6 **(a)** State Faraday's law of electromagnetic induction.

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(b) A horizontal wire is stretched between two fixed points A and B. The wire is between two magnetic poles, as shown in Fig. 6.1.

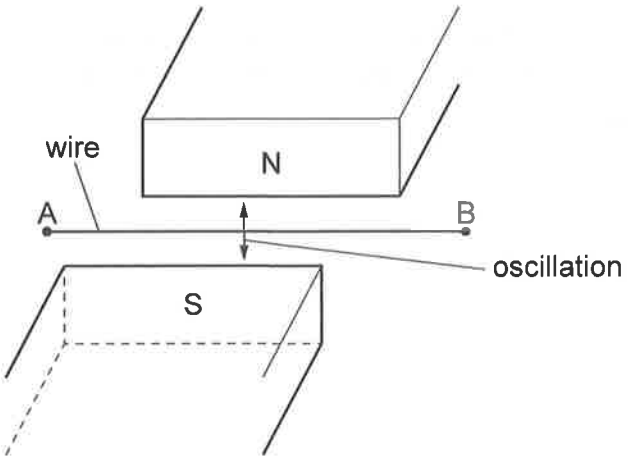

Fig. 6.1

The middle of the wire is displaced vertically and released so that it oscillates.

Explain why an alternating electromotive force (e.m.f.) is induced across the ends of the wire.

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..... [2]

(c) A second wire is moved at a speed of $0.80\,m\,s^{-1}$ between two magnetic poles, as shown in Fig. 6.2.

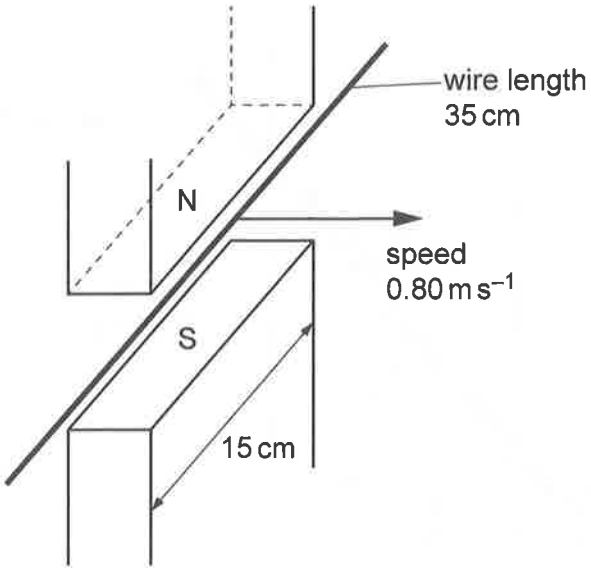

Fig. 6.2

The magnetic field between the two magnetic poles is perpendicular to the wire and to the direction of motion of the wire.
The magnetic flux density is 250 mT between the two magnetic poles and zero elsewhere.
The width of each magnetic pole is 15 cm and the length of the wire is 35 cm.

Calculate the e.m.f. induced across the ends of the wire.

e.m.f. = ... V [2]

(d) A third wire XY of twice the length of the wire in **(c)** is folded in half so that X is close to and vertically above Y. It is moved at the same speed of $0.80\,m\,s^{-1}$ between the same two magnetic poles in **(c)**, as shown in Fig. 6.3.

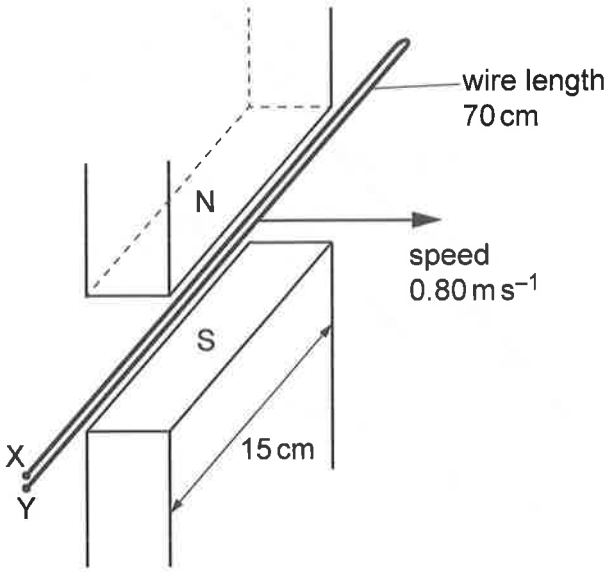

Fig. 6.3

State and explain the value of the e.m.f. induced across the ends X and Y of this wire.

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