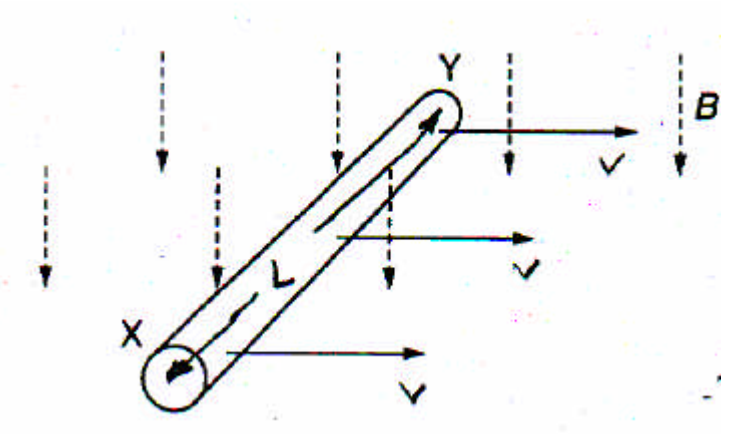
Chapter 15
Multiple choice and quick questions

1. This question is about the process of converting kinetic energy into electrical energy.

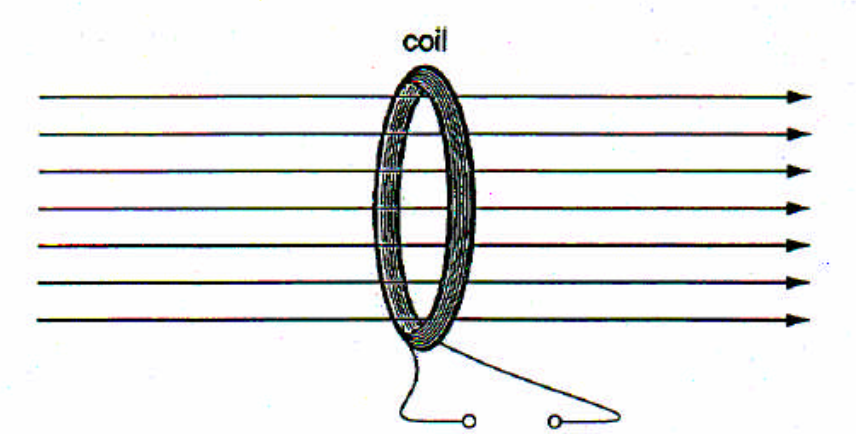
(a) (i) Use the diagram below to explain how moving a wire through a magnetic field can generate a voltage.



(ii) Which end of the wire becomes positively charged?
Give your reasoning

(iii) The magnitude of the voltage across the ends of the wire depends on several physical quantities. Give these quantities.

2. A 100-turn thin coil of cross-sectional area 2.0 x $10^{-3}m^2$ is perpendicular to a magnetic field which increases uniformly from zero to 1.5 x 10^{-2}T in a time of five seconds.



Which one of **A** to **D** below correctly describes the e.m.f. which is induced in the coil?

A the e.m.f. increases uniformly from zero to 0.6mV in the five seconds

B the e.m.f. decreases uniformly from 0.6mV to zero in five seconds

C the e.m.f. decreases uniformly from 6mV to zero in the five seconds

D the e.m.f. is constant and equal to 0.6mV in the five seconds

2. Fig. 3 shows the directions of the current *I* and the flux density *B* for a wire.

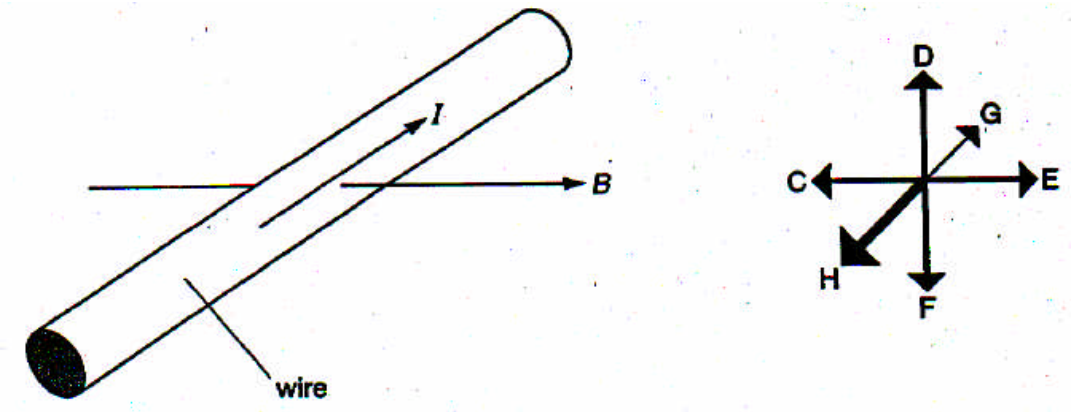


Fig. 3

The current interacts with the flux density to exert a force on the wire.

(a) Along which direction (DF,CE or GH) s the force on the wire?

(b) The piece of wire is 8.0 cm long. The magnetic flux density is 500mT. Calculate the force on the wire when the current in it is 420mA.

3. The diagram shows a compass near a rectangular coil of wire.

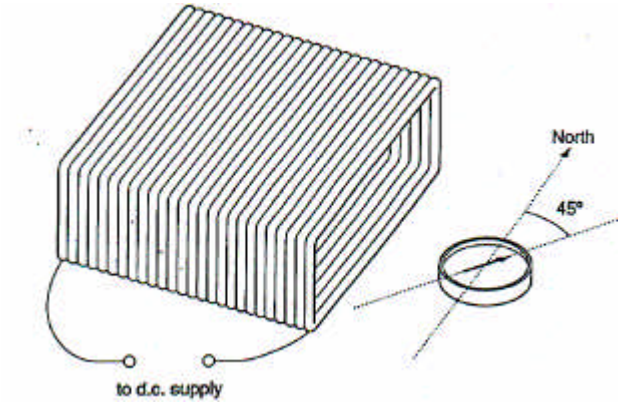


Fig. 4

A direct current flows in the coil creating a magnetic field. The field has caused the compass to be deflected away from the north and towards the east. The angle of deflection is about 45 degrees.

The current in the coil is doubled. Which one of **A** to **D** is the approximate value of the new angle of deflection?

A 20° **B** 60° **C** 90° **D** 135°

4. This question is about the simple d.c. motor shown in Fig. 5.

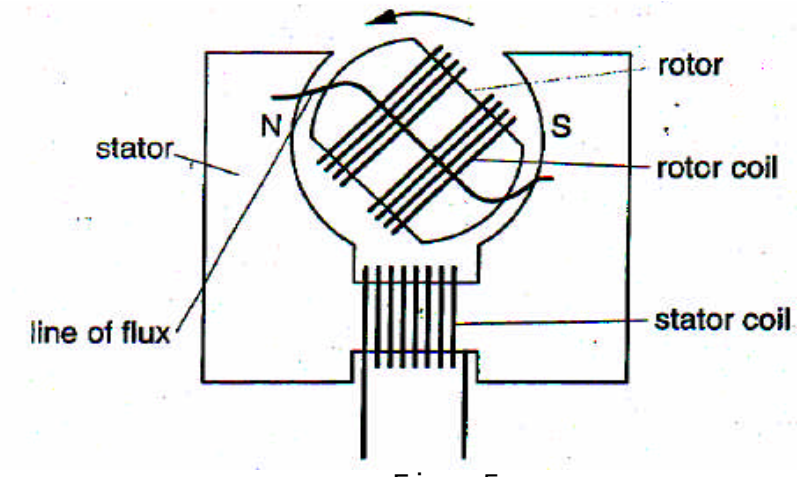


Fig. 5

(a) There is a current in both the rotor and stator coils. Complete the line of flux drawn in fig. 5.

(b) The rotor is turning anticlockwise

(i) Mark the north and south poles of the rotor appropriately.
(ii) Explain what causes the rotor to turn.

5. The diagram shows an aluminium plate about to be dropped between the poles of a magnet. Eddy currents are caused in the plate as it passes between the poles.

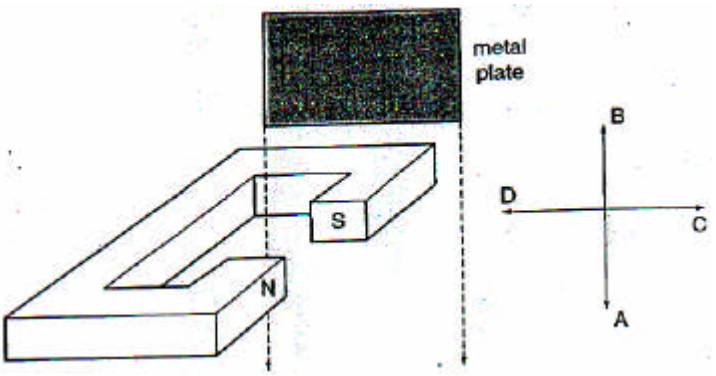


Fig. 6

Which one of **A** to **D** below describes the direction of the force on the plate, due to the magnet as it passes between the poles?

A in the direction labelled A

B in the direction labelled B

C in the direction labelled C

D in the direction labelled D

6. The iron cores of transformers are usually laminated, that is the iron core is constructed of thin strips.

Which one of **A** to **D** below is the principal purpose of this lamination?

A to reduce eddy currents in the core

B to increase the permeability of the core

C to reduce the electrical resistance of the core

D to improve the flux linkage of the two coils through the core

Below is some information about a transformer sub-station which steps down the voltage from a distant power station to the voltage of the supply to a village and some information about the transmission line itself.

> '..voltage of the transmission line at input to transformer is approximately 32kV. Resistance of transmission line between power station and transformer 100Ω. Transformer efficiency 100%. Voltage of supply to village from transformer 240V.

7. What is the current in the transmission line to the transformer when the power being delivered at the village is 480kW?

A 2000 A **B** 320 A **C** 167 A **D** 40 A **E** 15 A

8. What is the power loss in the transmission line from the power station to the transformer at a time when the transmission line carries a current of 20 A?

A 640kW **B** 40kW **C** 24kW **D** 4.8kW **E** 0.576kW