No. 61

SCIENCE SPAZA

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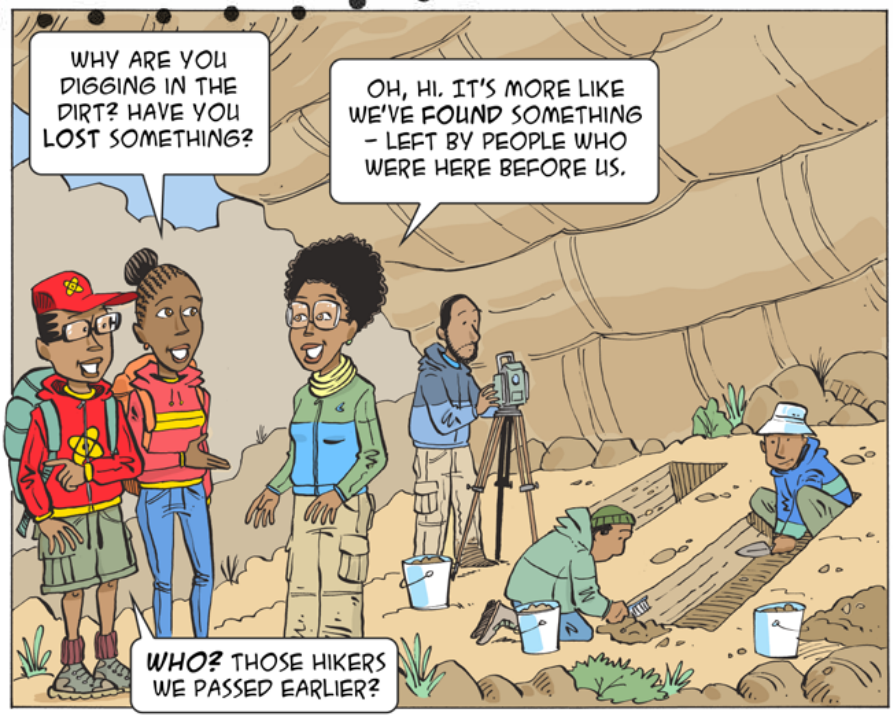
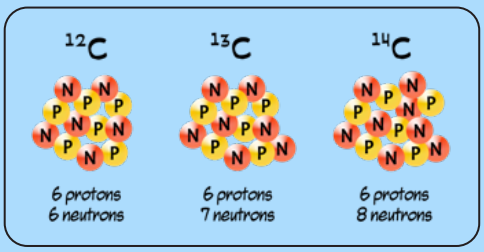
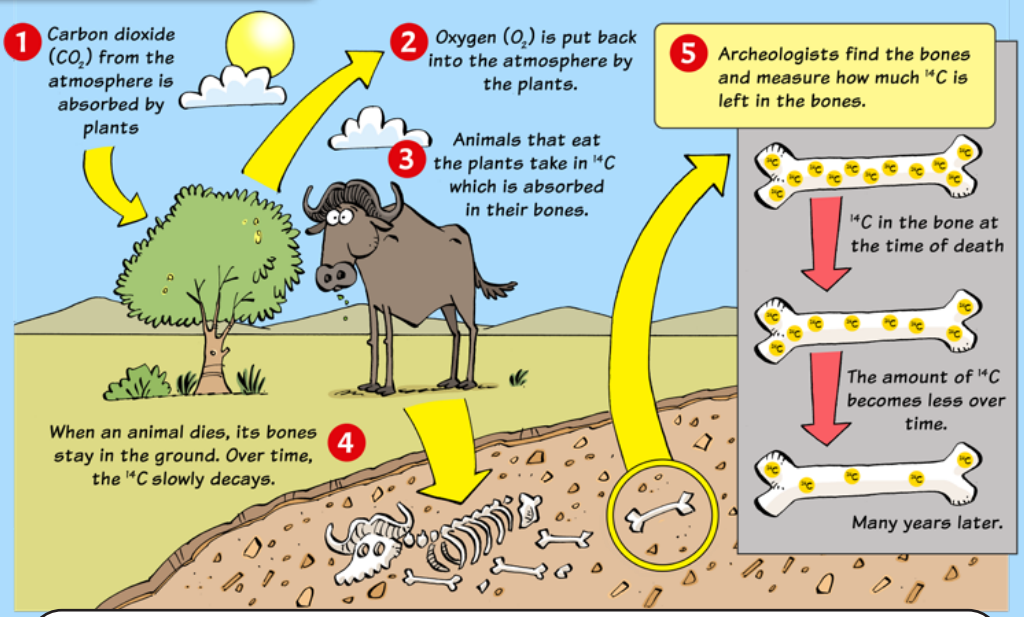
RADIOCARBON DATING – TICK-TOCK THE CARBON CLOCK!



INTRO TO RADIOCARBON DATING



All living things absorb carbon until the moment they die. Carbon usually has 6 protons and 6 neutrons. So we call it ^{12}C. But sometimes special carbon is formed by radiation from the sun. It's called ^{14}C with 2 extra neutrons. ^{14}C slowly breaks down into nitrogen when one of the neutrons becomes a proton. It's called radiocarbon dating and it helps us answer questions about the past.



SO WE CAN TELL WHEN SOMETHING DIED BY COMPARING HOW MUCH ^{12}C AND ^{14}C THERE IS IN IT. IT'S CALLED **RADIOCARBON DATING** AND IT HELPS US ANSWER QUESTIONS ABOUT THE PAST.

Knowledge is Ncah!

CREATE YOUR OWN MINI-DIG

ARCHAEOLOGISTS LEARN ABOUT THE PAST FROM THE ITEMS, OR **ARTEFACTS**, THAT PEOPLE LEAVE BEHIND. THIS IS CALLED **EXCAVATION** OR A **'DIG'.**

YOU WILL NEED:

- A CLEAR PLASTIC BOTTLE WITH THE TOP CUT OFF OR A GLASS JAR.
- DIFFERENT KINDS OF SOIL.
- "ARTEFACTS" - THESE COULD BE A PIECE OF CHARCOAL, BEADS, LEAVES OR STICKS.
- NOTE-BOOK AND PEN.
- BRUSH OR SPOON.

1 FILL THE BOTTLE WITH LAYERS OF SAND. YOU CAN USE THE TOP OF THE BOTTLE AS A FUNNEL.

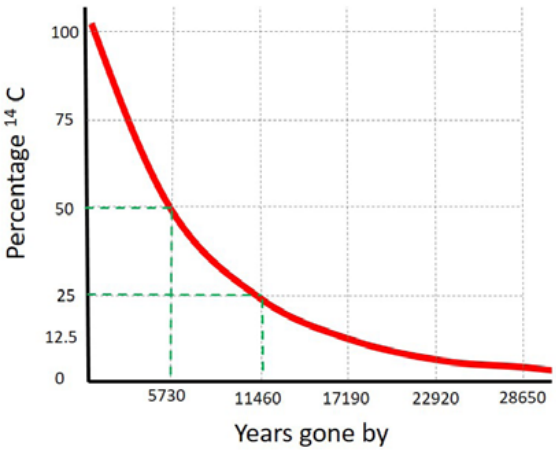
2 PLACE AN ARTEFACT IN EACH LAYER. YOU COULD PUT LETTERS (OR WORDS) IN THE BOTTLE AT DIFFERENT LEVELS TO SPELL OUT A WORD OR SEND A MESSAGE. YOU HAVE TO EXCAVATE CAREFULLY TO GET THEM OUT IN THE RIGHT ORDER.

3 SWOP YOUR BOTTLE WITH A FRIEND AND START EXCAVATING! REMEMBER ARCHAEOLOGISTS ALWAYS CAREFULLY RECORD EVERYTHING THAT THEY FIND.

WHAT'S HAPPENING HERE?

THE SOIL LAYERS, OR **STRATIGRAPHY**, TELL US APPROXIMATELY HOW OLD OBJECTS IN DIFFERENT LAYERS ARE COMPARED TO EACH OTHER. IT'S CALLED **RELATIVE DATING.**

RADIOCARBON DATING CAN HELP US FIND A LAYER'S **EXACT AGE** - KNOWN AS "ABSOLUTE DATING" - BY COMPARING ^{12}C AND ^{14}C LEVELS IN A LABORATORY.



^{14}C breaks down at a very specific rate. After 5730 years, half of the original ^{14}C has decayed. This period is called the half-life and it helps archaeologists know how long ago something died.

For example, if an artefact has 25% of ^{14}C then we know it has halved, and halved again. So it dates back to 5730+5730 = 11460 years!

TREASURES OF THE PAST

FEATURED SCIENTIST AND CAREERS

Radiocarbon dating specialists have many career options in fields such as nanotechnology, biomedicine, forensics, the nuclear industry and of course archaeology.

Rivoningo Khoza is a junior research scientist at iThemba labs, South Africa's leading radiocarbon dating facility. Her research looks at how landscapes, soil and rivers form over time by measuring isotopes.

Rivoningo is interested in isotopes formed by radiation from outer space called cosmogenic nuclides.

CURRICULUM LINKS

- ***Gr 7-9 Mathematics:*** Drawing and interpreting graphs.
- ***Grade 7-9 Natural Science:*** Periodic table, mass numbers and atomic numbers.
- ***Grade 10-12 Physical Science:*** Atomic structure, isotopes and radioactivity.

NRF National Research Foundation | iThemba LABS Laboratory for Accelerator Based Sciences

ISOTOPE FUN!

ISOTOPES ARE SPECIAL FORMS OF AN ATOM WITH EXTRA OR MISSING NEUTRONS.

APART FROM CARBON, ISOTOPES OF SEVERAL OTHER ELEMENTS (SHADED RED HERE) ARE USED TO FIND THE AGE OF ARCHAEOLOGICAL OBJECTS.

HOW MANY WORDS CAN YOU MAKE USING THE SYMBOLS OF THESE ELEMENTS?

53 I Iodine	6 C Carbon	20 Ca Calcium	92 U Uranium	14 Si Silicon	38 Sr Strontium
4 Be Beryllium	3 Li Lithium	5 B Boron	8 O Oxygen	18 Ar Argon	19 K Potassium
17 Cl Chlorine	15 P Phosphorus	5 Pb Lead	7 N Nitrogen	26 Fe Iron	2 He Helium

EXAMPLE:

4 Be Beryllium	18 Ar Argon

= BEAR

CAN YOU FIND A 6 LETTER WORD?
CLUE: ALL LIVING THINGS CONTAIN THIS.

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Visit www.sciencespaza.org, email info@sciencespaza.org, SMS or WhatsApp us on 076 173 7130 or write to us at PO Box 22106, Mayor's Walk, 3208.

WE WANT YOUR FEEDBACK!

WE WOULD LOVE TO SEE PHOTOS OF YOUR MINI-DIG AND HEAR HOW MANY WORDS YOU COULD FIND. VISIT OUR SCIENCE SPAZA PAGE ON FACEBOOK, OR WHATSAPP US YOUR PICTURES ON *076 173 7130.*

WITS UNIVERSITY

DST-NRF CENTRE OF EXCELLENCE IN PALAEOSCIENCES

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The P5 Project is an international and interdisciplinary collaboration of researchers studying human adaptations to coastal environments. More information about the P5 Project can be found at https://p5project.org, via facebook at https://www.facebook.com/pfiveproject/, via twitter at https://twitter.com/p5project and on YouTube.

P5 PROJECT — PONDOLAND PALEOECOLOGY, PALEOENVIRONMENT, PALEOCLIMATE, AND PALEOANTHROPOLOGY

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