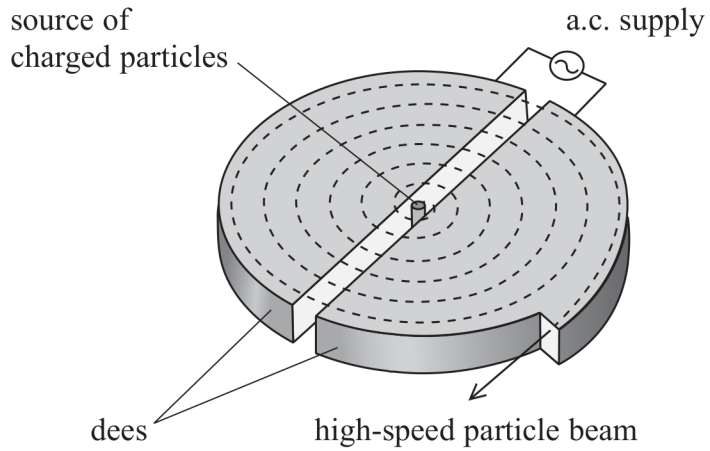
15 In 1937 scientists at the University of California used high-speed particles from a cyclotron to produce an isotope of phosphorus. This isotope can be used in a treatment for cancer.



*(a) Explain the role of electric and magnetic fields in the production of high-speed charged particles by a cyclotron.

(6)

(b) The cyclotron could produce beams of alpha particles with kinetic energy up to 16 MeV.

Calculate the magnetic flux density required by the cyclotron when alpha particles with kinetic energy of 16 MeV are produced.

diameter of cyclotron = 0.94 m

mass of alpha particle = 6.6×10^{-27} kg

(4)

Magnetic flux density = ...

(Total for Question 15 = 10 marks)