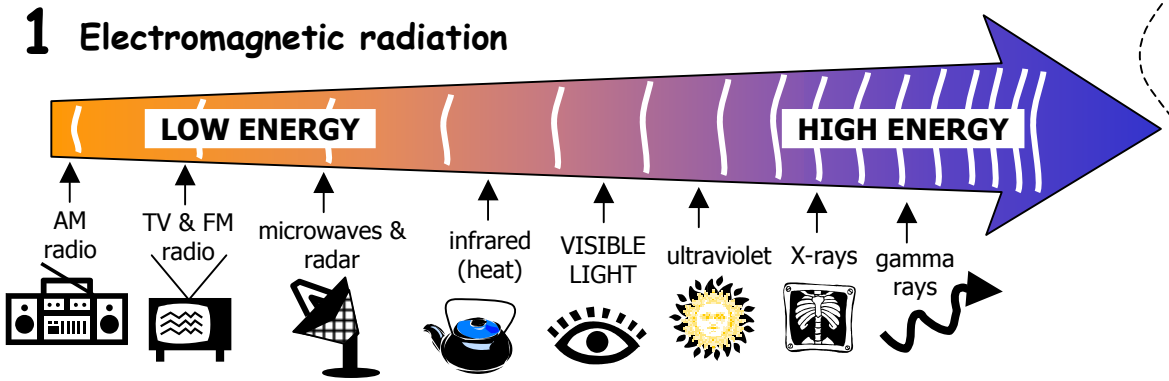
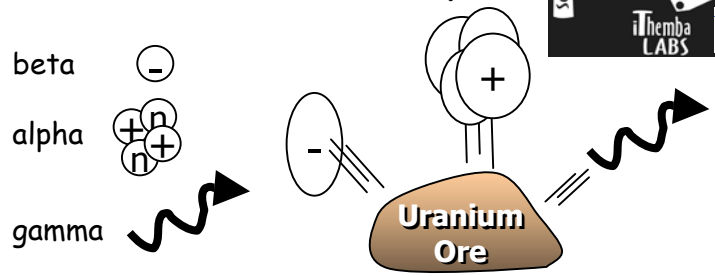
PHAT RADS

1 Electromagnetic radiation



2 Radioactive materials decay



3 Radioactive decay is a random event.

Let us simulate this by throwing some dice. Every time we throw a six we will say that atom decayed and will remove it

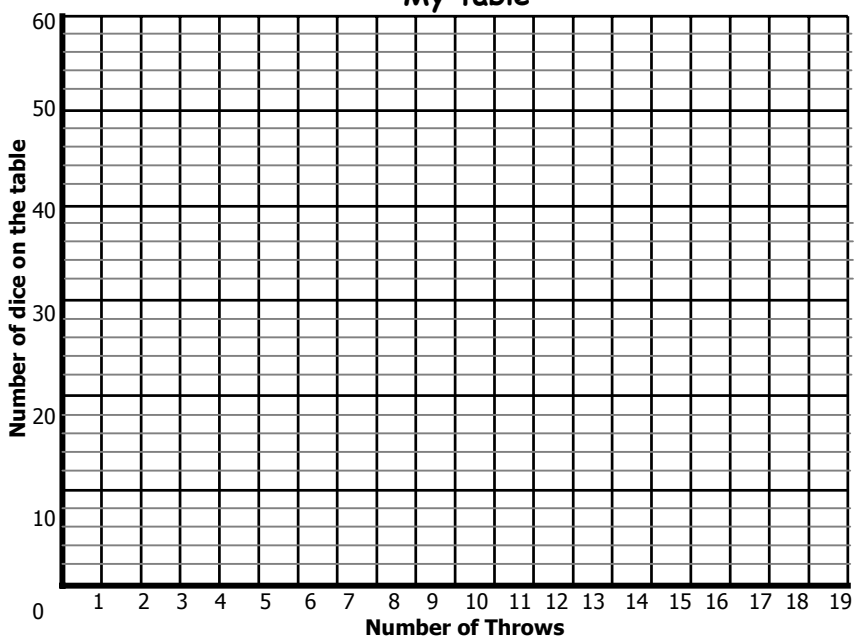
Q. Can we predict if an atom will decay?

Q. Plot the number of sixes thrown against the no.of dice used. Did you expect this?

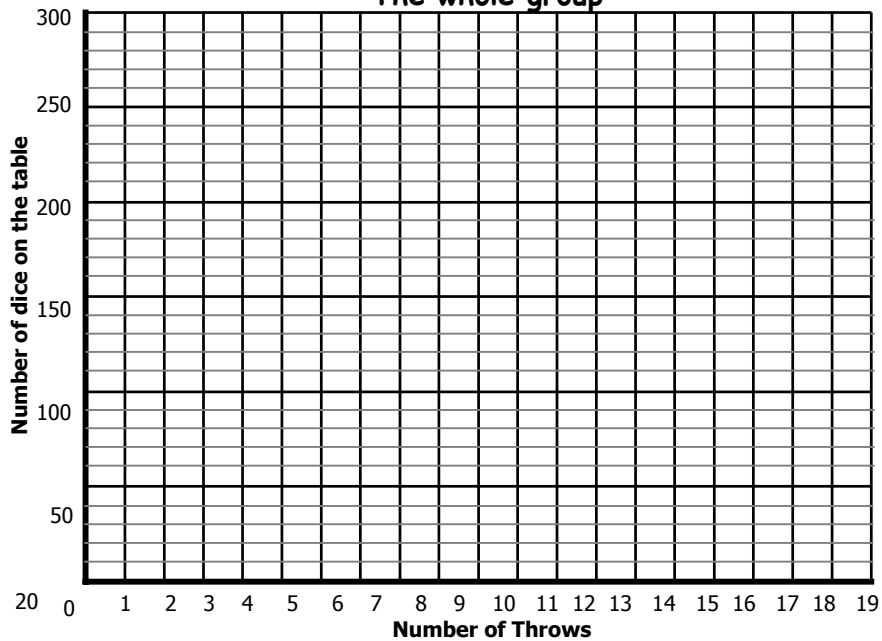
Q. How many throws until we have ½ the dice we started out with? Does this depend on how many dice we start out with? What do you think half-life means?

	My Table		Whole Group	
	No	6's	No.	6's
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

My table



The whole group



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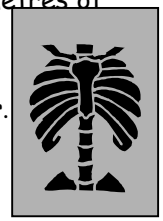
4 Radiation gets stopped or absorbed in matter

Alpha particles get stopped by a sheet of paper, skin, few cm of air.

Beta particles get stopped by aluminium foil, skin, several cm of air

Gamma Rays get stopped by tens of cm of lead, metres of

5 X-Rays are used in medicine



Cut out a skeleton and stick it onto the back of an A4 piece of paper.
Hold this up to the light.
Can you explain how X-rays work?

6 Detecting alpha and beta particles

A gas lamp contains some thorium which is naturally radioactive. It gives off alpha, beta and gamma rays. The detector we use will detect the alpha and beta particles.

Things to do: see how much air is needed to stop the beta particles.

How much paper and how much foil does the same thing?

7 Observing natural cosmic radiation

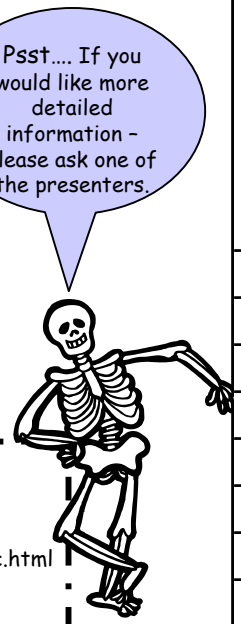
Pour some gassy cooldrink into a container and let it stand until there are only a few bubbles popping up. Throw in a small pinch of salt.

What happens?

We use a similar phenomenon to make clouds around the track left by radiation. This device is called a cloud chamber.

Things to look for:

- Different types of tracks
- The length of the tracks
- Is it possible to build your own cloud chamber?



Websites of interest

ABC's of Nuclear Science – www.lbl.gov/abc
The Particle Adventure – particleadventure.org/particleadventure
Cloud Chambers – www.sciencenet.org.uk/database/Physics/Atomic/p00423c.html
The electromagnetic spectrum – imagine.gsfc.nasa.gov/docs/science/know_l1/emspectrum.html
Background ionizing radiation – www.physics.isu.edu/radinf/natural.htm
Ionizing-radiation smoke detectors – www.howstuffworks.com/smoke2.htm

WHAT IS YOUR ESTIMATED ANNUAL RADIATION DOSE?

Source	Your average Annual Dose (mSv)
Cosmic radiation at sea level (from outer space)	0.28
Terrestrial (from the ground):	0.30
Internal radiation (in your body): From food and water, (e.g., potassium and radon in water)	0.40
From air, (radon)	2.00
Do you wear a plutonium powered pacemaker? If yes, add 1 mSv	
Do you have porcelain crowns or false teeth? If yes, add 0.0007 mSv	
Travel Related Sources: Add 0.005 mSv for each hour in the air	
Are x-ray luggage inspection machines used at your airport? Yes, add 0.00002 mSv	
Do you use a gas camping lantern? If yes, add 0.002 mSv	
Medical Sources X-rays: - Extremity (arm, hand, foot, or leg) add 0.01 mSv - Chest xrays, add 0.06 mSv - Skull/neck, add 0.20 mSv - Upper GI, add 2.45 mSv - Dental xrays, add 0.01 mSv - Pelvis hip, add 0.65 mSv - Barium enema, add 4.05 mSv CAT Scan (head and body), add 1.10 mSv	
Nuclear Medicine (e.g., thyroid scan), add 0.14 mSv	
Miscellaneous Sources: Weapons test fallout	0.01
Do you live in a stone, adobe brick, or concrete building? If yes, add 0.07 mSv	
Do you wear a luminous wristwatch (LCD)? If yes, add 0.0006 mSv	
Do you watch TV? If yes, add 0.01 mSv	
Do you use a computer terminal? If yes, add 0.001 mSv	
Do you have a smoke detector in your home? If yes, add 0.00008 mSv	
Do you live within 80 km of a nuclear power plant? If yes, add 0.0001 mSv	
Do you live within 80 km of a coal fired power plant? If yes, add 0.0003 mSv	
TOTAL YEARLY DOSE (in mSv):	