18 Faraday's law can be written as $\mathscr{E} = \dfrac{-\mathrm{d}(N\phi)}{\mathrm{d}t}$

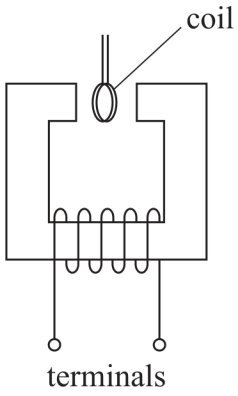
(a) State the name of the term $N\phi$ and its unit.

(2)

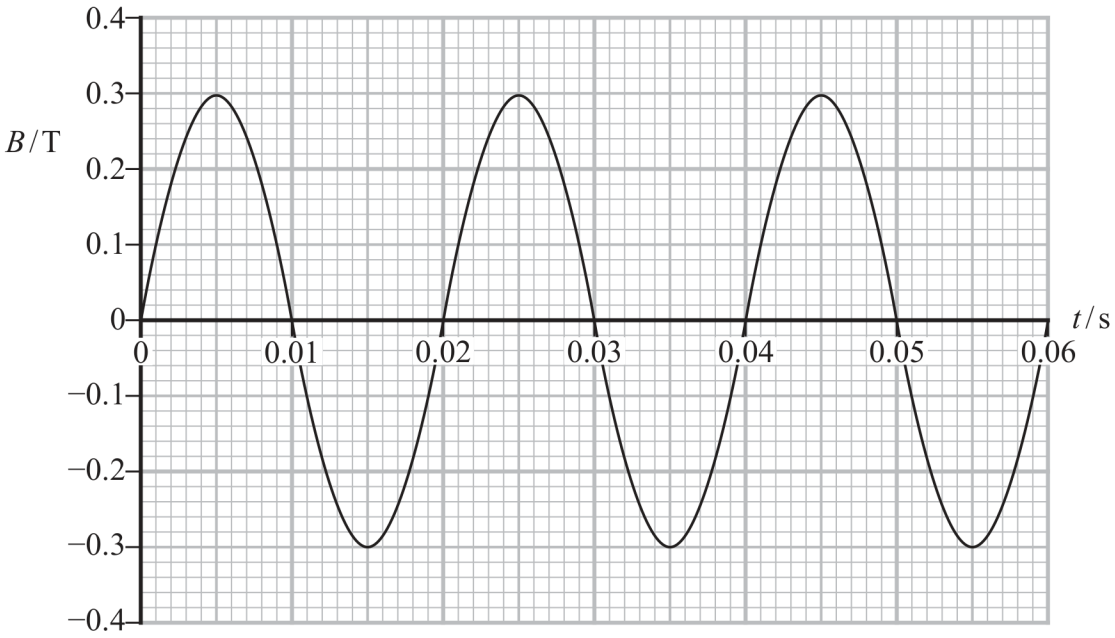
.....

.....

(b) A coil of 500 turns and radius 3.0 mm is placed between two poles of an electromagnet as shown. The terminals are connected to an a.c. power supply.



The magnetic flux density B perpendicular to the plane of the coil varies with time t as shown below.



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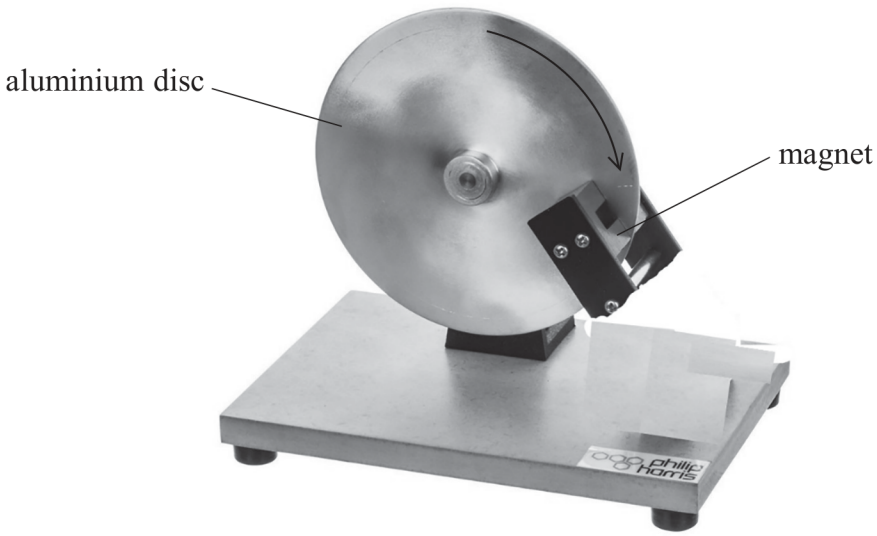
Determine the maximum e.m.f. across the coil.

(6)

Maximum e.m.f. = ...

(c) Some electric motor designs rely on electromagnetic induction.

A laboratory demonstration of the principle of an induction motor is shown.
An aluminium disc is free to rotate and is initially stationary. A powerful magnet is moved around the disc in the direction of the arrow, without touching the disc.



(Source: https://www.philipharris.co.uk/product/physics/electricity-and-electromagnetism/magnetism/eddy-current-unit/b8h79908)

A student suggests that the disc will start to rotate as the magnet is moved and that the disc will rotate in the same direction as the movement of the magnet.

Discuss this suggestion.

(6)

(Total for Question 18 = 14 marks)