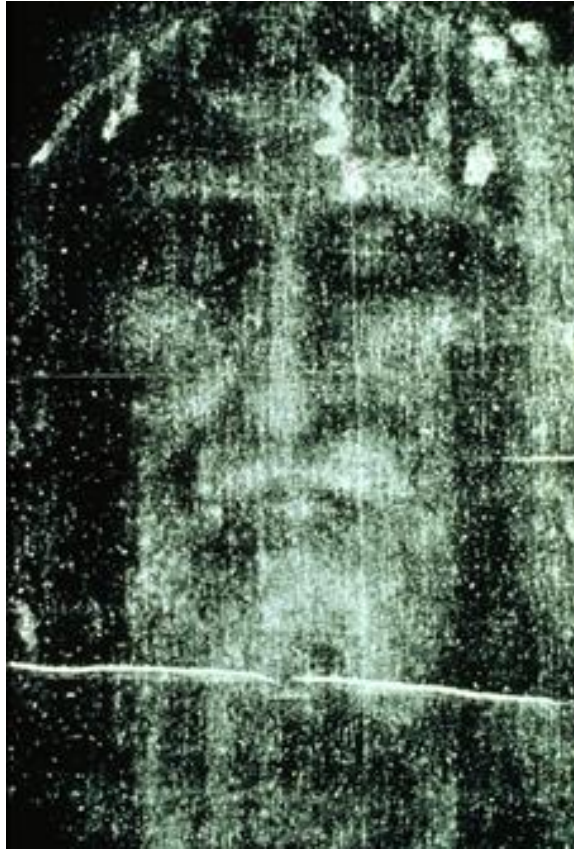


Physics Term 2 Week 10
Introduction
Uses of radioisotopes

Carbon dating



- The Turin Shroud

- Carbon-14 is a **radioactive isotope** of carbon (it has two extra neutrons in its nucleus making it unstable).
- There's a small amount of radioactive carbon-14 in all living organisms. When they die no new carbon-14 is taken in by the dead organism.

- The carbon-14 it contained at the time of death decays over a long period of time.
- By measuring the amount of carbon-14 left in dead organic material the approximate time since it died can be worked out.
- Some people believe the Turin shroud is almost 2000 years old and the burial cloth of Jesus Christ.
- It was carbon dated in 1988, and scientists found the shroud to be from the 13th of 14th century.

Rocks...

- Rocks do not contain carbon
- But then can still be dated, you need to use a Geiger counter....

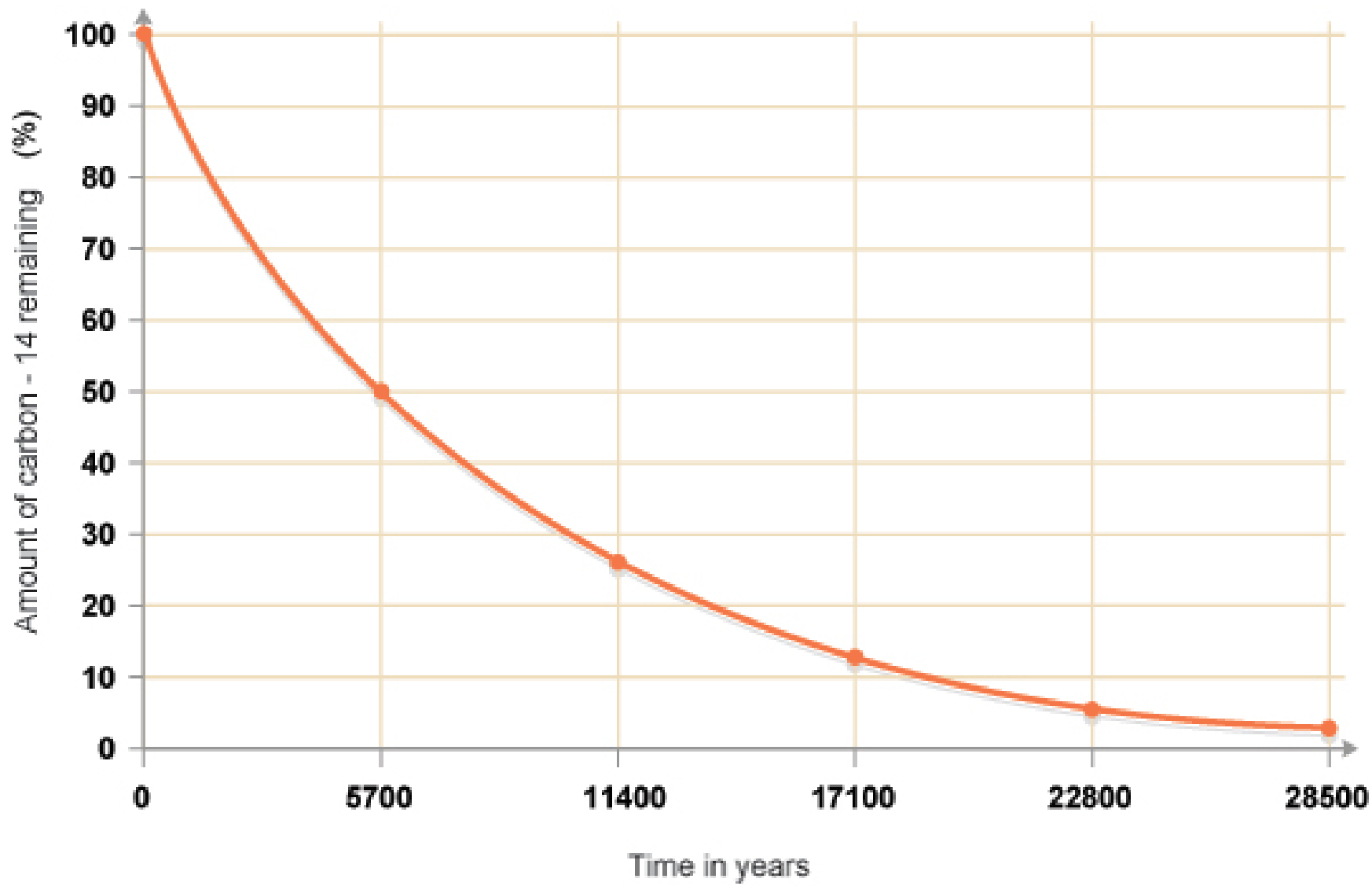


- Some rocks contain traces of **uranium**.
- Uranium has a very long half-life and so by measuring how much uranium is left in a rock its approximate age can be worked out.

Carbon dating

- The amount of carbon-14 in the atmosphere has not changed in thousands of years.
- Even though it decays into nitrogen, new carbon-14 is always being formed when cosmic rays hit atoms high in the atmosphere.
- Plants absorb carbon dioxide from the atmosphere and animals eat plants.

- This means all living things have radioactive carbon-14 in them.
- When an organism, eg a tree, dies it stops taking in carbon dioxide.
- The amount of carbon-14 in the wood decreases with time as it decays into nitrogen with a half-life of about 5700 years.
- By comparing how much carbon-14 there is in the dead organism with the amount in a living one, the age of the dead organism can be estimated.



Dating rocks - higher

- The half-life of uranium-238 is 4500 million years.
- When it decays it forms thorium-234 which is also unstable.
- Finally, after a series of radioactive isotopes are formed it becomes lead-206, which is stable.

- The age of the rock can be calculated if the ratio of uranium to lead is known.
- As the rock gets older the proportion of lead increases.
- If half of the uranium-238 has turned into lead-206 the rock will be 4500 million years old.

