2 **(a)** **(i)** Define *linear momentum*.

……

…… [1]

(ii) State the relation between force and momentum.

……

…… [1]

(b) A projectile of mass 300 g, initially at rest, is fired from a cylindrical barrel of cross-sectional area 2.8×10^{-4} m^2 by means of compressed gas. The variation with time t of the excess pressure p of the gas in the barrel above atmospheric pressure is shown in Fig. 2.1.

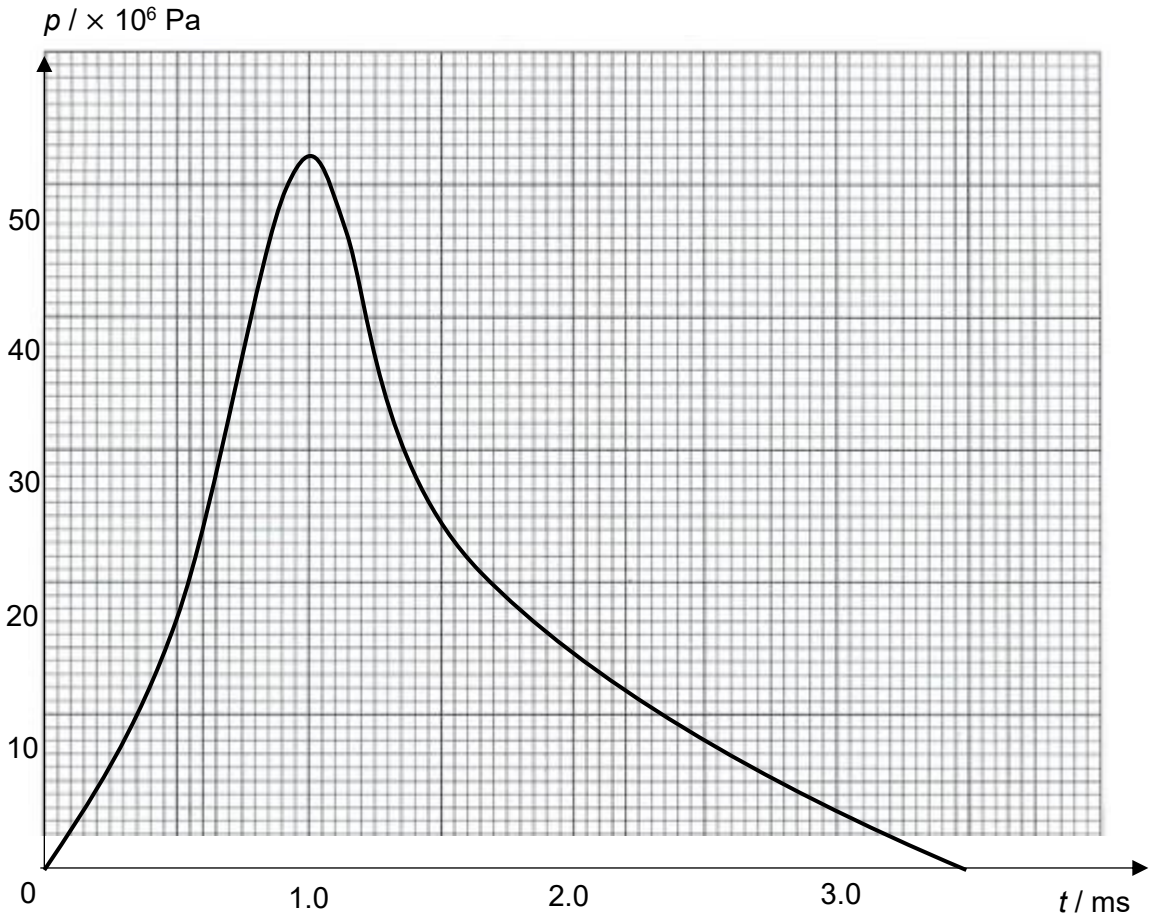

Fig. 2.1

(i) Calculate the maximum acceleration of the projectile due to the force exerted by the compressed gas on it.

maximum acceleration = ……..……... m s^{-2} [2]

(ii) Using Fig. 2.1, estimate the total change of momentum of the projectile due to the force exerted by the compressed gas on it.

change in momentum = ……..……... kg m s^{-1} [3]

(iii) The excess pressure exerted on the projectile is now higher than that shown in Fig. 2.1 from t = 0 ms to t = 3.5 ms. Explain how the final speed of the projectile will change.

……

……

…… [2]

[Total: 9]