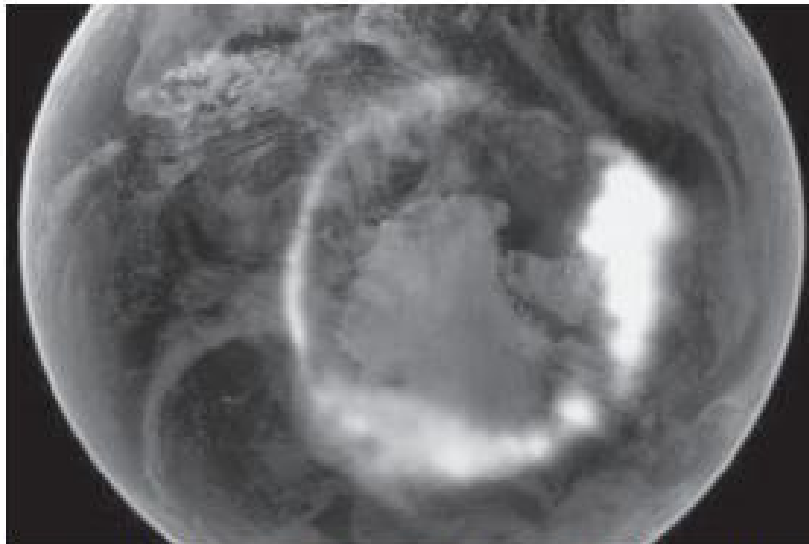


Auroras: What are they and how are they created?



The Aurora Australis, captured by NASA's IMAGE satellite and overlaid onto a photograph of the earth. (NASA: public domain)

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- (a) (i) Estimate how much time it takes for the plasma from a typical CME to reach the earth's magnetic field. (2 marks)

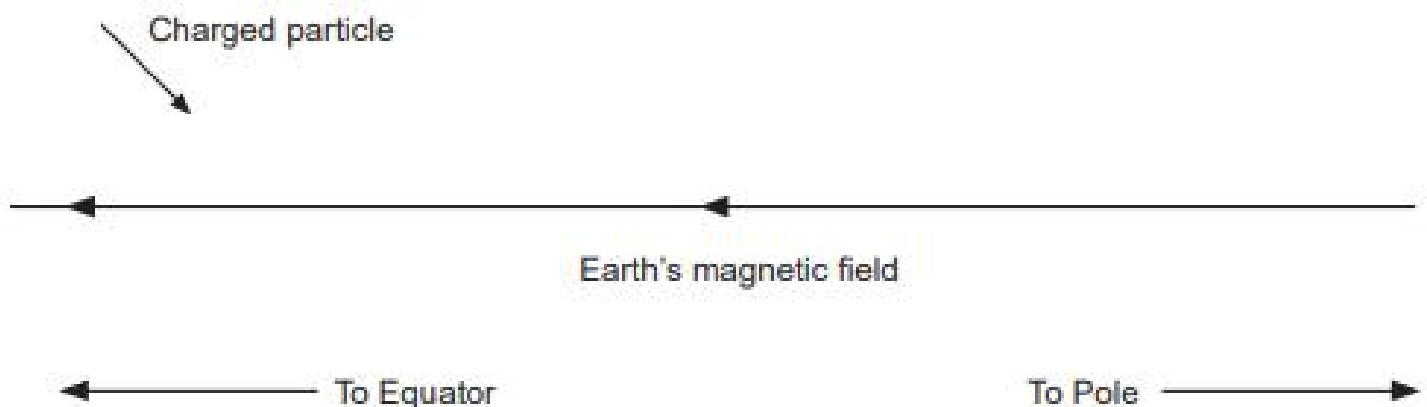
_____ hours

- (ii) Give **two** reasons why your answer to part (a) (i) is only an estimate. (2 marks)

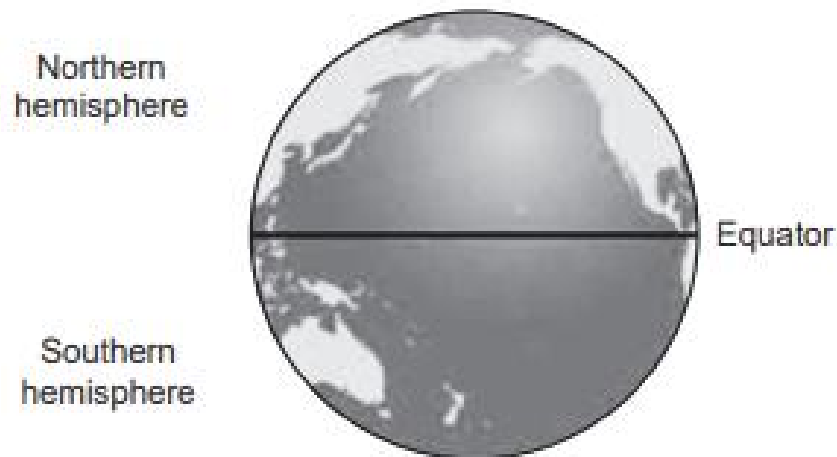
One: _____

Two: _____

- (b) Draw the possible path of a charged particle travelling along a magnetic field line after approaching it at an angle other than 90° . The field strength increases as the particle moves toward the pole. (3 marks)



- (c) (i) Draw the magnetic field around the earth on the diagram below before any distortion occurs due to a CME. (3 marks)



- (ii) Using information from the text, suggest a reason why auroras are usually seen at the north and south poles but not at the equator. (3 marks)

- (d) Using specific information from the passage, explain why the same photon-producing electron transition produces red light in neutral molecular nitrogen and blue light in ionised molecular nitrogen. (5 marks)
