19 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.

(a) 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

(4)

N = ...

*(b) Interactions between electrons and the neon atoms in the tube make the beam visible. Part of the spectrum of visible light produced by these interactions is shown.

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Explain the process that results in the emission of this spectrum. Your answer should include reference to energy levels in atoms.

(6)

(Total for Question 19 = 10 marks)