

- 3 A student, aspiring to be an astrophysicist is contemplating about the possibility of building a spacecraft that can house astronauts for a prolonged period.

Fig. 3.1 shows the spacecraft rotating in space. The spacecraft has a ring structure and uses its own rotation to create an artificial gravity that is similar to Earth for the inhabitants.

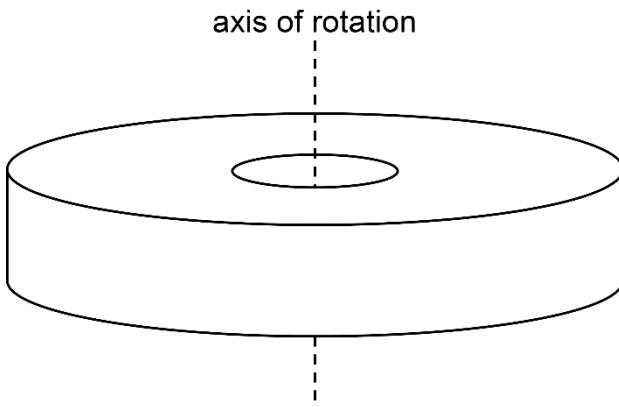


Fig. 3.1

- (a) Fig. 3.2 shows the cross section of the spacecraft and how the astronaut is positioned.

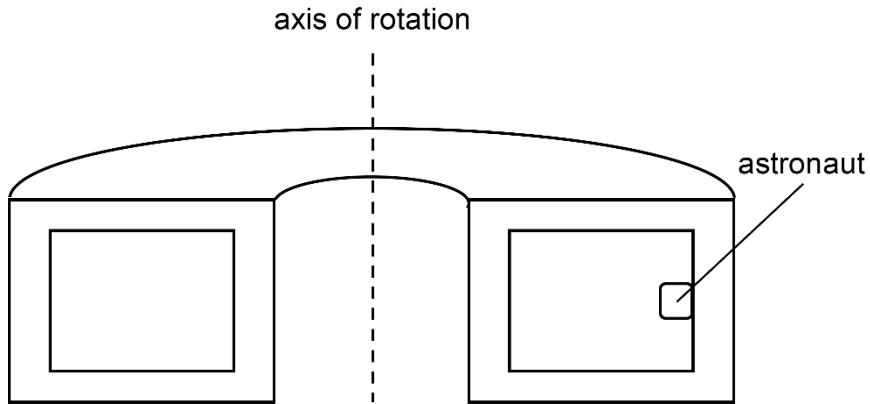


Fig. 3.2

On Fig. 3.2, draw arrow(s) to represent the force(s) acting on the astronaut. [1]

(b) The astronaut in the spacecraft has a constant speed of 100 m s^{-1} .

(i) Explain why the astronaut experiences a resultant force.

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..... [2]

(ii) Determine the radius of the spacecraft so that the resultant force experienced by the astronaut is equal to his weight on Earth.

radius = m [2]

[Total: 5]