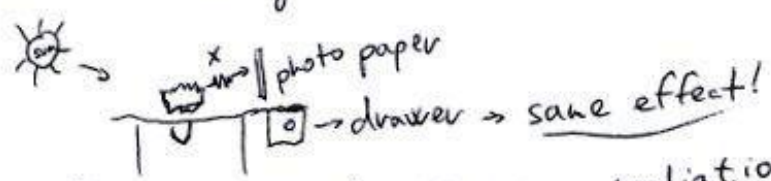


5. Radioactivity

- 1896 Henry Becquerel
 accidentally (looking for X-rays) uranium salts



⇒ Uranium produces some radiation!

- Marie Curie
 → radiations depends just on the amount of uranium
 (no chemical properties, no laboratory conditions)
 → discovered radium, polonium

- Rutherford:
 → it is the activity of nucleus
 (radiation)
 → result of decay or disintegration of unstable nuclei

3 types of radiation:

- alpha (α) → particles: ${}^4_2\text{He}$ nuclei
- beta (β) → particles: e^- or e^+
- gamma (γ) → rays (e-m): high energy photons

properties of nuc. radiation:

type of radiation	alpha particles (α)	beta particles (β)	gamma rays (γ)
	each particle is 2 protons + 2 neutrons (it is identical to a nucleus of helium-4)	each particle is an electron (created when the nucleus decays)	electromagnetic waves similar to X-rays
relative charge compared with charge on proton	+2	-1	0
mass	high, compared with betas	low	-
speed	up to 0.1 × speed of light	up to 0.9 × speed of light	speed of light
ionizing effect	strong	weak	very weak
penetrating effect	not very penetrating: stopped by a thick sheet of paper, or by skin, or by a few centimetres of air	penetrating, but stopped by a few millimetres of aluminium or other metal	very penetrating: never completely stopped, though lead and thick concrete will reduce intensity
effects of fields	deflected by magnetic and electric fields	deflected by magnetic and electric fields	not deflected by magnetic or electric fields

- Which of these three types of radiation
- a) is a form of electromagnetic radiation
 - b) carries positive charge
 - c) is made up of electrons
 - d) travels at the speed of light
 - e) is the most ionizing

- f) can penetrate a thick sheet of lead
 - g) is stopped by skin or thick paper
 - h) has the same properties as X-rays
 - i) is not deflected by an electric or magnetic field?
- 3 What is the difference between the atoms of an isotope that is radioactive and the atoms of an isotope that is not?