2 **(a)** State Coulomb's law.

....

....

.... [2]

(b) Positronium is a system in which an electron and a positron orbit, with the same period, around their common centre of mass, as shown in Fig. 2.1.
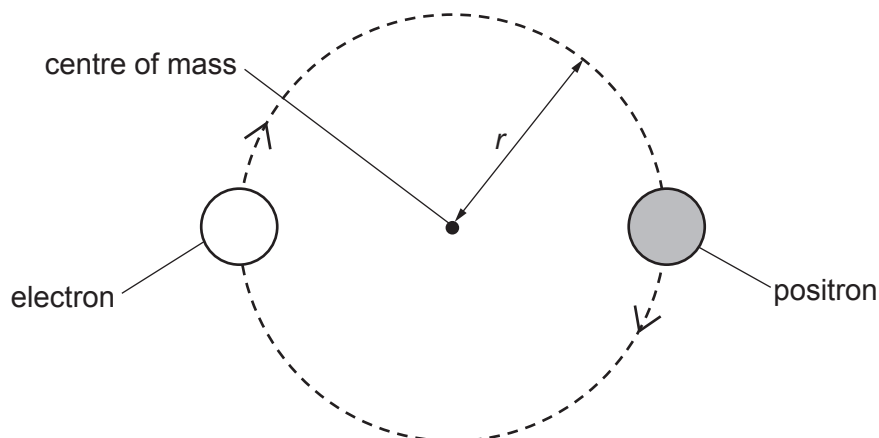

Fig. 2.1 (not to scale)

The radius r of the orbit of both particles is 1.59×10^{-10} m.

(i) Explain how the electric force between the electron and the positron causes the path of the moving particles to be circular.

....

....

.... [2]

(ii) Show that the magnitude of the electric force between the electron and the positron is 2.28×10^{-9} N.

[2]

(iii) Use the information in **(b)(ii)** to determine the period of the circular orbit of the two particles.

period = ... s [3]

(c) Positronium is highly unstable, and after a very short period of time it becomes gamma radiation.

(i) Describe how gamma radiation is formed from the two particles in positronium.

....

....

....

.... [3]

(ii) State **one** medical application of the process described in **(c)(i)**.

.... [1]

[Total: 13]