

H7 Magnetic Flux and Faraday's Law

9/12

H7.1 Complete the questions in the table:

Magnetic Flux Density /T	Area of Coil	Angle between plane of coil and magnetic field lines /°	Number of turns	Magnetic flux linkage /Wb turns
2.0	2.0 m × 1.0 m	90	40	(a)
0.00232	5.0 cm × 5.0 cm	60	2400	(b)

- H7.2 Calculate the magnetic flux linkage if a $3.0 \text{ cm} \times 2.0 \text{ cm}$ rectangular coil of 200 turns is in a 0.75 T magnetic field, with the field at right angles to the plane of the coil.
- H7.3 Calculate the magnetic flux linkage if a 2400 turn coil measuring $3.0 \text{ cm} \times 3.0 \text{ cm}$ lies within a 0.25 T magnetic field, with the field lines making an angle of 30° to the plane of the coil.
- H7.4 Assume field lines are perpendicular to the plane of a 400 turn coil of area $3.0 \times 10^{-4} \text{ m}^2$.
- Calculate the rate of change in the magnetic flux linkage when the magnetic field is reduced from 0.20 T to zero in 0.40 s .
 - What is the voltage induced across the coil?

H7.5 Complete the questions in the table:

Initial flux linkage /Wb turns	Final flux linkage /Wb turns	Time taken for flux to change /s	Voltage induced /V
30	60	0.20	(a)
200	0	(b)	400

- H7.6 A single turn coil of $10 \text{ cm} \times 5.0 \text{ cm}$ sits, stationary, in a 21000 T magnetic field, at right angles to the plane of the coil.
- What is the voltage induced across the ends of the wire?
 - The coil is made of extensible wire and is stretched steadily to $10 \text{ cm} \times 10 \text{ cm}$ over 0.020 s . Calculate the voltage induced across the ends of the wire.
 - What would the induced voltage be if the magnetic field were parallel to the sides of the coil which were originally 5.0 cm long?
- H7.7 A bicycle wheel with only one spoke has a magnetic flux of $1.95 \times 10^{-5} \text{ Wb}$ passing through it. If the wheel goes round 6 times in one second, what voltage will be induced between the hub and the rim?
- Something to think about – would the answer to question H7.7 change if there were twenty spokes?