3 (a) State **two** quantities which increase when the temperature of a fixed mass of gas is increased at constant volume.

……

…… [1]

(b) A car tyre of volume 1.0×10^{-2} m^3 contains air at a pressure of 300 kPa and a temperature of 17 °C. The mass of one average air particle is 4.82×10^{-26} kg.

Assuming that the air behaves as an ideal gas, calculate

(i) the amount of air in moles,

number of moles = …….. mol [2]

(ii) the mass of air,

mass of air = …….. kg [2]

(iii) the density of the air.

density of air = …….. kg m^{-3} [1]

(c) **(i)** State the *first law of thermodynamics*.

……..

……..

……..

…….. [2]

(ii) Define *specific heat capacity*.

……..

……..

…….. [1]

(iii) Using the first law of thermodynamics, explain why the specific heat capacity of an ideal gas measured at constant volume is different from the specific heat capacity when measured at constant pressure.

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……..

……..

……..

……..

…….. [3]

[Total: 12]