

ZIRCON CRYSTALS FOR RADIOMETRIC DATING IN GEOLOGY

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KEYWORDS

QUESTIONS

SUMMARY

1

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KEYWORDS

QUESTIONS

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2

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KEYWORDS

QUESTIONS

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KEYWORDS

QUESTIONS

SUMMARY

4

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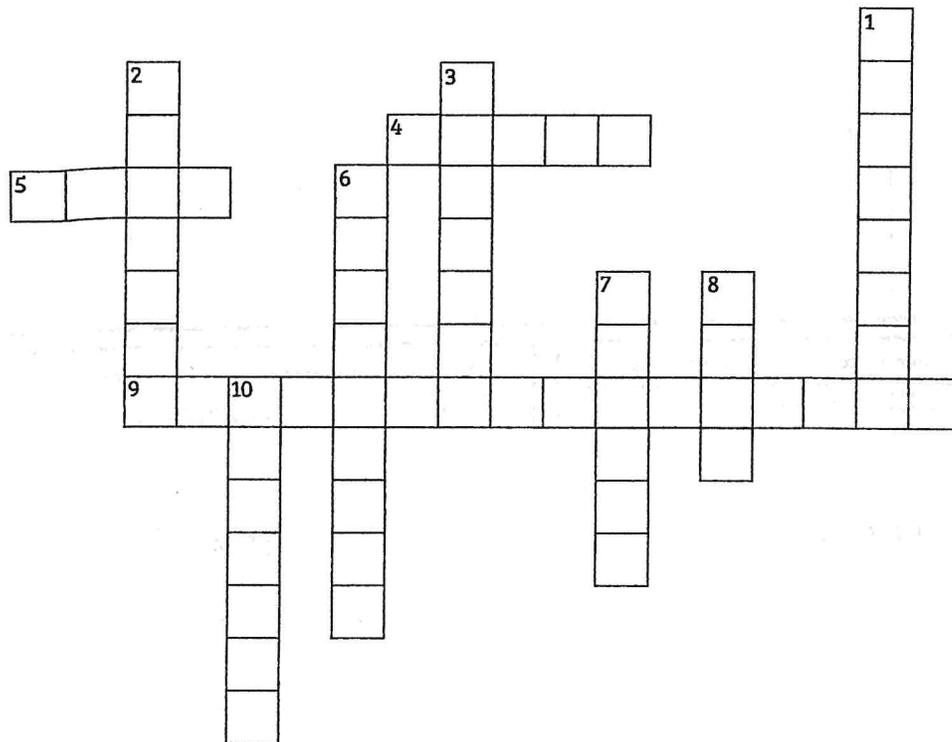
KEYWORDS

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5

ZIRCON CRYSTALS FOR RADIOMETRIC DATING IN GEOLOGY



Across

4. Zircon crystals form under the earth in molten ____.
5. Although zircon crystals don't contain this element or helium, it can be found in "pure" zircon due to radioactive decay
9. Instrument used to analyze the amounts of uranium and lead in zircon crystals

Down

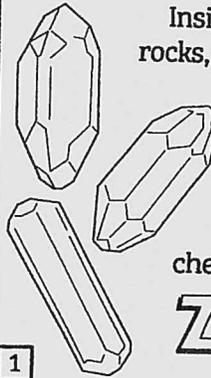
1. The time needed for half of the radioactive material in a sample to decay; this value is calculated mathematically
2. Element whose atoms join molecules in the same way as zirconium atoms
3. Zircon molecules form a _____ that makes up crystals.
6. Zircon crystals are so small that ____ of them can be found in a rock the size of a grapefruit.
7. Crystals made of zirconium silicate
8. By plotting the amount of uranium on a graph and pinpointing its half-life, we can figure out how much ____ has passed since a zircon crystal formed
10. In addition to zirconium and oxygen, zircon crystals contain this element

RADIOMETRIC DATING NOTE TAKING PAGE

Cut out each piece along the bold outlines. Fold back the glue tab along the dotted line of each piece. Apply glue to each glue tab and glue to the correct place on the corresponding page. For a short "how to use this page" video, go to <https://www.youtube.com/watch?v=-AE2voGqWw&t=5s>.

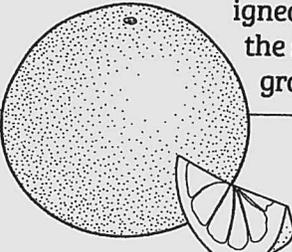
Cut piece out along solid line. Fold on dotted line. Put glue over entire glue tab. Affix in the correct spot on the corresponding page.

Inside many igneous rocks, you can find tiny zircon crystals. Zircon crystals are made of zirconium silicate, whose chemical formula is **ZrSiO₄**

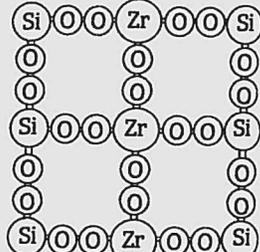


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Zircon crystals are small and abundant. There can be thousands of them inside an igneous rock the size of a grapefruit!

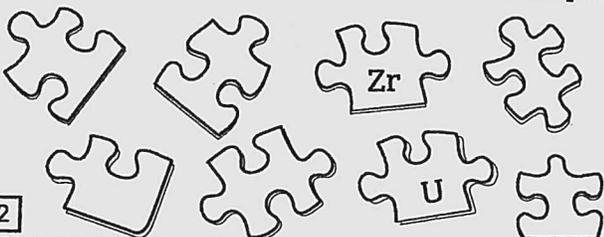


Zircon molecules form a lattice that makes up crystals. This lattice is very tightly organized and does not accept other types of atoms, so zircon crystals are very pure.



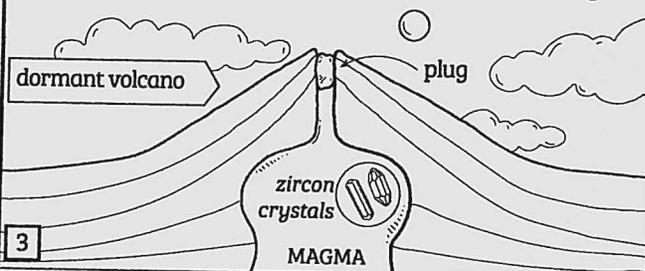
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Usually zircon crystals are pure zirconium, silicon, and oxygen. Sometimes, however, uranium atoms sneak in and take the place of the zirconium atoms. Chemically, zirconium and uranium can connect to other atoms in the same way. No other type of atom can connect in a zirconium silicate molecule like uranium can. It's as if zirconium and uranium were puzzle pieces that are the same size and shape!



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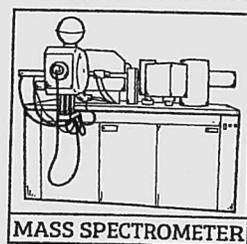
Zircon crystals form under the earth in molten magma.



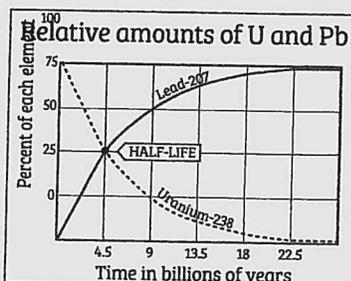
When a volcano erupts, some zircon crystals can be found in igneous rocks like rhyolite and dacite.

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Using a mass spectrometer, we can figure out how much uranium and how much lead is in a sample of zircon.

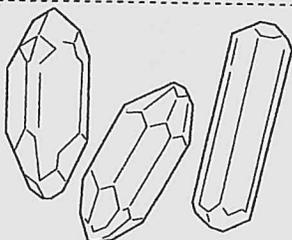


By using mathematical formulas, scientists have calculated that it takes 4.5 billion years for half of the uranium-238 in a sample to turn into lead-207. The **half-life** of uranium-238 is 4.5 billion years.



The percentages of uranium-238 and lead-207 can be plotted on a graph like this, and we can determine how much time has passed since a zircon crystal formed.

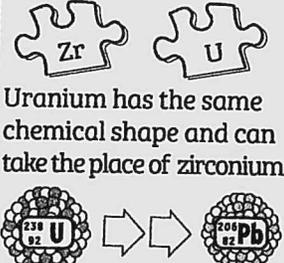
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Zirconium silicate, also known as zircon, is made of zirconium, silicon, and oxygen. Yet scientists have found that zircon crystals also often contain helium and lead. How can this be?

4

Zirconium and uranium puzzle pieces are shown. Below them, a diagram shows Uranium-238 (U) decaying into Lead-207 (Pb) via alpha decay.



Lead is the end product when uranium decays.

Alpha particles from alpha decay are actually nuclei of helium atoms.



MYSTERY SOLVED!

5

