

- 2 (a) One assumption of the kinetic theory of gases is that gas molecules behave as if they are hard, elastic identical spheres.

For  
Examiner's  
Use

State two other assumptions of the kinetic theory of gases.

1. ....

.....

2. ....

.....

[2]

- (b) Using the kinetic theory of gases, it can be shown that the product of the pressure  $p$  and the volume  $V$  of an ideal gas is given by the expression

$$pV = \frac{1}{3}Nm\langle c^2 \rangle$$

where  $m$  is the mass of a gas molecule.

- (i) State the meaning of the symbol

1.  $N$ ,

..... [1]

2.  $\langle c^2 \rangle$ .

..... [1]

- (ii) Use the expression to deduce that the mean kinetic energy  $\langle E_K \rangle$  of a gas molecule at temperature  $T$  is given by the equation

$$\langle E_K \rangle = \frac{3}{2}kT$$

where  $k$  is a constant.

[2]

- (c) (i) State what is meant by the *internal energy* of a substance.

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

- (ii) Use the equation in (b)(ii) to explain that, for an ideal gas, a change in internal energy  $\Delta U$  is given by

$$\Delta U \propto \Delta T$$

where  $\Delta T$  is the change in temperature of the gas.

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