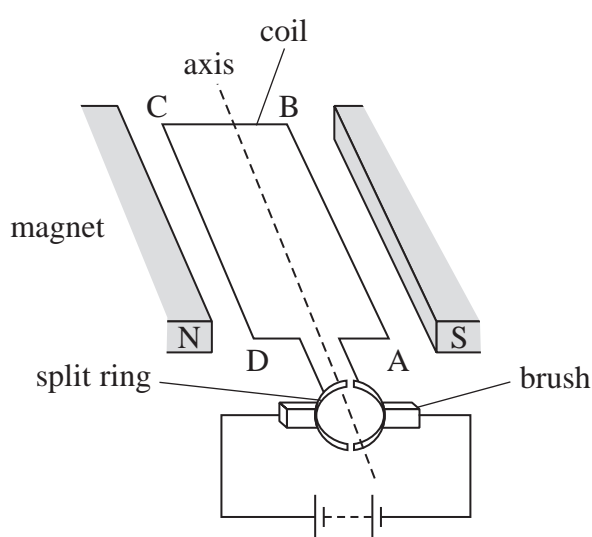


16 Electric vehicles use a direct current (d.c.) electric motor powered by a battery for propulsion. A simplified diagram of a d.c. electric motor is shown.

A split ring consists of two semi-circular sections that are attached to a coil. The coil is labelled ABCD. Two brushes, made of carbon, rub against and make electrical contact with the split ring.



* (a) Describe how this arrangement can lead to the coil rotating.

(6)

(b) An advert for an electric car has the following information:

- electric motor can develop up to 390kW output power
- car achieves a velocity of 28 m s^{-1} from rest in 4.0s at maximum power

Calculate the work done by resistive forces when the car accelerates to a velocity of 28 m s^{-1} from rest in 4.0 s .

mass of car = 1950 kg

(3)

Work done by resistive forces =

(c) A website suggests that ‘fast-charging’ the battery in an electric vehicle can increase the internal resistance of the battery.

Explain why an increase in internal resistance of a battery is a disadvantage.

(3)