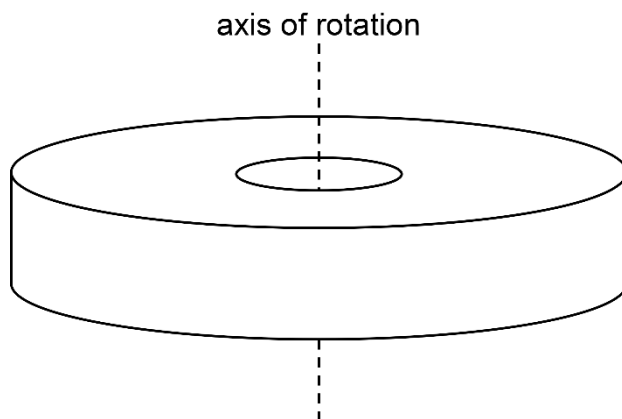


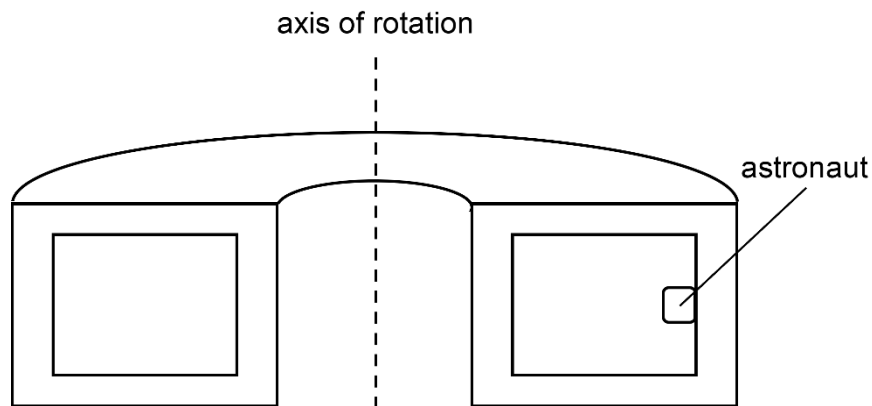
- 3 A student, aspiring to be an astrophysicist is contemplating about the possibility of building a spacecraft that can house astronauts for a prolonged period.

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  $100 \text{ m s}^{-1}$ .

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

.....

.....

.....

..... [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]