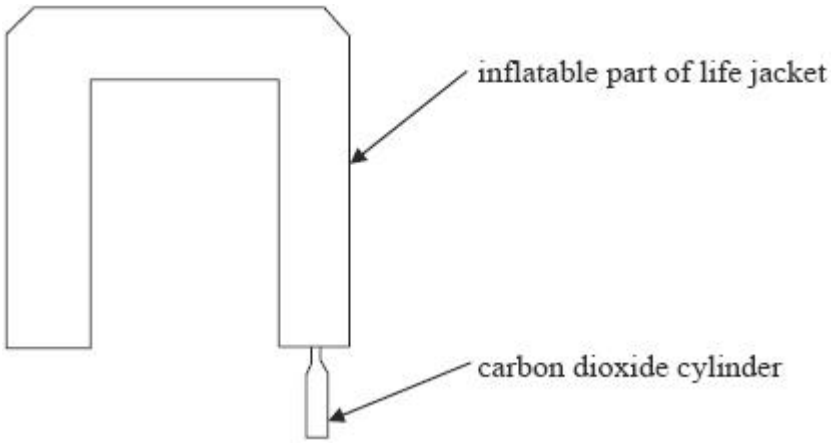
Name of the Student:_____
Max. Marks : 16 Marks **Time : 16 Minutes**

Q1.

A life jacket inflates using gas released from a small carbon dioxide cylinder. The arrangement is shown in the following figure.



(a) The cylinder initially contains 1.7×10^{23} molecules of carbon dioxide at a temperature of 12 °C and occupying a volume of 3.0×10^{-5} m^3.

(i) Calculate the initial pressure, in Pa, in the carbon dioxide cylinder.

(2)

(ii) When the life jacket inflates, the pressure falls to 1.9×10^5 Pa and the final temperature is the same as the initial temperature. Calculate the new volume of the gas.

(2)

(iii) Calculate the mean molecular kinetic energy, in J, of the carbon dioxide in the cylinder.

(2)

(b) (i) Explain, in terms of the kinetic theory model, why the pressure drops when the carbon dioxide is released into the life jacket.

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(3)

(ii) Explain why the kinetic theory model would apply more accurately to the gas in the inflated life jacket compared with the gas in the small cylinder.

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(3)

(c) Explain, in terms of the first law of thermodynamics, how the temperature of the gas in the system can be the same at the beginning and the end of the process.

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(4)

(Total 16 marks)