



# **A Level Physics A**

**H556/02** Exploring physics

## **Question Set 18**

1 Fig. 21.1 shows a coil of a simple generator rotating in a uniform magnetic field.

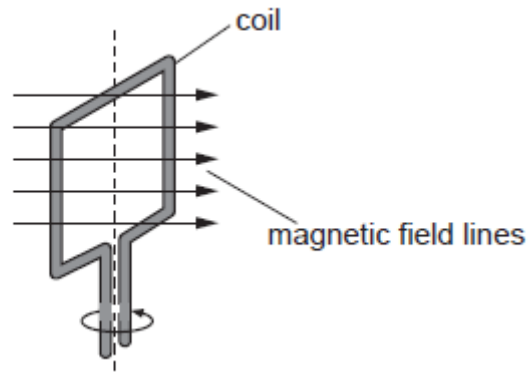


Fig. 21.1

The coil has 85 turns of insulated wire. The cross-sectional area of the coil is  $14 \text{ cm}^2$ .

Fig. 21.2 shows the variation of magnetic flux density  $B$  through the plane of the coil with time  $t$  as it rotates.

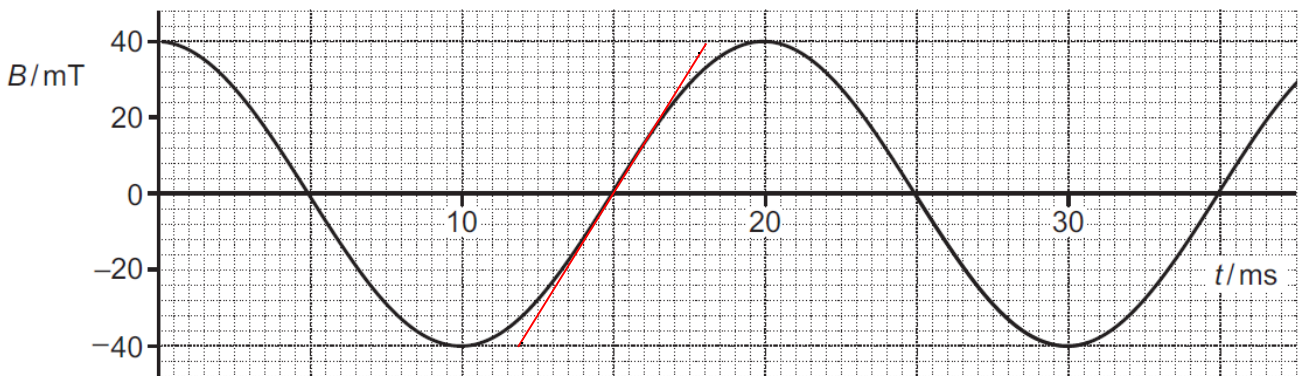


Fig. 21.2

- (a) (i) Explain why the electromotive force (e.m.f.) induced across the ends of the coil is a **maximum** at the times when  $B = 0$ .

*This is where there is max rate of change of flux linkage.*

[1]

- (ii) Draw a tangent to the curve in Fig. 21.2 when  $B = 0$ , and hence determine the **maximum** e.m.f. induced across the ends of the coil.

$$\text{gradient} = \frac{80 \times 10^{-3}}{6.5 \times 10^{-3}} = 12.3 \quad \text{maximum e.m.f.} = \dots\dots\dots 1.5 \dots\dots\dots \text{V [3]}$$

$$\begin{aligned} \mathcal{E} &= \frac{dB}{dt} NA = 12.3 \times 14 \times 10^{-4} \times 85 \\ &= 1.5 \text{ V} \end{aligned}$$

(b) Fig. 21.3 shows the variation of the e.m.f. induced across the ends of the coil with time  $t$ .

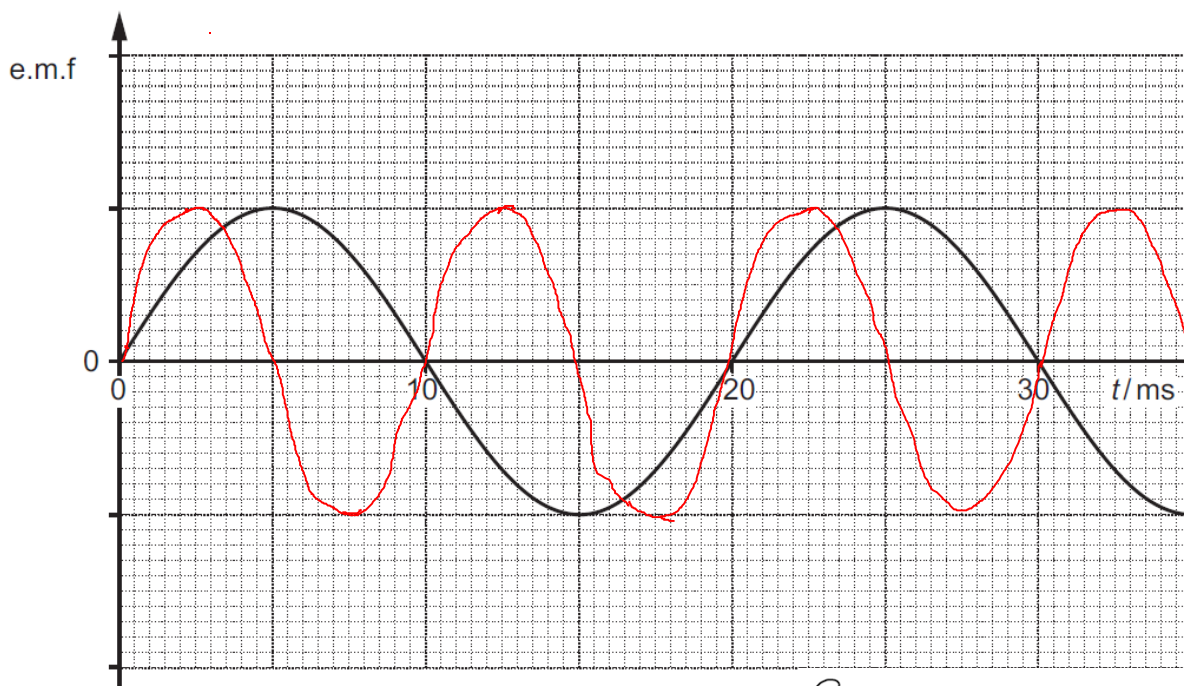


Fig. 21.3

*Sin curve with peak = emf<sub>0</sub> and period half of given curve.*

The magnitude of the magnetic flux density of the uniform field is now halved and the coil is rotated at twice its previous frequency.

On Fig. 21.3 sketch the new variation of the e.m.f. induced with time  $t$ .

[2]

$\mathcal{E} \propto \frac{d \cos \theta \times B}{dt}$  so max  $\mathcal{E}$  stays constant. However it will have  $1/2$  the period.

**Total Marks for Question Set 18: 6**

---

# OCR

Oxford Cambridge and RSA

## **Copyright Information**

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website ([www.ocr.org.uk](http://www.ocr.org.uk)) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact The OCR Copyright Team, The Triangle Building, Shaftesbury Road, Cambridge CB2 8EA.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge