

Question 3

- a) The beetle is accelerating, since it's velocity changes with time. In the case that it walks outwards, both the direction *and* the tangential magnitude of its velocity changes with time.

(1 mark)

- b) It is the frictional force between the beetle's feet and the surface of the turntable which provides the centripetal force.

(1 mark)

- c) The beetle would slide outwards in the absence of friction. The maximum centripetal force which can be provided by friction is

$$\mu_s F_N = F_c = \frac{mv^2}{r} = m\omega^2 r$$

If $m\omega^2 r > \mu_s F_N$, beetle slides off. For m , ω fixed, as r increases, the likelihood of the above expression being true increases.

(Reasoning - 2 marks)

∴ Beetle is more likely to slide off as he walks outwards.

(Conclusion - 1 mark)

(Total 5 marks)