Practice Question Set For A-Level
Subject : Physics
Paper-2 Topic: Thermal Physics

Name of the Student:_____
Max. Marks : 23 Marks **Time : 23 Minutes**

Q1.

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

(i) _____

(ii) _____

(2)

(b) A car tyre of volume 1.0×10^{-2} m^3 contains air at a pressure of 300 kPa and a temperature of 290K. The mass of one mole of air is 2.9×10^{-2} kg. Assuming that the air behaves as an ideal gas, calculate

(i) n, the amount, in mol, of air,

_____

_____

(ii) the mass of the air,

_____

_____

(iii) the density of the air.

_____

_____

(5)

(c) Air contains oxygen and nitrogen molecules. State, with a reason, whether the following are the same for oxygen and nitrogen molecules in air at a given temperature.

(i) The average kinetic energy per molecule

_____

_____

_____

_____

(ii) The r.m.s. speed

_____

_____

_____

_____

(4)

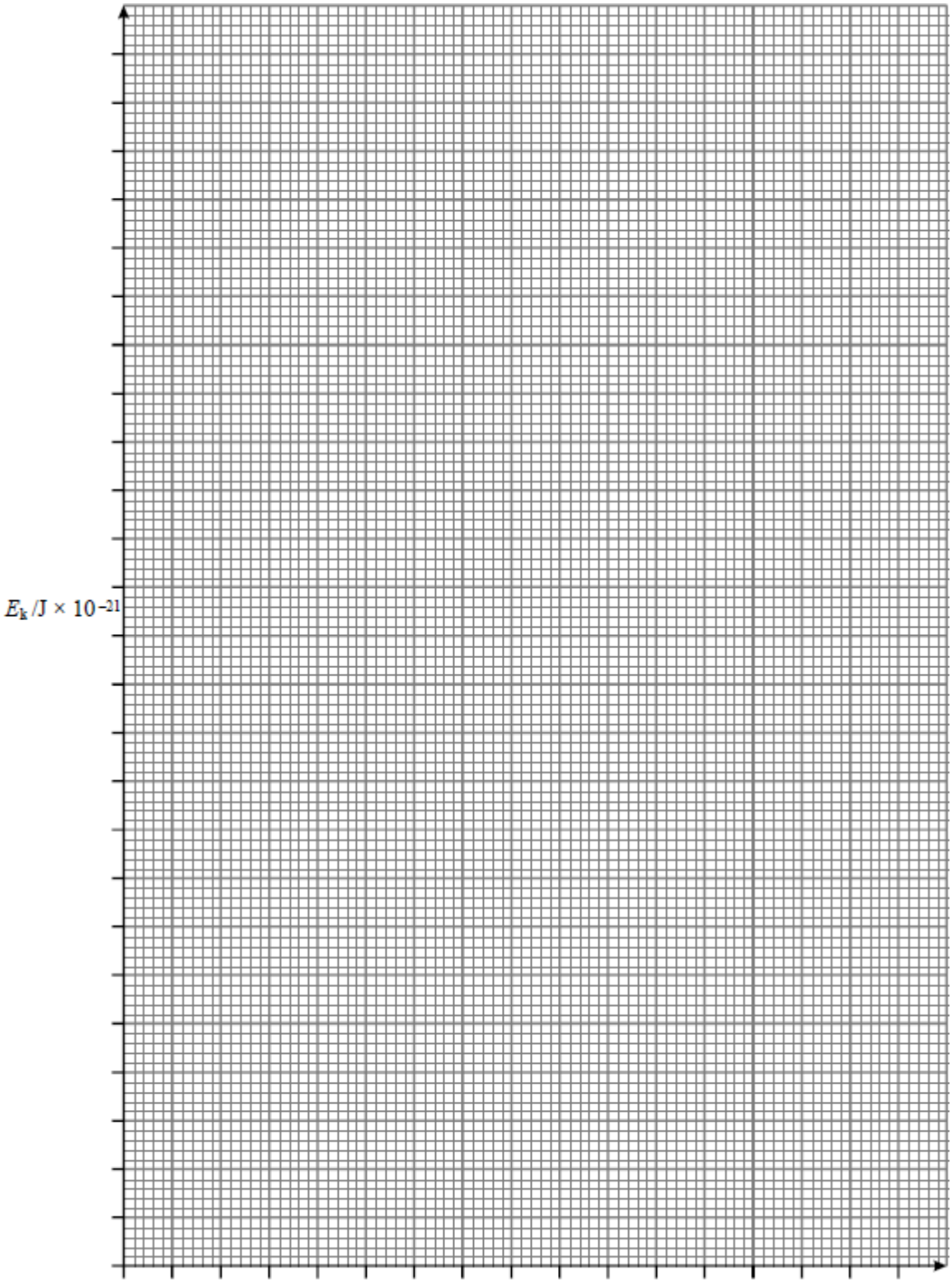
(Total 11 marks)

Q2.

The table gives the average kinetic energy of gas molecules at certain temperatures.

E_k/J × 10^{-21}	6.21	6.62	7.04	7.45	7.87	8.28
T/K	300	320	340	360	380	400

(a) On the grid provided below plot a graph of E_k against T.



(i) Use your graph to determine the average kinetic energy of gas molecules at 350K.

_____

(ii) Determine the gradient of your graph and hence calculate a value for the Boltzmann constant. Show all your working.

_____

_____

_____

_____

_____

_____

(8)

(b) One of the assumptions of the kinetic theory is that collisions of gas molecules are elastic.

(i) State what is meant by an elastic collision.

_____

_____

_____

(ii) State another assumption of the kinetic theory.

_____

_____

(iii) Explain how the data in the table leads to the concept of absolute zero.

_____

_____

_____

_____

(4)

(Total 12 marks)