2 Lightning strikes the Earth frequently and often starts in rain clouds.

Inside the clouds, powerful winds move ice particles and tiny water droplets.

The bottom of the clouds becomes negatively charged and the top becomes positively charged.

(a) Give a reason why the clouds become charged.

(1)

....

....

(b) The ground below the cloud becomes positively charged.

Explain why the ground becomes charged.

You should use ideas about electron movement in your answer.

(2)

....

....

....

....

(c) The build-up of charge in the cloud and in the ground causes the air to ionise.

This means that the air becomes a conductor, and a low resistance path from the cloud to the ground is formed.

(i) State what is meant by the term **ionise**.

(1)

....

(ii) State the relationship between charge, current and time.

(1)

....

(iii) During one lightning strike, the mean current is 32 kA and the mean charge transferred is 15 C.

Calculate the mean time duration of a lightning strike.

(2)

mean time = ... s

(iv) The mean energy transferred during the lightning strike is 510×10^6 J.

Show that the resistance of the air is approximately 1000 Ω.

(4)

(Total for Question 2 = 11 marks)