Oxford Cambridge and RSA

A level Physics B

H557/02 Scientific literacy in physics

Question Set 15

1 This question is about electromagnetic induction and eddy currents.

(a) A bar magnet is dropped through a vertically mounted coil connected to a data-logger, as shown in **Fig. 1.1**.

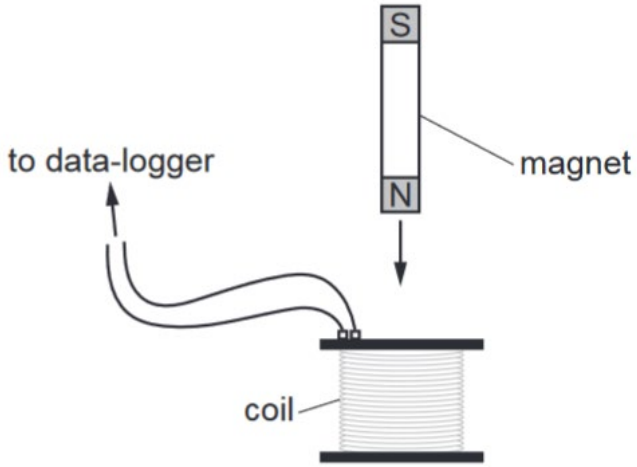

Fig. 1.1

The e.m.f. recorded by the data-logger varies as shown in **Fig. 1.2**.

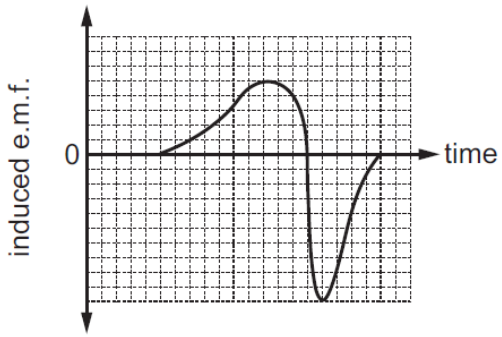

Fig. 1.2

Use the ideas of electromagnetic induction to explain the variation in e.m.f. in **Fig. 1.2**.

[4]

(b) An aluminium disk, mounted horizontally on a low-friction pivot, is placed between the poles of a strong magnet, as shown in **Fig. 1.3**. There is a uniform magnetic field between the poles of the magnet.

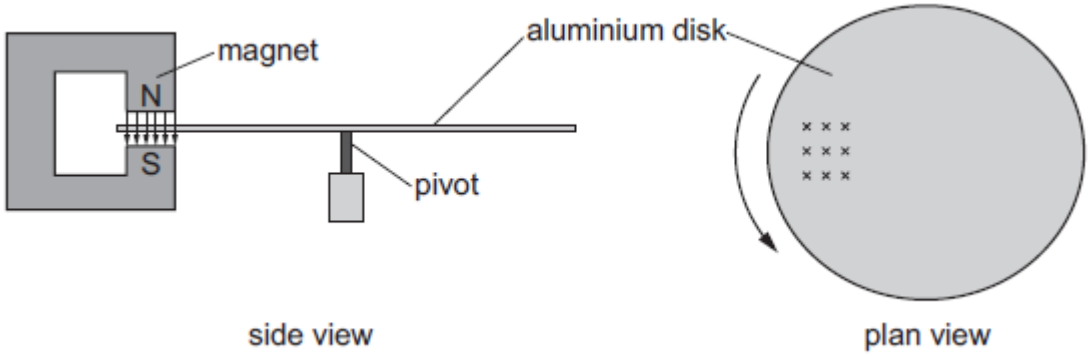

Fig. 1.3

A student sets the disk spinning in the direction shown by the arrow in the plan view above.

Explain how eddy currents are produced in the spinning disk and why these eddy currents make the disk slow down.

[4]

(c) The student monitors the slowing of the aluminium disk using light gates to measure the speed of a card fastened to the edge of the disk, as shown in Fig. **1.4**.

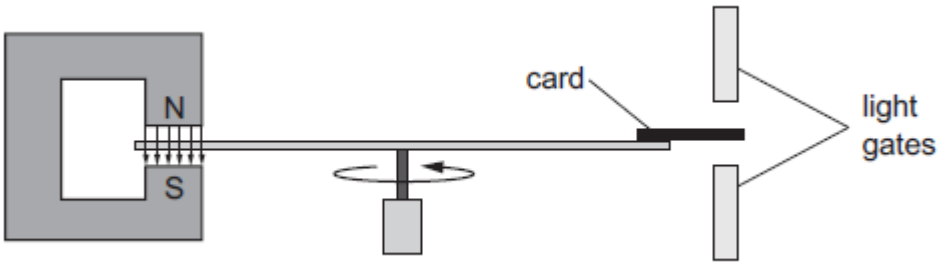

Fig. 1.4

Fig. 1.5 shows how the speed falls over time.

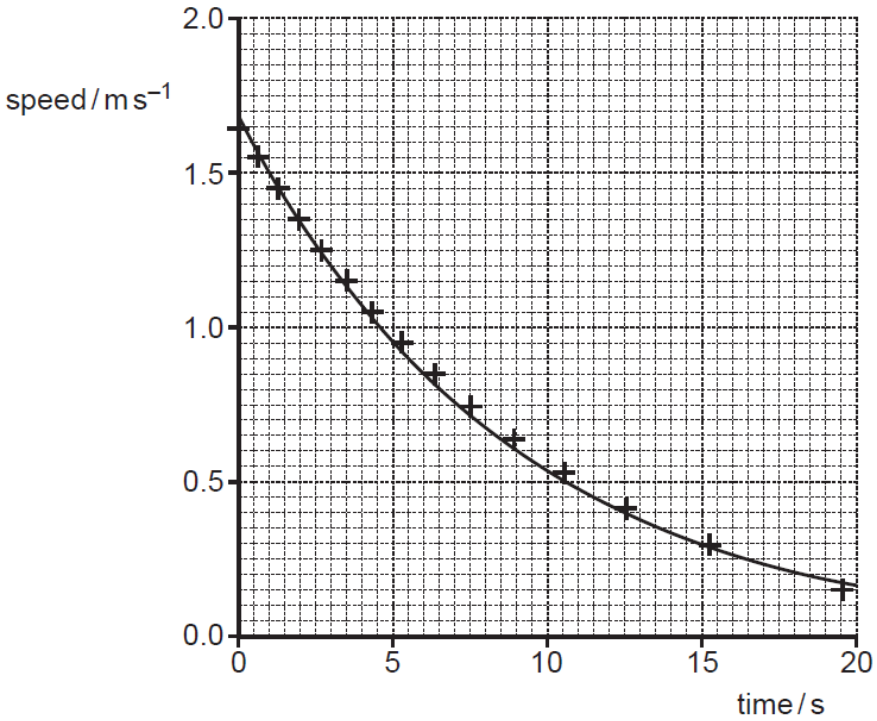

Fig. 1.5

The student suggests that the speed decreases exponentially.

(i) Explain what the student means by 'decreases exponentially' and, using ideas from part **(b)**, explain whether you would expect the speed of the disk to decrease in this way.

[4]

(ii) Use data from the graph to test whether there is an exponential decrease in speed overtime. Make your conclusion clear.

[3]

Total Marks for Question Set 15: 15