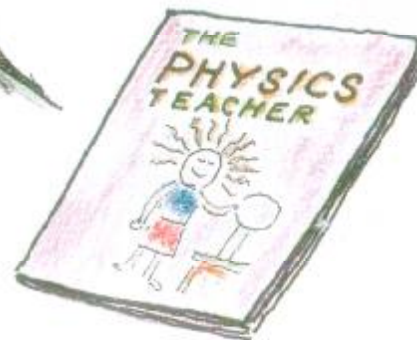


NEXT-TIME QUESTION

Which of these do *not* ordinarily emit electromagnetic waves?



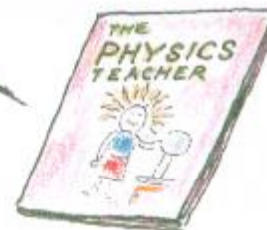
- a) The Sun.
- b) Lava from a volcano.
- c) Red-hot coals.
- d) This page from *The Physics Teacher*.
- e) ... but all continually emit electromagnetic waves!



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Answer: e

All substances—even this page—emit radiant energy according to the rule $\bar{f} \sim T$, where \bar{f} is the frequency of the most intensely emitted radiation from a substance at absolute temperature T . Although this page emits radiation with a quite low frequency (infrared) compared with the frequencies of radiation emitted by substances a), b), and c), everything—regardless of its temperature—emits electromagnetic waves.

Infrared thermometers nicely utilize $\bar{f} \sim T$. You simply point the thermometer at an object, press a button, and a digital temperature reading of the object appears. Typical classroom ones operate in the range of about -30°C to 200°C .



This rule of physics is from Wein's displacement law, $\bar{f} = (5.88 \times 10^{10} \frac{\text{Hz}}{\text{K}})T$, where \bar{f} is the peak frequency of radiation.

