

# RADIOACTIVE

THE R STEPHEN HAWKING FOUNDATION

# **DART ACTIVITY**

# Complete the following tasks

- 1. Fill in the blank keywords if you are not sure, there are clues on the next page.
- 2. Circle sections in red that describe uses of radioactivity
- 3. Circle sections in green that describe dangers of radioactivity
- 4. Circle sections in **blue** that describe **how** unstable nuclei decay
- 5. Circle sections in **black** that describe **why** unstable nuclei decay

#### Verse 1:

In the middle of every atom you'll find a 1.\_\_\_\_\_ which will be made,

Of protons and neutrons that strongly bind, and most nuclei never will change.

But large nuclei that are bigger than 2. \_\_\_\_\_ can't hold all their protons in place,

And some rare  $\alpha$  have too many neutrons, or not enough, for them to be stable,

They may decay, and radiate particles or high energy 4.\_\_\_\_

\_\_\_\_\_*,* As their nucleus changes, they change their name as their 5.\_\_\_\_\_ does not stay the same.

#### Chorus:

Unstable nuclei randomly 6.

Spit out an alpha or a beta then emit a 7.

They may be dangerous, (watch out!) but we use them every day, yeah.

Radioactive r-radioactive.

#### Verse 2:

Alpha's a 8. \_\_\_\_\_ nucleus, with a charge of plus 2, and it's slow,

It won't 9. \_\_\_\_\_ paper or skin but that makes emitters more dangerous if they are swallowed. Betas are just fast electrons emitted when 10. \_\_\_\_\_ decay so beware,

They can get through your skin, ionise you within, but aluminium can 11. you if you're prepared. Gamma rays may not be so 12.\_\_\_\_\_, but they go through most things in their way, You'll need about one inch of lead to protect all your cells from the rays that may go astray.

### Bridge 1

Ooooh, small amounts can be found almost everywhere,

13. \_\_\_\_\_ can come from food, rocks or space, from nuclear waste and breathed in from the air, Ooooh, this is normal but too much exposure can leave you unwell,

If 14. \_\_\_\_\_ you'll be 15. \_\_\_\_\_ from within causing cancer or killing your cells,

### Verse 3:

are in smoke detectors and saving lives all of the time, Alpha 16.

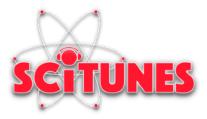
Beta emitters will measure the thickness of paper or foil in a factory line,

Doctors, inject you with gamma emitters, to track stuff that's flowing inside,

If you have a tumour, they may kill it with gamma rays, so that they don't have to cut you with knives.

### Bridge 2:

| Oooh 17.   | _ or decays every second, are 18,             |  |  |  |
|--|---|--|--|--|
| It decreases with time, as fewer unstable nuclei are left to decay 19,                   |   |  |  |  |
| Ooh 20 is t  | the time for it to go down by half naturally, |  |  |  |
| For some isotopes this will be seconds or millions of years if they have more stability. |   |  |  |  |





The Stephen Hawking Foundation

| Each of these words is used once. |           |          |            |         |          |  |  |  |
|-----------------------------------|-----------|----------|------------|---------|----------|--|--|--|
| nucleus                           | radiation | contamin | ated gam   | nma ray | helium   |  |  |  |
| penetrate                         | isotopes  | beque    | erels neu  | trons   | emitters |  |  |  |
| atomic n                          | umber h   | alf-life | irradiated | lead    | activity |  |  |  |
| ionising                          | random    | ly shiel | d EM w     | aves    | decay    |  |  |  |

# Definitions

- 1. The part at the centre of an atom containing protons and neutrons.
- 2. The heaviest element with stable isotopes.
- 3. Types of an element with the same number of protons but a different number of neutrons to other atoms of the same element.
- 4. A wave that can travel through a vacuum at the speed of light.
- 5. Equal to the number of protons in the nucleus of an atom.
- 6. Fall apart.
- 7. An EM wave with a very high frequency.
- 8. The second element on the periodic table.
- 9. To go through something.
- 10. A particle with no charge, found in the nucleus of an atom.
- 11. When a substance absorbs radiation so that it cannot penetrate further.
- 12. Able to knock electrons out of atoms, causing them to become charged.
- 13. Waves or particles that spread out from something.
- 14. When someone has radioactive material inside them.
- 15. Bombarded by radiation.
- 16. A radioactive element that gives out a type of radiation.
- 17. A unit of measurement for radioactivity.
- 18. The number decays given off by a sample per second.
- 19. Unpredictably, without a pattern.
- 20. The time taken for the activity of a sample to decrease by half.