2 **(a)** State Newton's Second Law of motion.

.....

.....[1]

(b) A jet of water hits a vertical wall at right angles, as shown in Fig. 2.1. The jet of water has density ρ, cross-sectional area A, and hits the vertical wall with impact velocity u. The water then runs down the wall after impact with the wall.

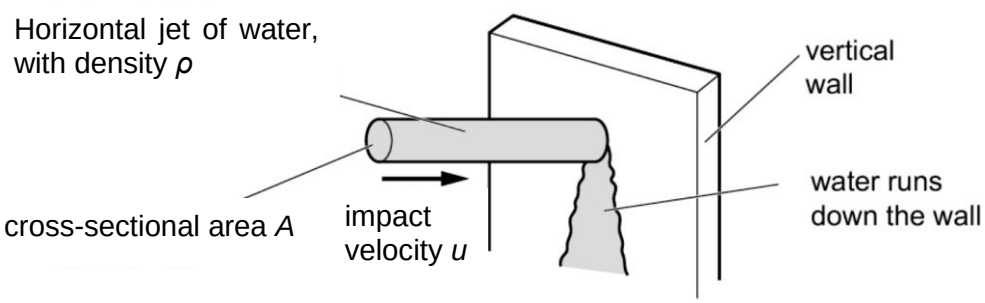

Fig. 2.1

(i) Using Newton's Law of motion, show that the magnitude of the average force exerted on the water by the wall is

$$F = \rho A u^2 .$$

[3]

(ii) The density of water ρ is 1000 kg m^{-3}. Given that the jet of water in **(b)** has cross-sectional area A of 1.5 cm^2 and impact velocity u of 5.0 m s^{-1},

1. Calculate the magnitude of the average force exerted on the wall by the water. Explain your answer.

magnitude of average force = ... N [2]

2. On Fig. 2.2, sketch a graph to show the variation of pressure p on the wall with impact velocity u. [1]

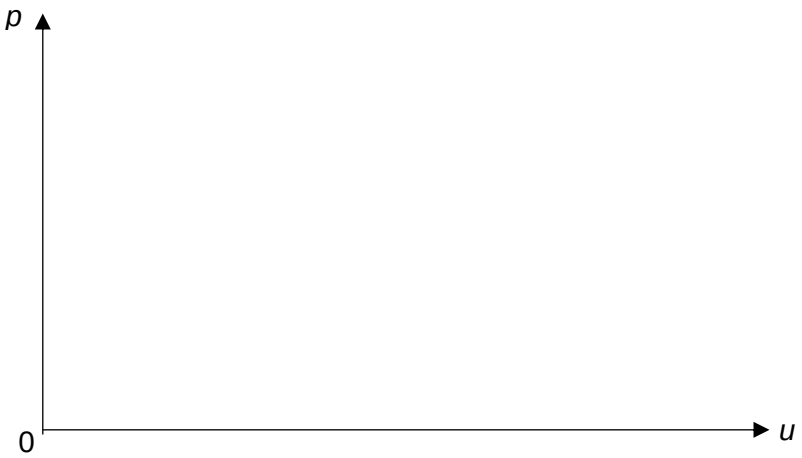

Fig. 2.2

3. Suggest the change, if any, to pressure p if the cross-sectional area A of the water jet is doubled.

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.....[1]

[Total: 8]