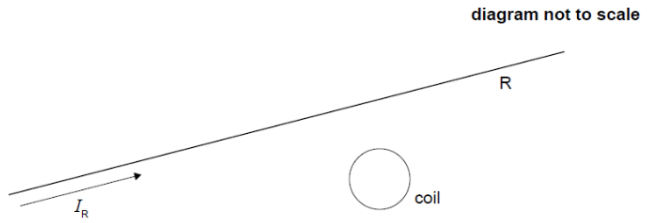
A horizontal conducting ring is perpendicular to a uniform vertical magnetic field. When the ring is rotated through 180° about the horizontal axis, an average emf of 2.0 μV is induced in the ring. The area enclosed by the ring is 4.0 cm^2 and the rotation takes 2.0 s. What is the magnetic field?

A. 2.5 mT B. 5.0 mT C. 10.0 mT D. 20.0 mT

[1]

6. Paper 2 IB May 2025 (one part)

A long straight wire R carries a current I_R. A small coil of wire of radius 2.0 cm and 20 turns is located with its centre 10.0 cm from R. The current in R is kept constant at 2.0 A.



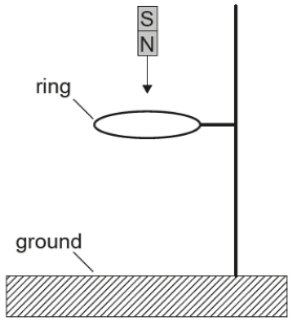
(a) **Explain** why there is no current induced in the coil. **[2]**

The current in R now increases at a constant rate from 2.0 A to 10.0 A.

(b) **Deduce** the direction of the current induced in the coil. **[2]**

7. Paper 1A IB May 2026

A falling magnet approaches a conducting circular ring above the ground.



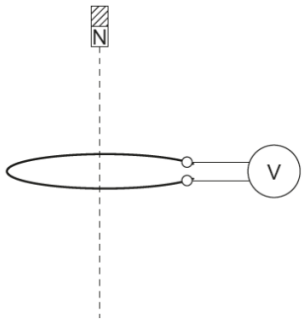
What is correct about the direction and magnitude of the current induced in the ring as the magnet approaches it, as seen from the ground?

	Direction of the current	**Magnitude of the current**
A.	Counter-clockwise	Constant
B.	Counter-clockwise	Variable
C.	Clockwise	Constant
D.	Clockwise	Variable

[1]

8. Paper 2 IB May 2026 (parts of one question)

The diagram shows a bar magnet with its north pole pointing down. It is positioned above a conducting loop of wire connected to a voltmeter.

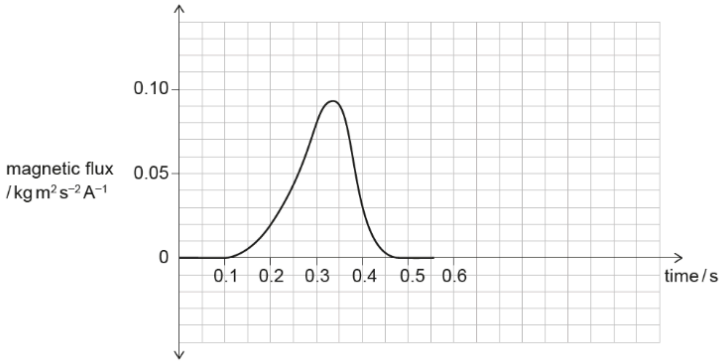


The magnet is dropped and falls through the loop of wire. The magnetic flux through the wire increases and then decreases.

(a) **State** the definition of magnetic flux. **[1]**

(b) **Explain**, with reference to Faraday's law, the reading of the voltmeter as the magnet approaches the wire. **[2]**

The graph shows the variation with time of the magnetic flux through the wire.



(c) Using the graph, **determine** the maximum value of the emf induced by the fall of the magnet. **[3]**

(d) **State** the direction of the current induced in the wire as the magnet enters the loop and as it leaves the loop. **[2]**

9. Paper 1A IB May 2026

A magnet is inserted into a coil of 100 turns with speed 2.0 m s^{-1} and induces a maximum emf of 400 V. The magnet is then inserted into a coil of the same length and cross-sectional area with 300 turns and induces a maximum emf of 300 V.

What is its new speed?

A. 6.0 m s^{-1} B. 2.3 m s^{-1} C. 1.5 m s^{-1} D. 0.5 m s^{-1}

[1]

10. Paper 2 IB May 2025 (parts of one question)

A bar magnet hangs from a vertical spring and oscillates up and down. A stationary horizontal coil is placed directly below the oscillating magnet.

(a) **Discuss** two factors that affect the magnitude of the emf induced in the coil. In your answer, you should explain: **[4]**

- how an induced emf can arise in the coil, and
- how each factor affects the magnitude of the emf.

(b) A resistor is now connected across the coil. The amplitude of oscillation of the magnet rapidly decreases. **Explain** this phenomenon. **[3]**

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