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 3.34×10^{-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 $1.87 \times 10^{-4}\,m^3$.

(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]

(ii) By considering the weight of a molecule, suggest with a reason whether your answer in **(d)(i)** is consistent with the assumption of the kinetic theory of gases that there are no forces exerted between molecules.

.....

.....

..... [1]

[Total: 11]