Question 21 (4 marks)

In his science fiction novel *From the Earth to the Moon*, Jules Verne describes how to launch a capsule from a cannon to land on the moon. To reach the moon, the capsule must leave the cannon with a speed of 1.06×10^4 m s^{-1}. The cannon has a length of 215 m, over which the capsule can be assumed to accelerate constantly.

(a) Calculate the magnitude of the acceleration required to achieve this speed using this cannon. **2**

$v^2 = u^2 + 2as$ $(u=0)$ $\therefore a = \frac{v^2}{2s} = \frac{(1.06\times10^4)^2}{2\times215}$

$\therefore$ Acceleration $= 2.6 \times 10^5$ ms^{-2} (1 decimal place).

(b) Referring to your answer in part (a), explain why Jules Verne's method is unsuitable for sending a living person to the moon. **2**

This would produce 25000 g's of force on the passenger, which would kill any living person. Usually any acceleration over 10 g's is fatal.

NOTE [No. of g's = $\frac{\text{acceleration}}{9.8}$]