8 **(a)** State the meaning of the following terms associated with wave motion, using labelled diagrams where useful.

(i) *frequency* of a wave

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.....[1]

(ii) *diffraction* of a wave

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.....[2]

(iii) *superposition* of two waves

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.....[2]

(iv) *stationary* waves

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.....[3]

(b) Describe a method for finding the speed of a sound wave in the laboratory by first measuring its frequency and then measuring its wavelength.

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.....[8]

(c) The speed of sound in air varies with temperature. It is given by the equation

$$c = \sqrt{\frac{kT}{M}}$$

where c is the speed of sound in air,
k is a constant which has the value $11.6\,\text{J mol}^{-1}\,\text{K}^{-1}$,
T is the absolute temperature and
M is the molar mass and for air is $0.0288\,\text{kg mol}^{-1}$.

(i) Calculate the value of c for air at a temperature of 25 °C.

(Absolute temperature T = temperature in Celsius + 273)

c = ...m s^{-1} [2]

(ii) Show that the unit of c is the same as the unit of $\sqrt{\frac{kT}{M}}$.

[2]

[Total: 20]