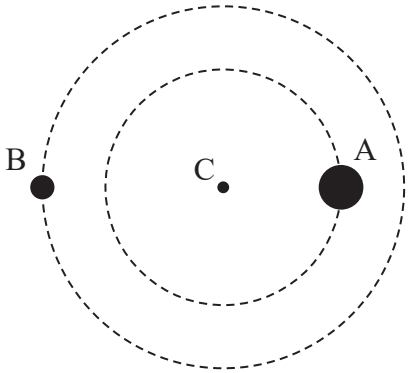
12 The diagram shows two black holes, A and B, orbiting each other.

Assume that the centre of mass C of the system is the centre of a circular orbit for each black hole as shown in the diagram.



Black hole A is in an orbit of radius 2.9×10^{10} m and black hole B is in an orbit of radius 3.6×10^{10} m. Both orbit with the same period, so the total distance between them is 6.5×10^{10} m.

(a) Calculate the force between the black holes.

mass of Sun, $M_{\odot} = 1.99 \times 10^{30}$ kg
mass of black hole A = $36M_{\odot}$
mass of black hole B = $29M_{\odot}$

(2)

Force = ...

(b) By considering the orbit of one black hole about C, determine the period of the orbit.

(3)

Period = ...

(Total for Question 12 = 5 marks)