NEXT-TIME QUESTION

Common granite rock contains trace amounts of uranium and other radioactive minerals releasing about 0.03 joules of energy per kilogram each year. Granite at the Earth's surface transfers this energy to the surroundings practically as fast as it is generated, so we don't find granite particularly warm. But the rock in the Earth's interior, which is more insulated, gets quite warm — hot enough to keep the interior molten, heat lava, and provide warmth to natural hot springs.

1. About how many years are required for a chunk of thermally insulated granite to increase 500°C in temperature (assume the specific heat of granite is 800 J/kg·C°)?

2. Why doesn't the radioactive process continue and melt the whole Earth?

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Answers:

1. To heat granite by 500°C takes 500°C × 800 J/kg·C° = 400,000 joules per kilogram of rock. So the time required is (400,000 J/kg) / (0.03 J/kg·yr) = 13.3 million years. Small wonder it stays hot down there!

2. The process *does* continue, but because the Earth's interior is far from being perfectly insulated, heat migrates to the surface. There it eventually goes into space by terrestrial radiation.

Energy moves around! In fact, that's the only time it counts.

CONCEPTUAL Physics

ARBOR SCIENTIFIC
TOOLS THAT TEACH.

Hewitt Drew it!