Name of the Student:_____

Max. **Marks : 20 Marks**   **Time : 20 Minutes**

Q1.

The fuel used in a camping stove is butane, which is stored in a canister as shown.

Some of the butane in the canister is in a liquid state, and some is a gas.

When the stove uses the butane gas, some of the liquid butane evaporates.

Explain why the temperature of the canister decreases when the stove is used.

(3)

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(Total for question = 3 marks)

Q2.

The fuel used in a camping stove is butane, which is stored in a canister as shown.

butane canister — camping stove

The pressure inside the canister is 220 kPa and the temperature of the gas is 21 °C.

(i) The canister is in the shape of a cylinder of length 0.23 m and radius 0.11 m.

Calculate the number of molecules of butane gas in the canister.
Assume the volume of liquid butane inside the canister is negligible.

(4)

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Number of molecules of butane gas = ...

(ii) Calculate the r.m.s. speed of the molecules of butane gas.

mass of butane molecule = 9.6×10^{-26} kg

(2)

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rms speed = ...

(Total for question = 6 marks)

Q3.

A fine-beam tube is used for investigating properties of electrons.

An electron beam is produced inside a spherical glass bulb. The bulb contains neon gas at a very low pressure.

The neon gas is at a pressure of 1.25 Pa and a temperature of 25 °C.

Calculate the number N of neon atoms inside the bulb.
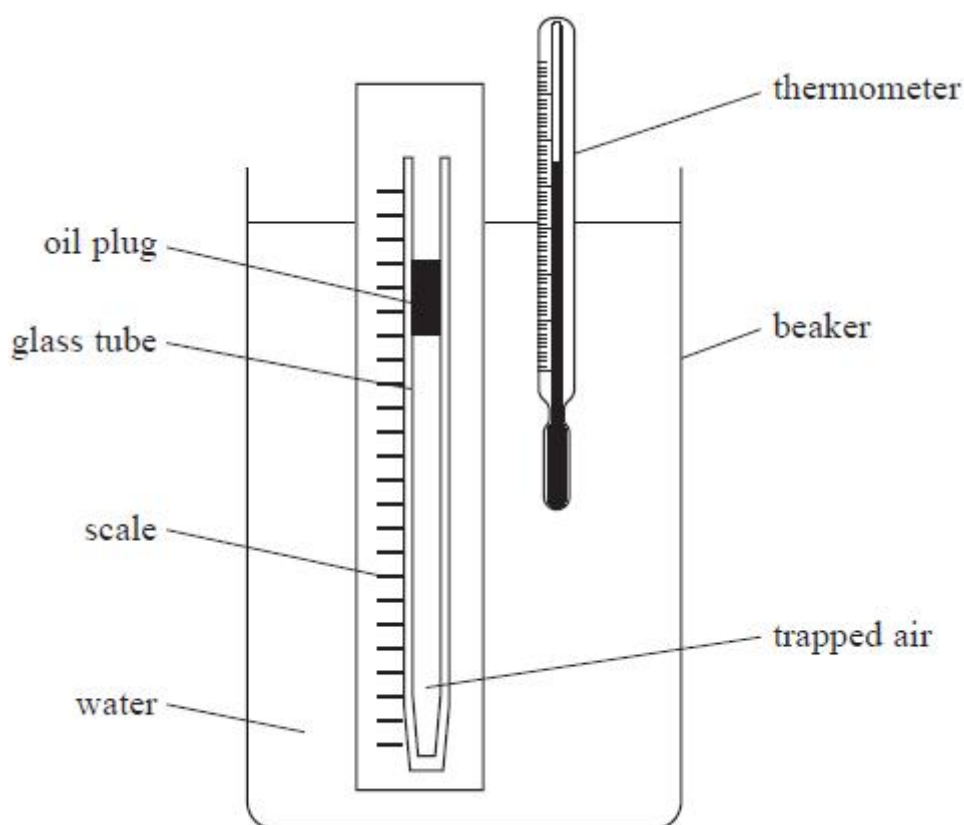
bulb diameter = 16.0 cm

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N = ...

(Total for question = 4 marks)

Q4.

A student investigated how the volume of a fixed mass of air varies with the temperature of the air. She used the apparatus shown.


A glass tube was sealed at one end. A plug of oil trapped a length *l* of air in the tube. The water in the beaker was heated to a temperature *θ*. The corresponding value of *l* was measured. This was repeated for a range of temperatures.

The thermometer had a resolution of 0.5 °C. The scale had mm divisions.

The student's results are shown in the table.

θ / °C	l / cm
24	8.8
60	9.8
78.5	10.3
95.5	10.9

The student plotted a graph of l against θ as shown.

θ / °C
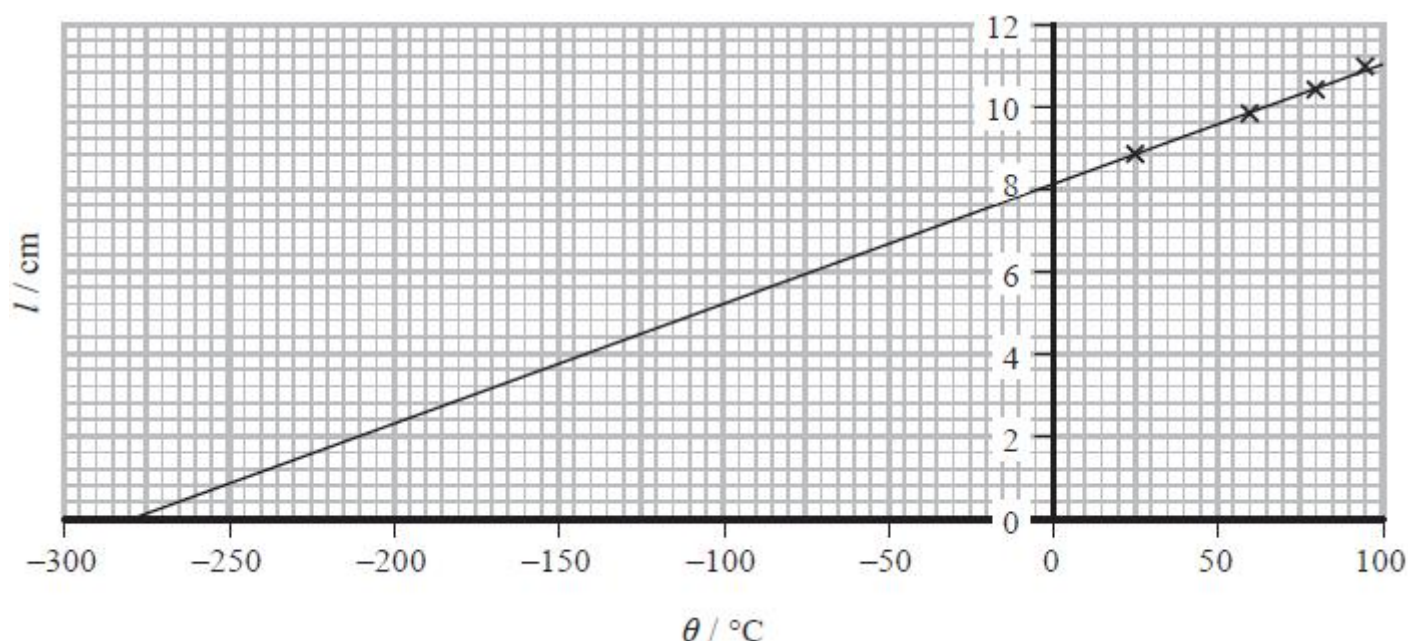
(i) Explain the significance of the intercept on the x-axis.

(3)

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(ii) The student wrote a report of the investigation in her lab book. In the conclusion she wrote:

"In this investigation uncertainties were minimised by selecting measuring instruments with a high resolution. The points lie on a perfect straight line, indicating that the investigation is accurate."

Discuss the student's conclusion.

(4)

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(Total for question = 7 marks)