

- 16 Some spiders may be seen suddenly moving up into the air, even when there is no wind. This happens when they let out strands of web.

The spiders are pulled upwards as the electrically charged strands of web interact with the Earth's electric field.

The average strength of the Earth's electric field is 120 V m^{-1} downwards.

- (a) State, with a reason, the polarity of the charge on the strands of web.

(1)

- (b) A spider moves upwards after letting out a strand of web.

Determine the initial upwards acceleration of the spider.

mass of spider = $3.00 \times 10^{-6} \text{ kg}$

total magnitude of charge on a strand of web = $3.00 \times 10^{-7} \text{ C}$

(5)

Acceleration =



- (c) The Earth has an electric field because charge is distributed over its surface.

Determine the quantity of charge on 1 m^2 of the Earth's surface which would cause an electric field of 120 V m^{-1} .

You should assume that the charge is distributed evenly.

radius of Earth = 6400 km

(3)

Charge =

(Total for Question 16 = 9 marks)