A Level H2 Physics Tutorial 17: Electromagnetic Induction

Syllabus :
(a) define magnetic flux as the product of an area and the component of the magnetic flux density perpendicular to that area

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1. A wire loop is placed in a magnetic field. Area of the loop is A, and magnetic flux density is B. The loop is a flat rectangle, and B is at angle θ to the normal of the loop.

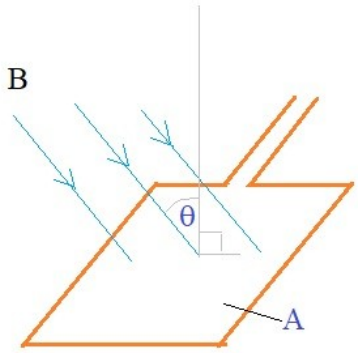

Figure 17-1

Referring to this figure, define magnetic flux.

(b) recall and solve problems using $\Phi = BA$

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2. Referring to the above figure, find the magnetic flux when A is 10 cm^3 and B is 0.1 T, with $\theta = 60^o$.

(c) define magnetic flux linkage

3.

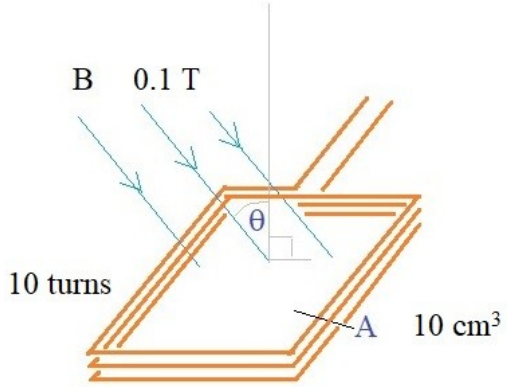

Figure 17-2

(a) Define magnetic flux linkage.

(b) Find the magnetic flux linkage for the above coil.

(d) infer from appropriate experiments on electromagnetic induction:

i. that a changing magnetic flux can induce an e.m.f.
ii. that the direction of the induced e.m.f. opposes the change producing it
iii. the factors affecting the magnitude of the induced e.m.f.

4.

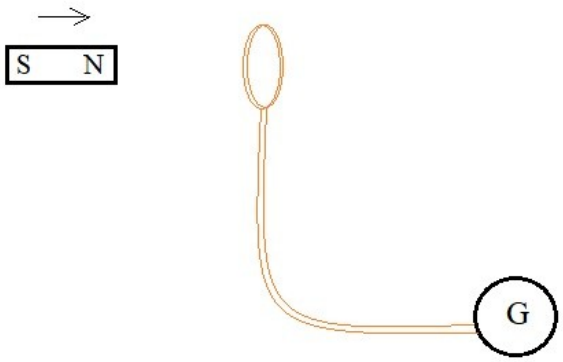

Figure 17-3

(a) A wire loop is connected to a galvanometer. A magnet is moved towards the loop and stopped just before the loop. Describe the measurement of the galvanometer needle.

(b) The magnet is the moved backward. What happens to the galvanometer needle? How is it different from (a).

(c) How can we determine the direction of the induced voltage or current?

(e) recall and solve problems using Faraday's law of electromagnetic induction and Lenz's law

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5. (a) State Faraday's law of electric magnetic induction.

(b) A magnet gives a field of 0.1 T on a loop with 10 turns and area 10 cm^3. When the magnet is quickly removed, the field through the loop drops to zero in 0.2 s. Estimate the voltage induced in the loop.

(f) explain simple applications of electromagnetic induction.

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6. Briefly explain how these devices make use of electromagnetic induction.

(a) microphone,
(b) electricity generator,
(c) transformer,
(d) induction cooker.