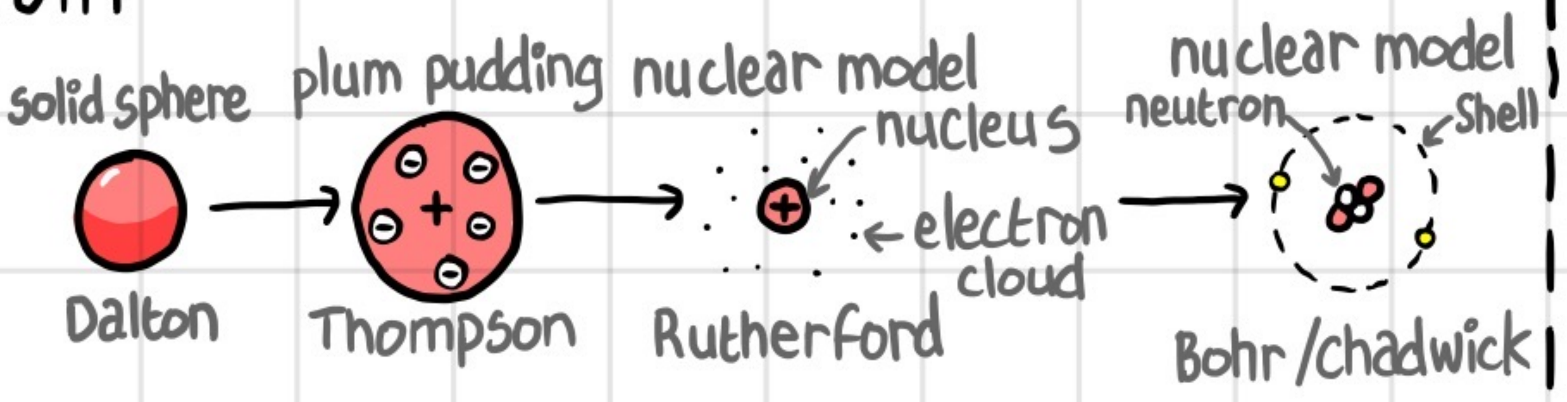
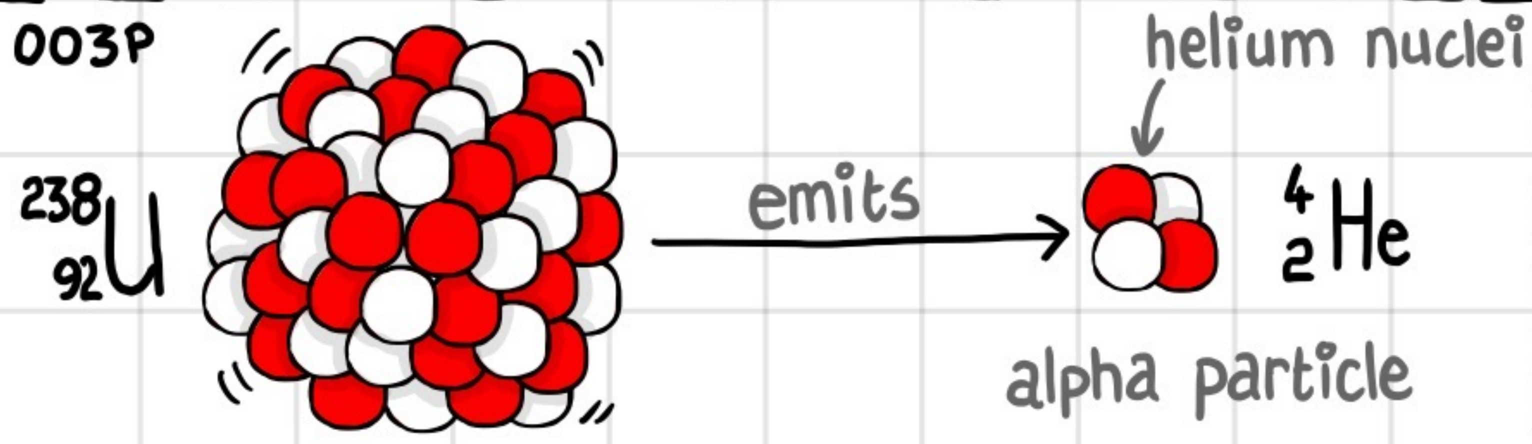
011 P



The history of how scientists understanding of the atom has changed over the years.

Q. Describe the alpha particle scattering experiment by Rutherford and Marsden.

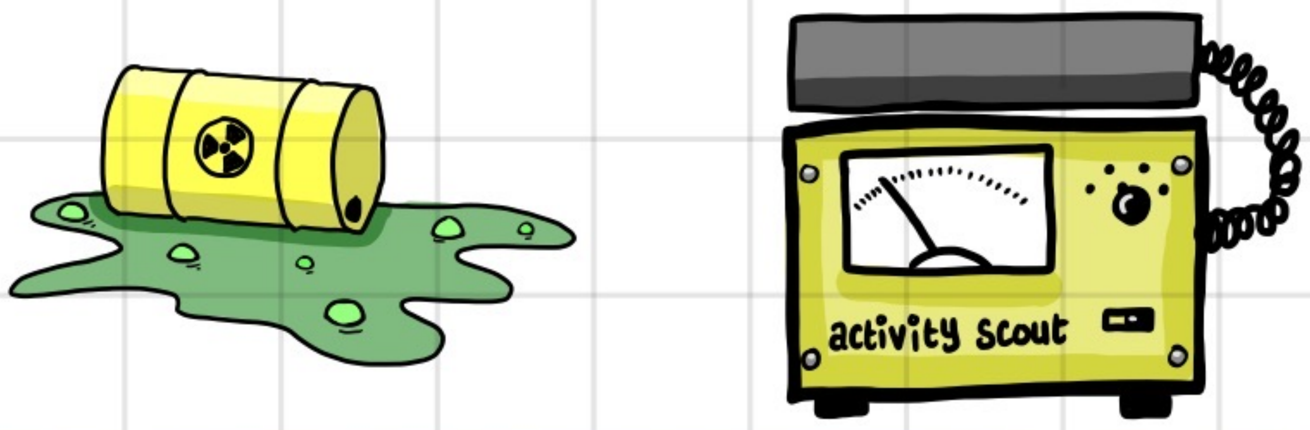
003P



A particle emitted from a nucleus during radioactive decay. The particle consists of two protons and two neutrons (a helium nuclei).

Q. Describe the ionising and penetrative potential of an alpha particle.

014P

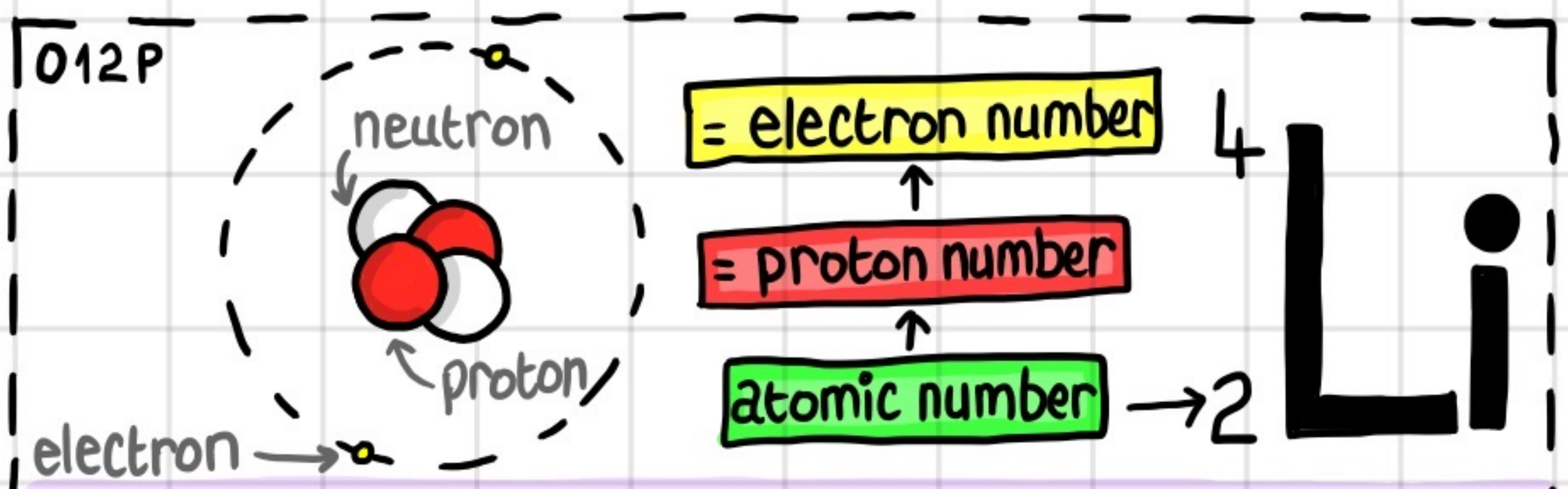


unit of radioactivity equal to one decay per second

Bq

Q. The initial activity of a radioactive isotope is 840 Bq. Calculate the final % activity after 2 half lives.

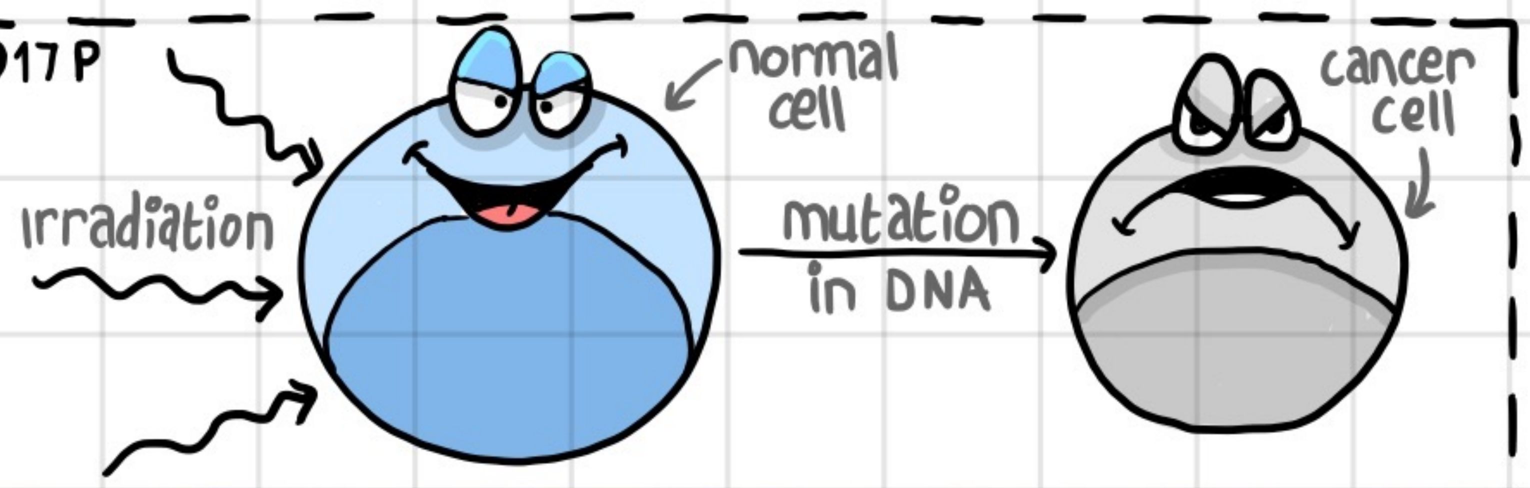
012P



The number of protons in an atom.

Q. How many protons are in a uranium atom. $^{238}_{92}U$

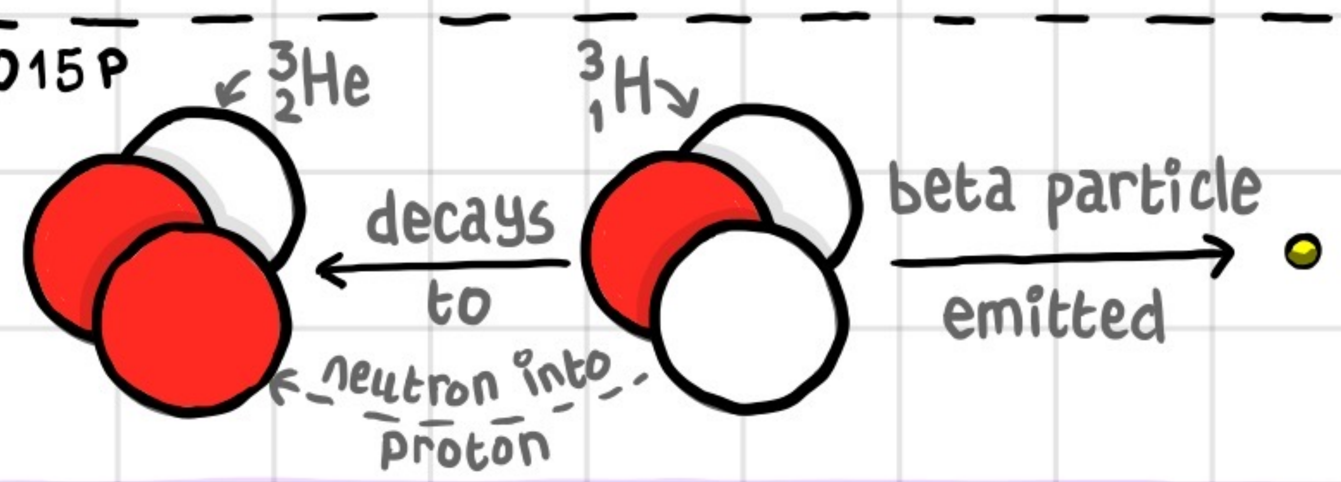
017P



Uncontrollable cell division caused by a mutation in the DNA of a cell. Mutations are caused by irradation of cells by nuclear radiation

Q. Explain how irradiation causes damage to living things.

015P



A high speed electron ejected from a nucleus as a neutron turns into a proton

Q. Describe the ionising and penetrative potential of a beta particle.

Alpha (α) Particle

003P

Atomic model

011P

Atomic number

012P

unit

Becquerel

014P

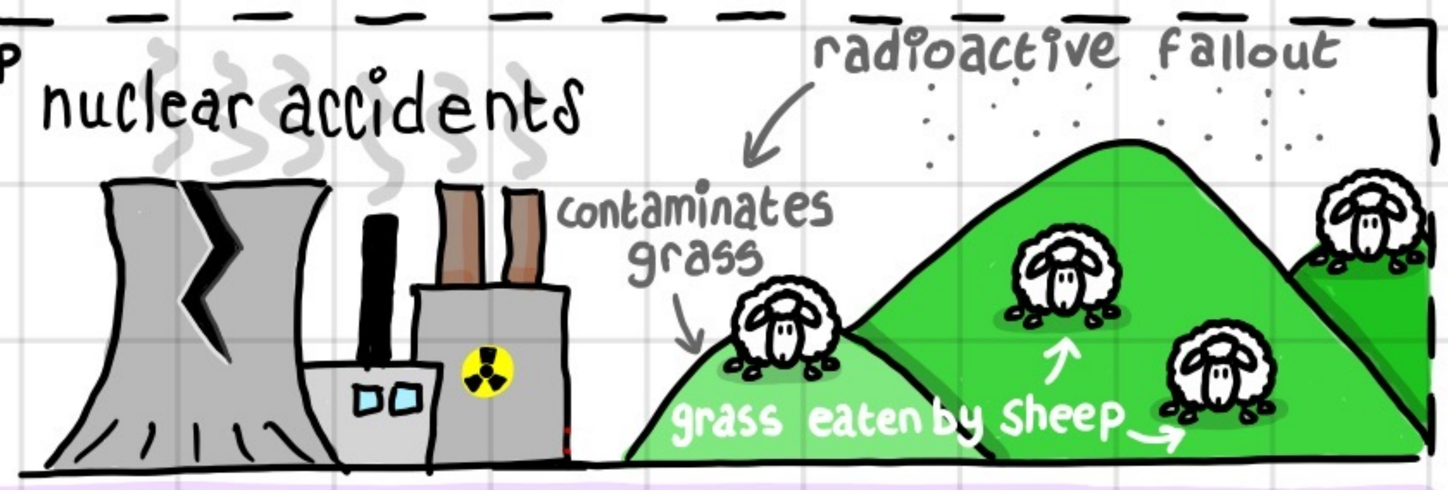
Beta (β) Particle

015P

Cancer

017P

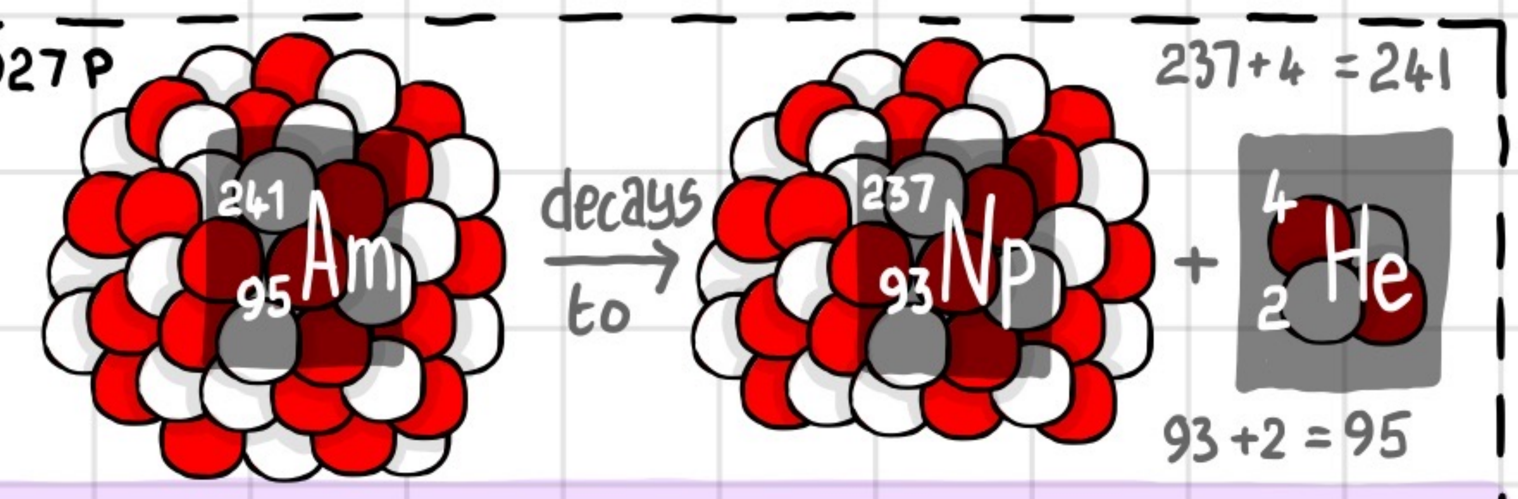
030P



The transfer of radioactive material onto a clean object or body.

Q. Compare irradiation and contamination by a radioactive source.

027P

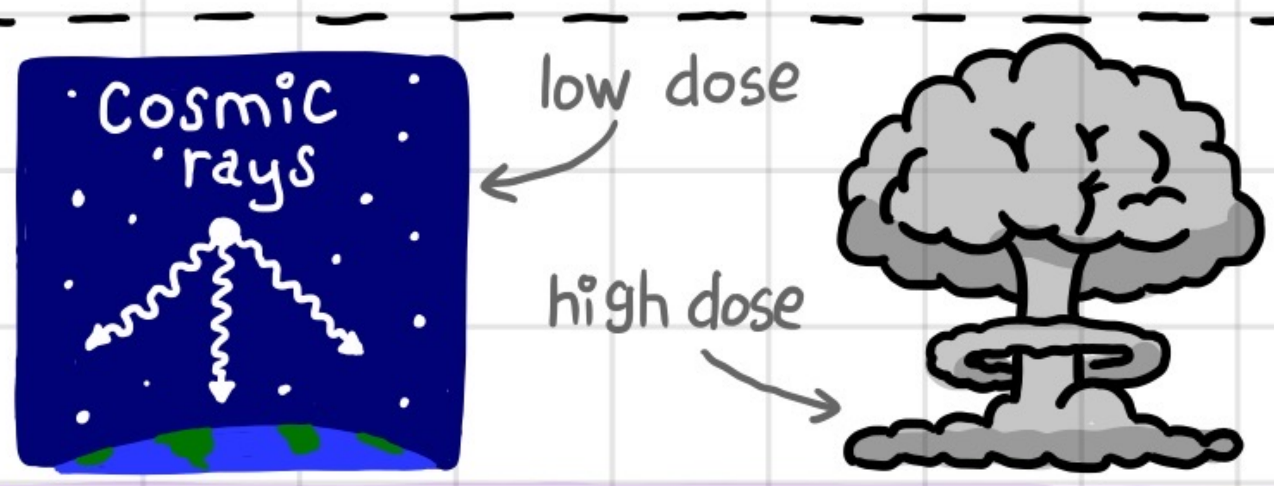


The mass numbers showing decay in nuclear equations are the same on both sides of the equation.

Q. Use the conservation of mass to complete the equation

$$^{238}_{92}U \longrightarrow ^{4}_{2}He + ^{\square}_{\square}Th$$

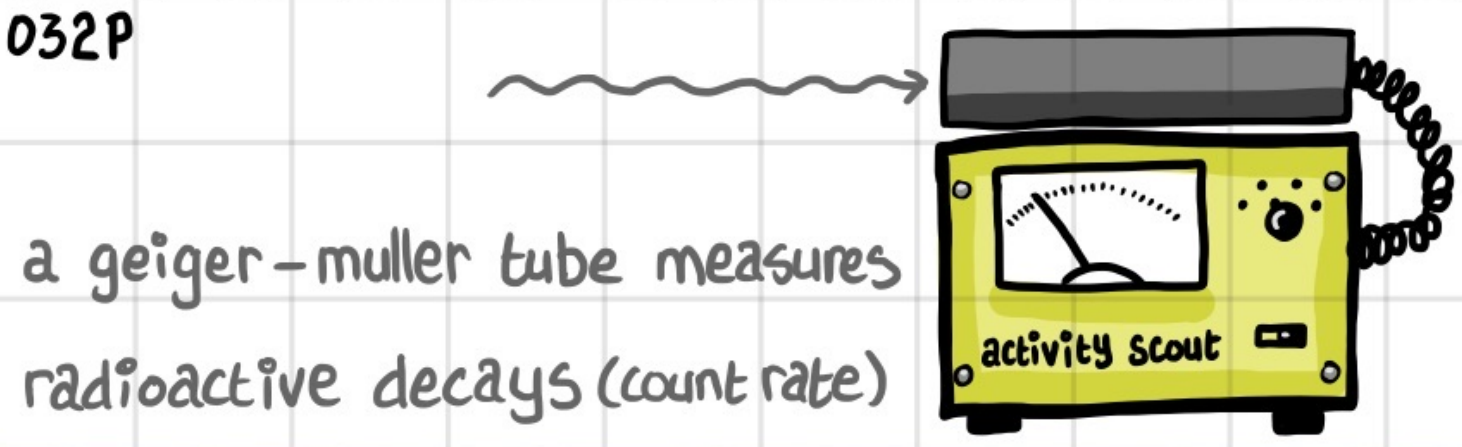
042P



A measure of the risk of harm resulting from exposure to radiation

Q. Explain if alpha sources will cause more harm by irradiation or contamination.

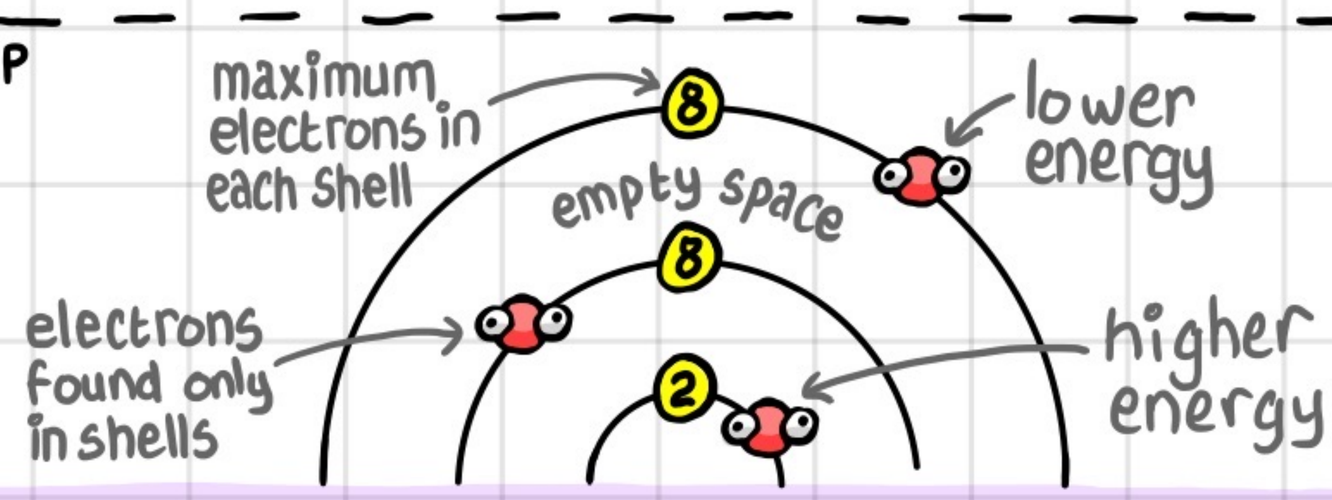
032P



The number of radioactive decays measured each second.

Q. The inital count rate of a substance with a half life of 3 days is 1200 cpm. Calculate the activity after 9 days.

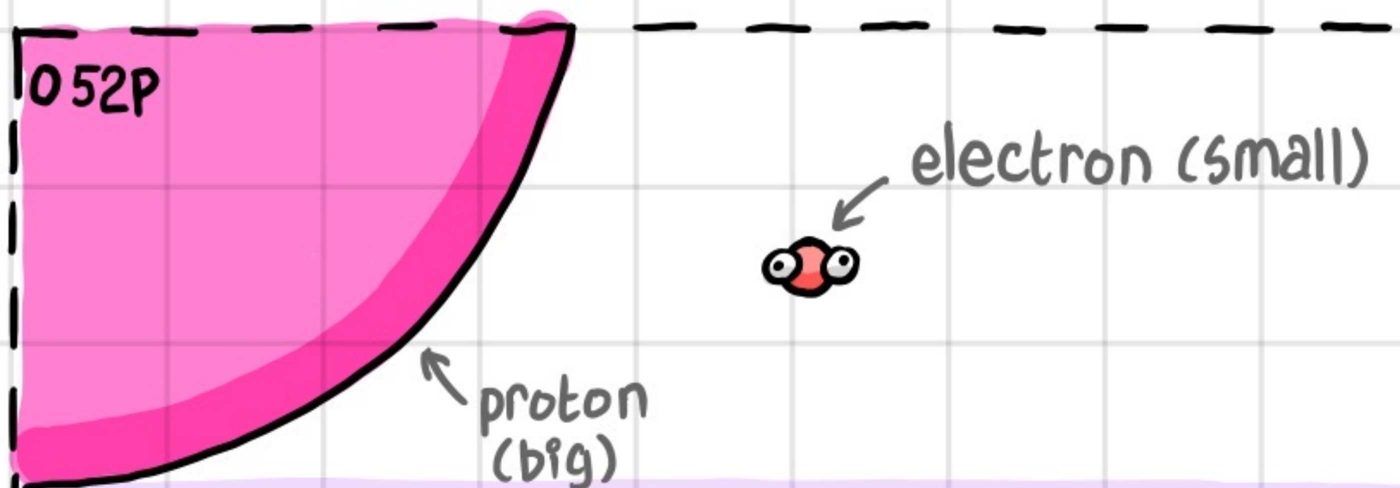
054P



The arrangement of electrons at different distances from the nucleus

Q. Explain what happens to the energy levels of electrons when electromagnetic radiation is absorbed or released.

052P



A fundamental particle with a negative charge and negligble mass.

Q. Explain the difference between Rutherfords model of the atom and Bohrs model of the atom.

Conservation of mass

027P

Contamination

030P

Count rate

032P

Dose

042P

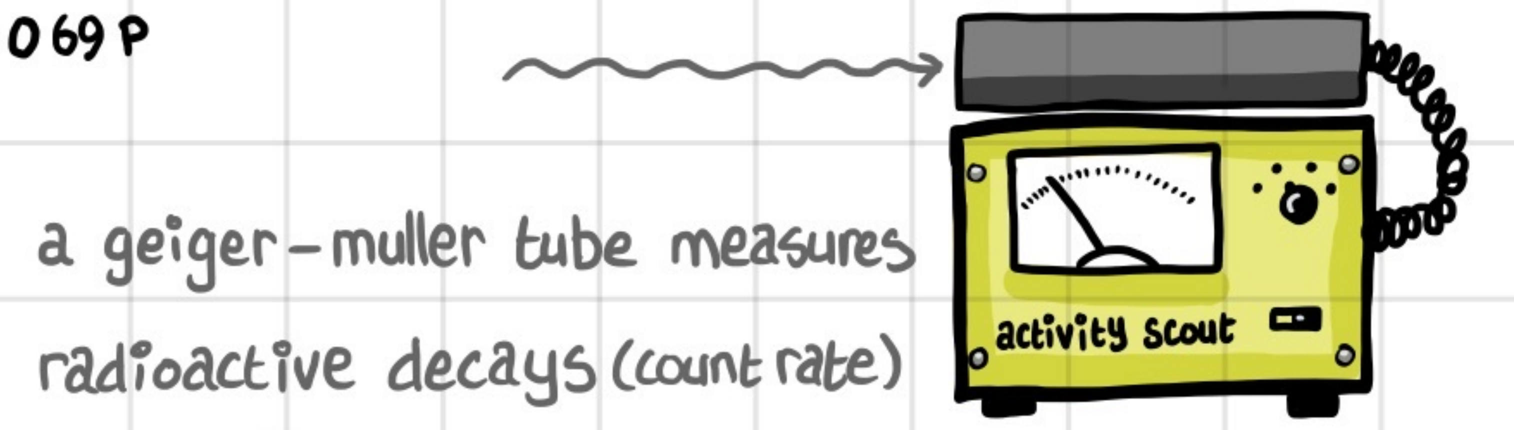
Electron

052P

Energy level (electron)

054P

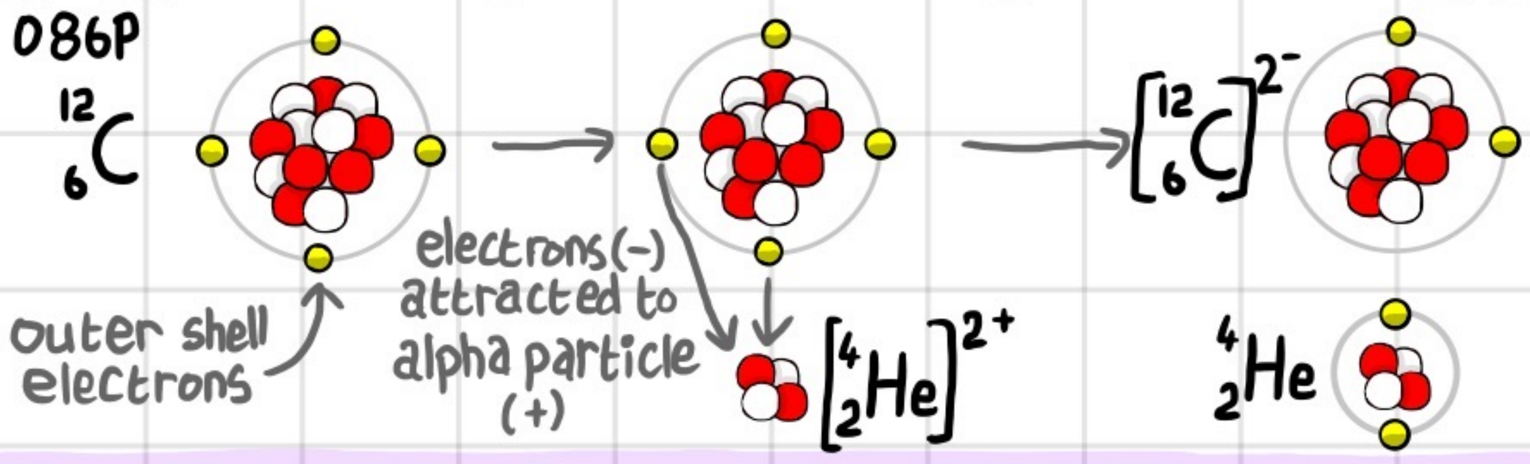
069P



A detector that records the number of decays per second (count rate)

Q. Describe how you would use a Geiger-Muller tube to calculate the half life of a radioactive isotope.

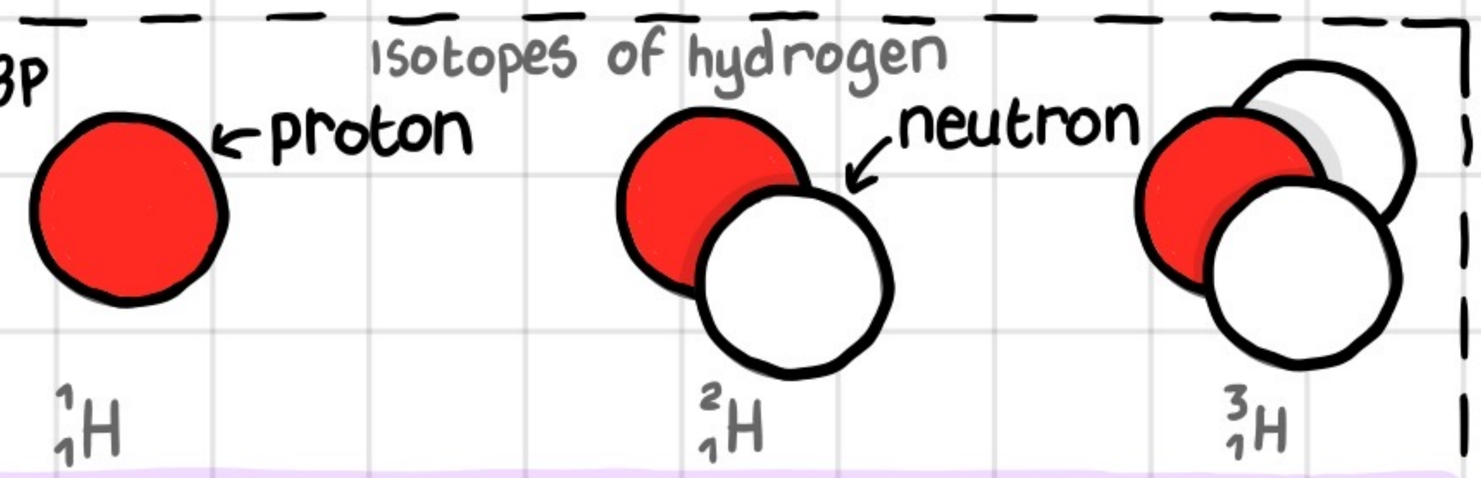
086P



Emissions from radioactive decay which remove electrons from atoms causing the formation of ions

Q. Explain why a gamma ray source is used in preference to an alpha particle source to irradiate tumours.

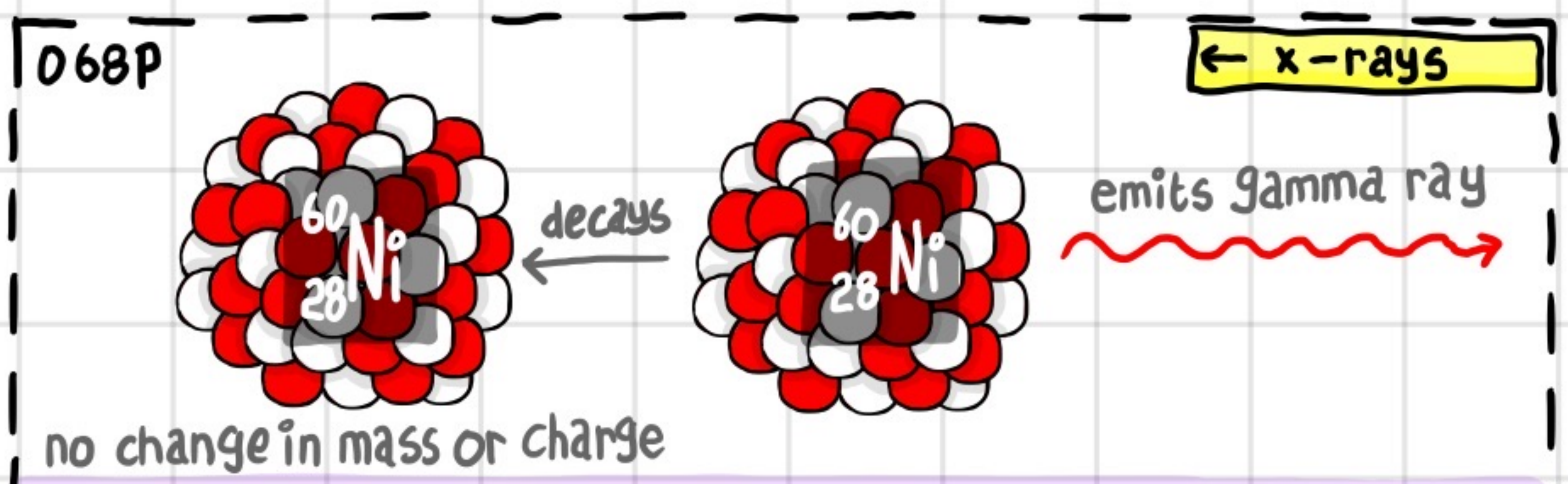
088P



Atoms of the same element with different numbers of neutrons

Q. Calculate the number of neutrons in $^{16}_{8}O$ and its isotope $^{18}_{8}O$.

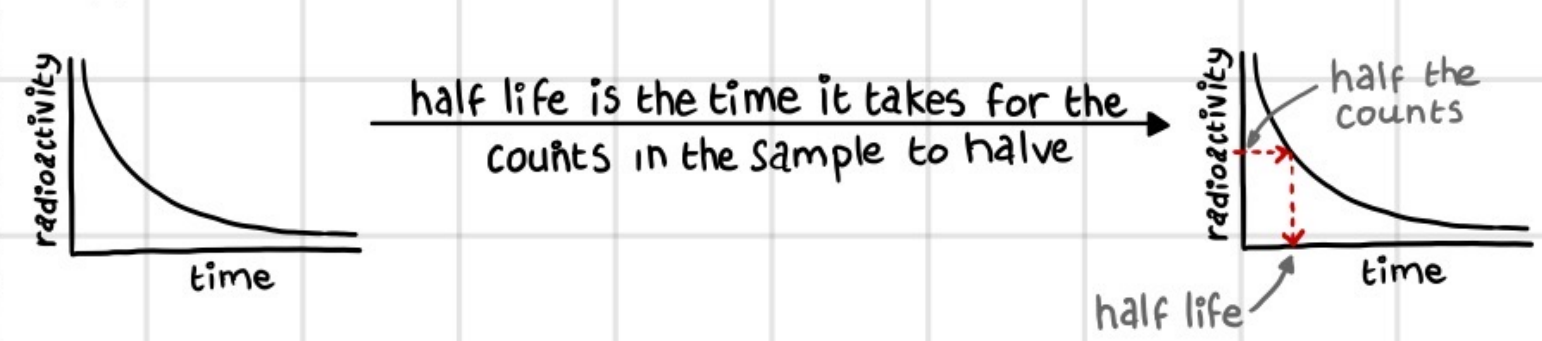
068P



Electromagnet radiation emitted from the nucleus during radioactive decay

Q. Describe the penetration and ionising potential of gamma rays.

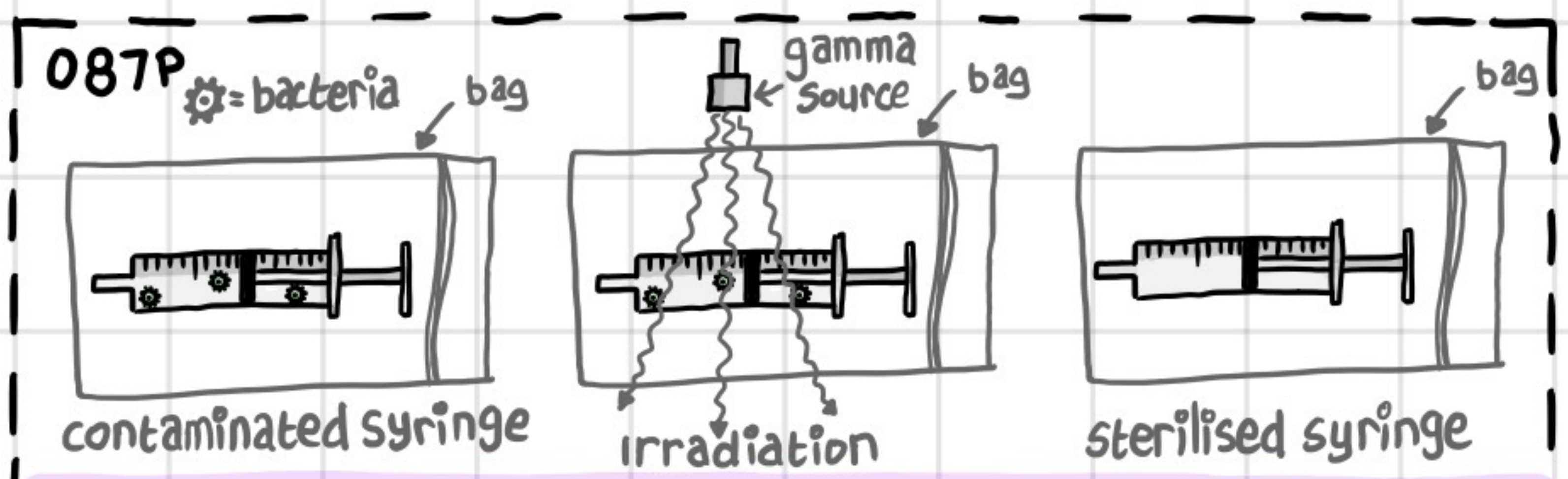
074P



The time it takes for the count rate (activity) of an isotope to fall to half of the initial activity

Q. The activity of a radioisotope is 720 Bq. Two hours later the activity is only 45 Bq. Calculate the half life.

087P



The process of exposing an object to nuclear radiation

Q. Discuss if irradiation by an alpha particle source is more dangerous than contamination by an alpha particle source.

EM Spectrum

Gamma(γ) radiation
068P

Geiger-Muller tube
069P

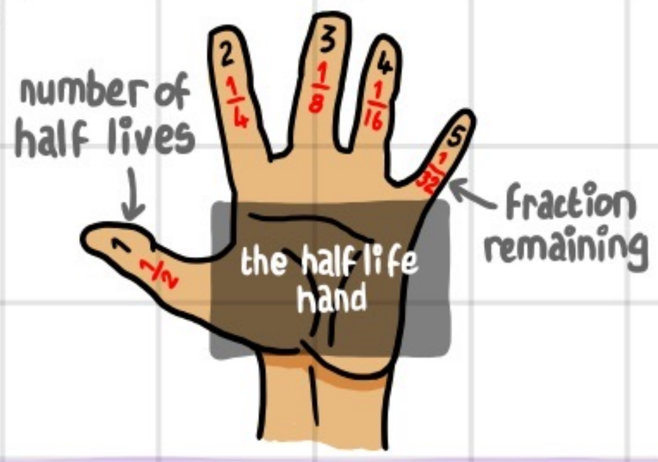
Half life
074P

Ionising radiation
086P

Irradiation
087P

Isotopes
088P

113P



multiply initial activity by fraction remaining

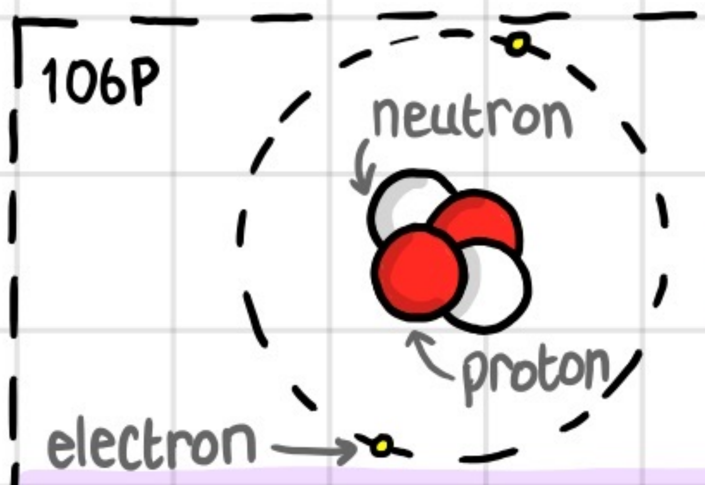
e.g. initial activity = 1000 Bq

3 half lives = $1000 \times \frac{1}{8} = 125$ Bq

The ratio of the final activity to the initial activity of a radioactive substance for a given number of half-lives

Q. Sodium-24 has a half life of 15 hours. The initial activity of a sample is 1280 Bq. Calculate the net decline after 60 hours.

106P



mass number → 4

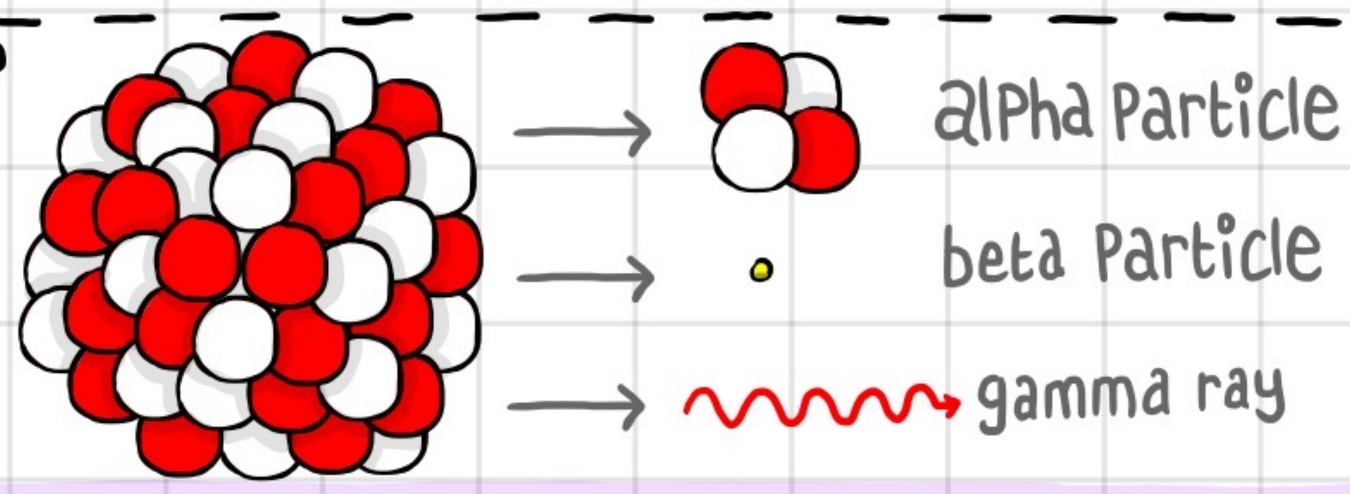
= proton number + neutron number

$^{4}_{2}Li$

The number of protons and neutrons in an atom.

Q. How many neutrons are in a uranium atom? $^{238}_{92}U$

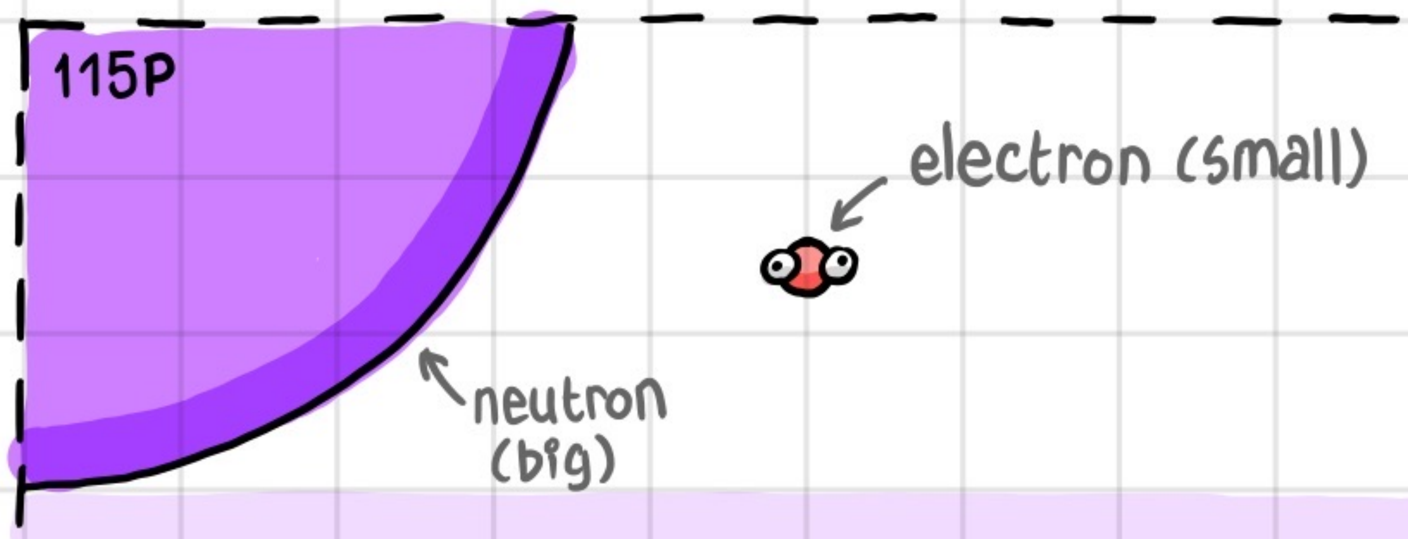
122P



The process by which an unstable atom emits radiation as it changes to become more stable.

Q. Describe the three types of emissions that can be released from an unstable atom.

115P

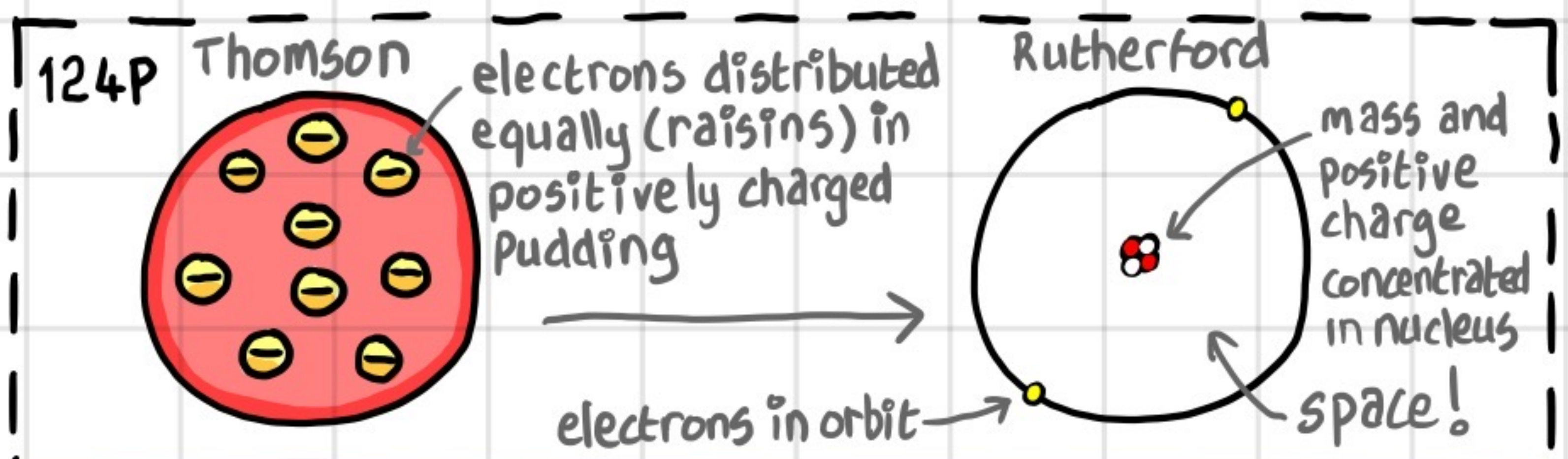


A particle with no charge and a relative mass of 1.

Q. Calculate the number of neutrons in:

i) carbon-12 ii) carbon-14

124P



A model of an atom proposed by Rutherford. This model concentrated the mass and positive charge (proton) into a small central nucleus.

Q. Describe the alpha particle scattering experiment and explain the results.

123P

alpha decay $^{238}_{92}U \rightarrow {}^{234}_{90}Th + {}^{4}_{2}He$ $238 \rightarrow 234 + 4$, $92 \rightarrow 90 + 2$

beta decay $^{14}_{6}C \rightarrow {}^{14}_{7}N + {}^{0}_{-1}e$ $14 \rightarrow 14 + 0$, $6 \rightarrow 7 - 1$

A method of representing nuclear decay

Q. Write a balanced equation to represent the breakdown of $^{238}_{92}U$ by alpha decay to to Thorium (Th).

Mass number
106P

Net decline
113P

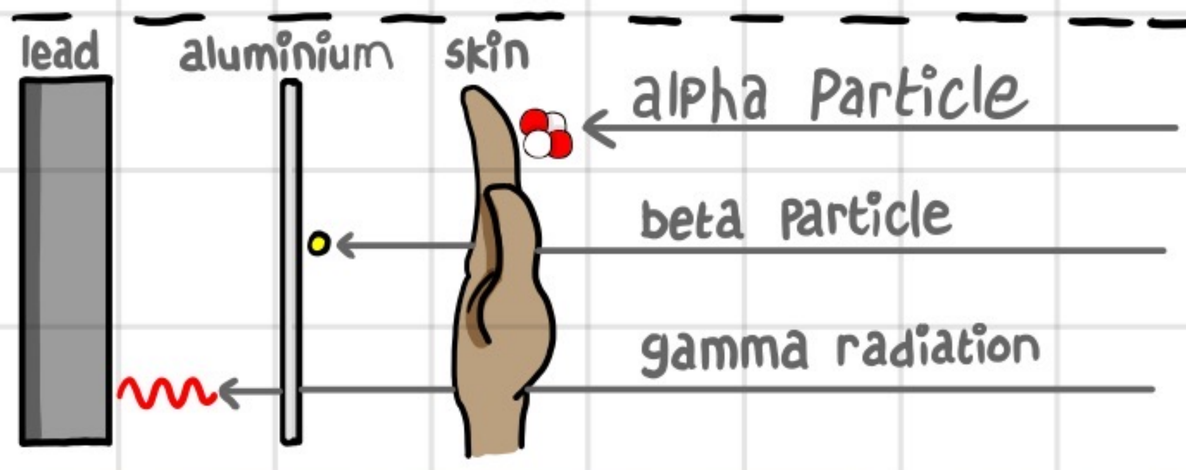
Neutron
115P

Nuclear decay
122P

Nuclear equation
123P

Nuclear model
124P

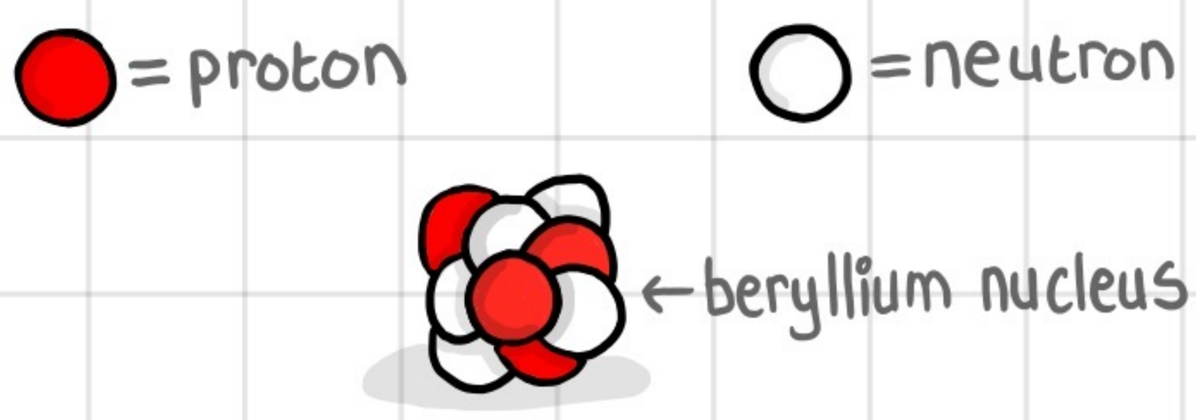
132P



A measure of how far the three types of radiation travel in air and through different materials

Q. Explain which type of radioactive emitter you would use to monitor the thickness of metal sheets.

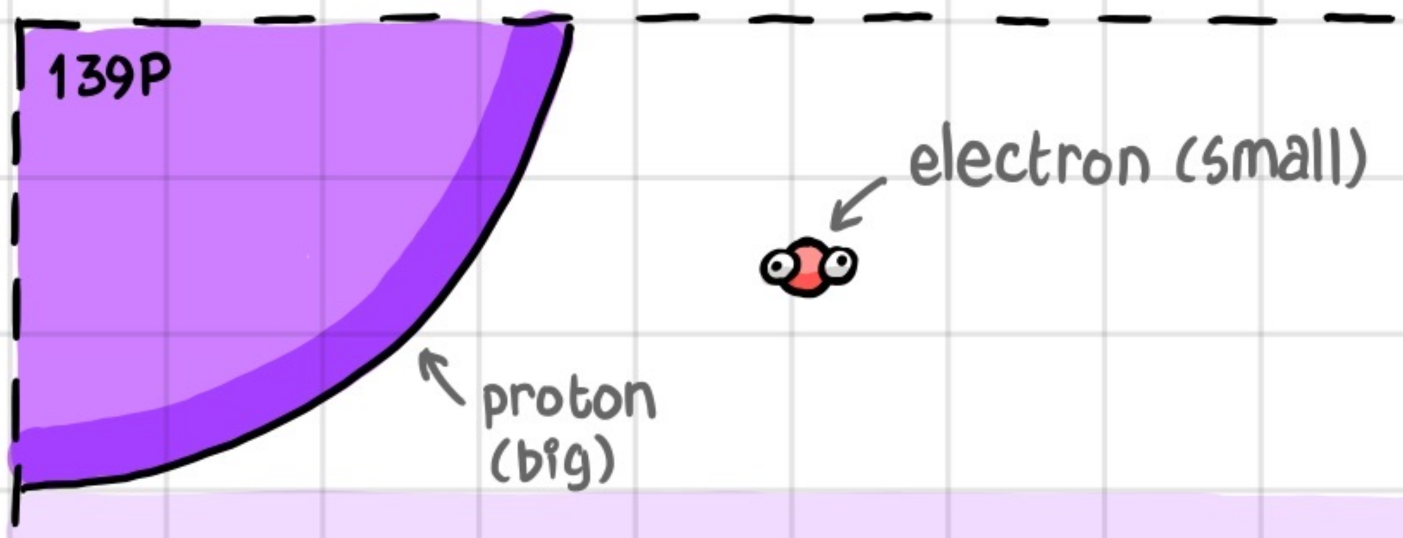
125P



The centre of the atom made from protons and neutrons. All the mass and positive charge in an atom is here

Q. The radius of a nucleus = 1×10^{-14} m
The radius of an atom is 1×10^{-10} m. Explain the difference in size.

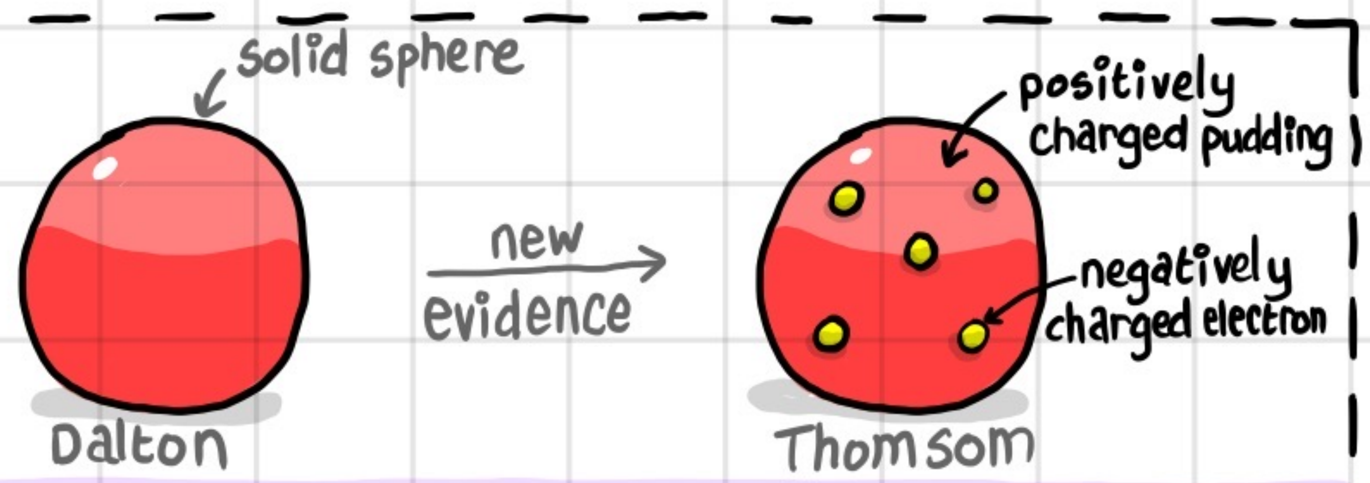
139P



A particle with a +1 charge and a relative mass of 1

Q. Calculate the number of protons in:
i) Carbon-12 ii) Carbon-14

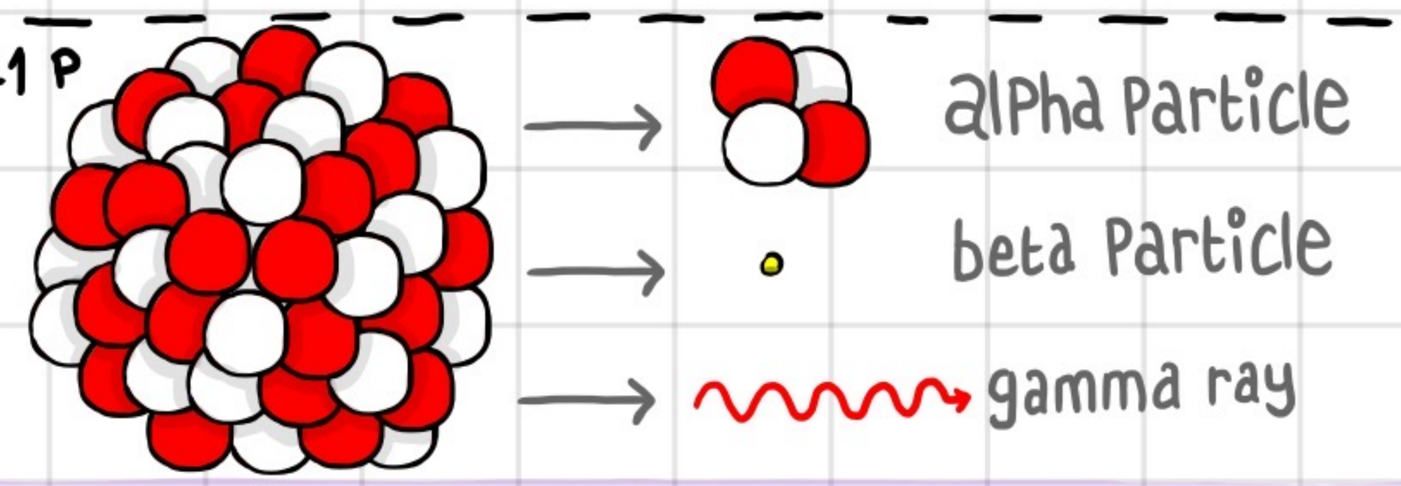
135P



A model of the atom by JJ Thomson after his discovery of electrons.

Q. Describe the 'plum pudding' model of an atom.

141P



The process of producing particles or rays by the random decay of unstable nuclei

Q. Suggest, with reasons, a type of radioactivity to sterilise medical equipment sealed in plastic bags.

140P

Energy emitted from an unstable nucleus in the form of particles or electromagnetic waves

Q. Deduce the radiation emitted from the following: ${}^{14}_{6}C \rightarrow {}^{14}_{7}N$ ${}^{219}_{86}Rn \rightarrow {}^{219}_{86}Rn$ and ${}^{238}_{92}U \rightarrow {}^{234}_{90}Th$

Nucleus
125P

Penetrating power
132P

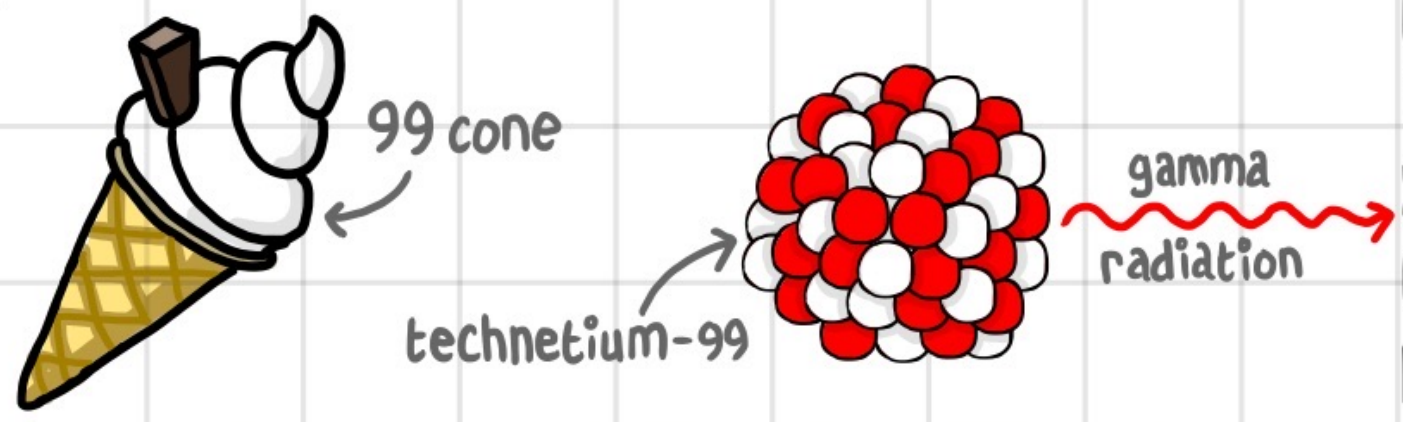
Plum Pudding model
135P

Proton
139P

Radiation
140P

Radioactivity
141P

180 P



A short half life (6 hours) radio-isotope which emits gamma rays

Q. Explain the advantages of using a short half life gamma emitter for medical imaging.

162 P

unit of radiation dose

Sv

Q. Compare the effects of being exposed to high levels of ultraviolet wave radiation and gamma rays.

unit

Sievert

162P

Technetium-99

180P