

- 2 (a) State Newton's law of gravitation.

.....  
 .....  
 ..... [2]

- (b) One of the basic assumptions of the kinetic theory of gases is that there are no forces exerted between the molecules of the gas except during collisions.

State **two** other basic assumptions of the kinetic theory of gases.

1 .....  
 .....  
 2 .....  
 ..... [2]

- (c) Hydrogen gas consists of molecules that each have a mass of  $3.34 \times 10^{-27}$  kg. Hydrogen may be considered to be an ideal gas.

A spherical balloon contains 0.0160 mol of hydrogen gas at a temperature of 282 K. At this temperature, the volume of gas in the balloon is  $1.87 \times 10^{-4} \text{ m}^3$ .

- (i) Determine the pressure of the gas.

pressure = ..... Pa [2]

- (ii) Estimate the average separation of the hydrogen molecules in the gas.

average separation = ..... m [2]

- (d) (i) Use your answer in (c)(ii) to calculate the average gravitational force between adjacent molecules in hydrogen gas.

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