

- 2 In a binary star system, two stars of equal mass $3.5 \times 10^{30} \text{ kg}$ orbit about their common centre of mass O, as shown in Fig. 2.1. O is equidistant from the centres of the two stars. The separation between the centres of the two stars is $2.0 \times 10^{11} \text{ m}$.

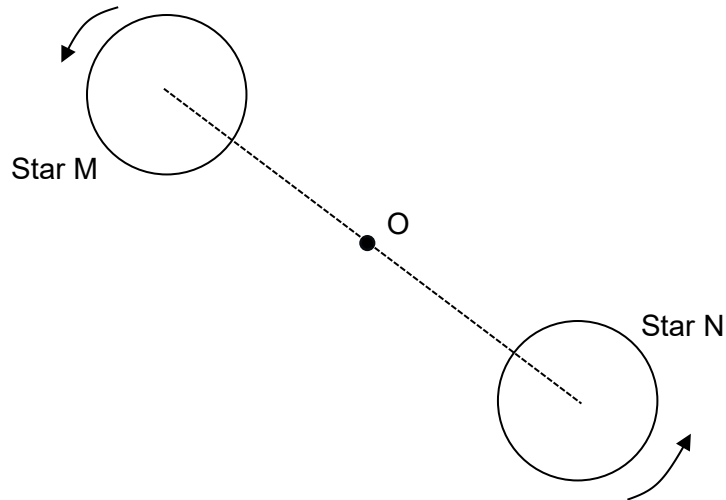


Fig. 2.1

- (a) (i) Define gravitational potential at a point.

.....
..... [1]

- (ii) Calculate the gravitational potential at O.

gravitational potential = J kg^{-1} [2]

- (iii) An asteroid passes through point O.

Determine the minimum speed of the asteroid at point O if it is to escape from the gravitational pull of the binary star system.

minimum speed = m s^{-1} [3]

- (iv) On Fig. 2.2, sketch a graph showing the variation of gravitational potential from the surface of Star M to the surface of Star N, along the line joining the centres of the two stars.

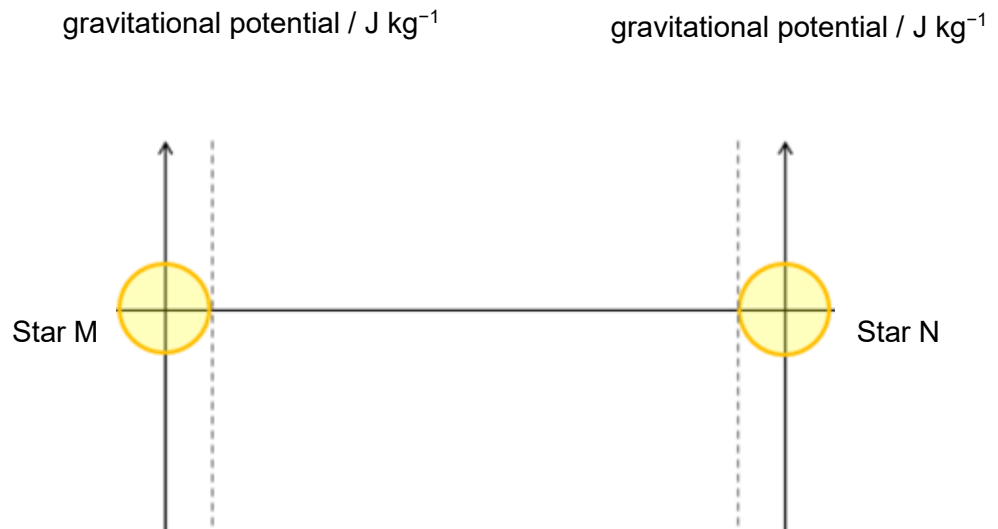


Fig. 2.2

[2]

- (b) (i) Explain why the gravitational force acting on the stars do not cause them to move closer to each other.

.....

.....

..... [1]

- (ii) Calculate the period of the stars.

period = years [3]

[Total: 12]

