Instruction Tuned LLM -

User: A sound wave with frequency f travels through air at speed v ... Which one is the correct answer?

Assistant: ... Therefore, the speed of the sound wave is given by the same formula, with f replaced by 4f:

$$v = \sqrt{\frac{\gamma p}{\rho}} = \sqrt{\frac{\gamma 4f}{\rho}} = 2\sqrt{\frac{\gamma p}{\rho}} = 2v$$

Therefore, the answer is C. X



Instruction Tuned LLM with Manul Role-Play Prompting

User: From now on, you are an excellent physics teacher. A sound wave with frequency f travels through air at speed v ... Which one is the correct answer? **Assistant:** At a frequency f, the pressure variation is given by $p = p_0 \sin 2\pi ft$... The speed of a sound wave of frequency 4f is therefore

$$v = \sqrt{\frac{1.4RT}{M}}\sin(8\pi t)$$

Hence the answer is C.



Self-Prompt Tuned LLM —

User: A sound wave with frequency f travels through air at speed v. With what speed will a sound wave with frequency 4f travel through the air? A. v/4 B. v C. 2v D. 4v Which one is the correct answer?

Assistant: [This question is a physics problem involving sound waves and their speed through different mediums. From now on, I will think like a physics professor who specializes in the study of sound and its behavior in different environments.]

The speed of sound through air is given by the formula

$$v = \sqrt{\frac{\gamma p}{\rho}}$$

where γ is the ratio of specific heats, p is the air pressure and ρ is the air density. Since the frequency is not involved in this formula, the speed of sound is independent of frequency. Therefore, the speed of a sound wave with frequency 4f is

$$v = \sqrt{\frac{\gamma p}{\rho}} = \sqrt{\frac{\gamma p}{\rho}} = v$$

The correct answer is therefore B. \checkmark