Section A

Answer **all** the questions in this Section in the spaces provided.

1 (a) A monoatomic ideal gas A is contained in an insulated cylinder to prevent the loss of heat, while monoatomic ideal gas B is contained in a cylinder without any insulation, as shown in Fig. 1.1.

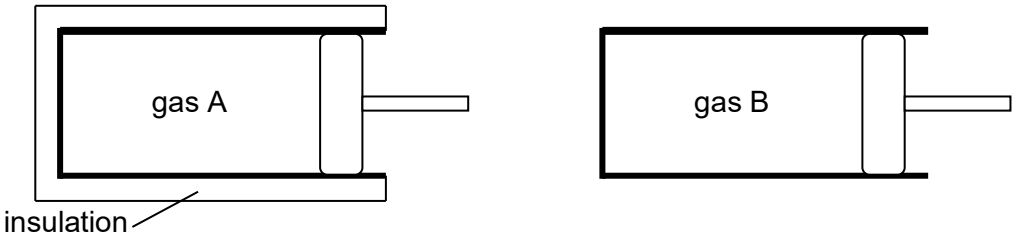

Fig. 1.1

Initially, the two gases have the same volume of 2.90×10^{-4} m^3, the same pressure of 1.05×10^5 Pa and the same temperature of 303 K.

(i) Explain what is meant by the *internal energy* of an ideal gas.

.....

.....

.....

.....[1]

(ii) Determine the number of molecules in gas A.

number of molecules = ... [2]

(iii) Determine the mean translational kinetic energy of a molecule of gas A.

mean translational kinetic energy = ... J [1]

(b) When gas A is compressed to a volume of 2.10×10^{-4} m^3, its temperature rises to 357 K. Gas B is compressed very slowly to the same volume of 2.10×10^{-4} m^3.

(i) Determine the change in internal energy of gas A during the compression.

change in internal energy = ... J [2]

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(ii) Determine the work done on gas A during the compression.

work done on the gas = ... J [1]

(iii) On Fig. 1.2, sketch the variation with volume of the pressure of gas A and gas B. Include appropriate labels, and values of pressure and volume.

[3]

Fig.1.2