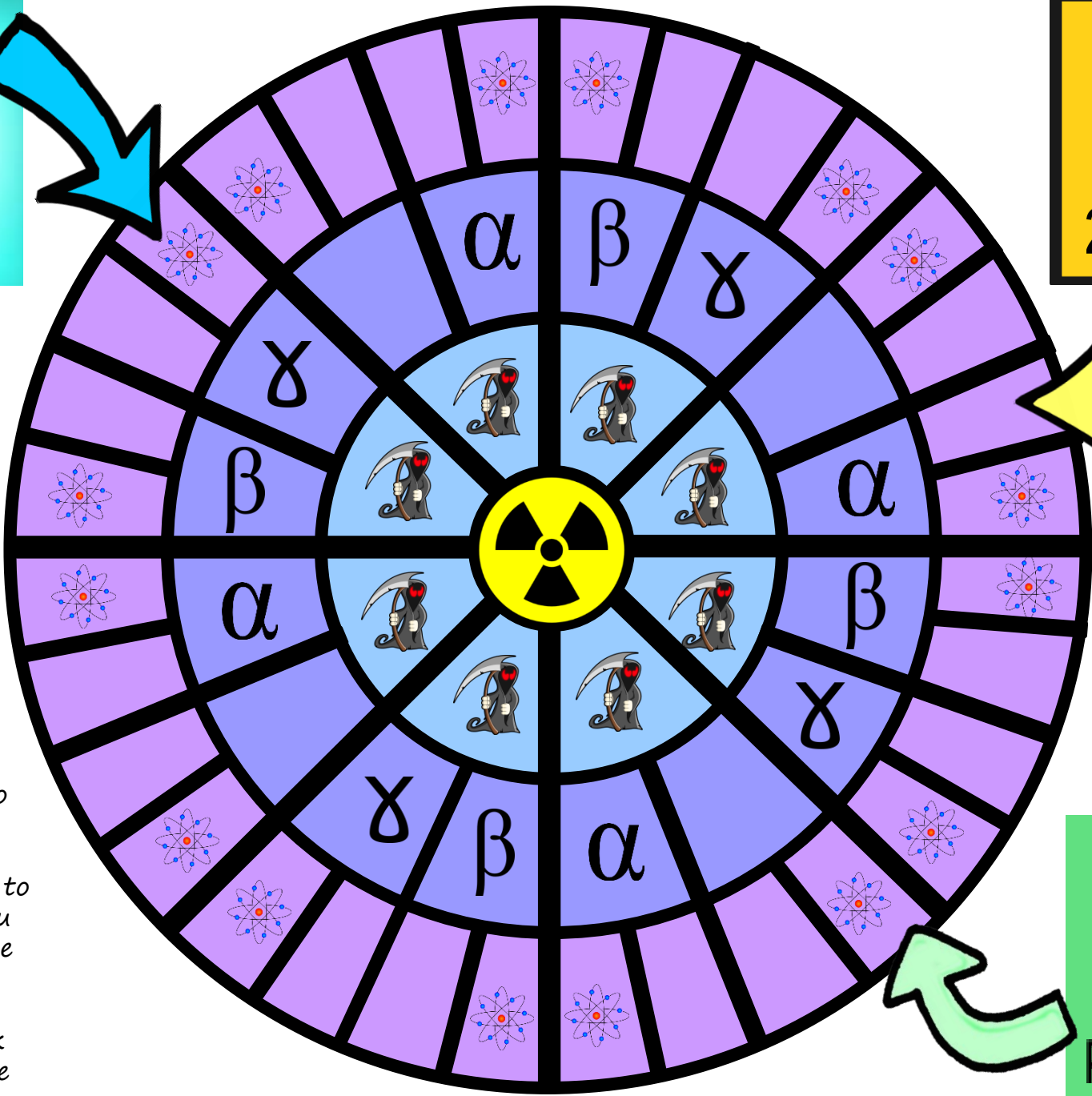
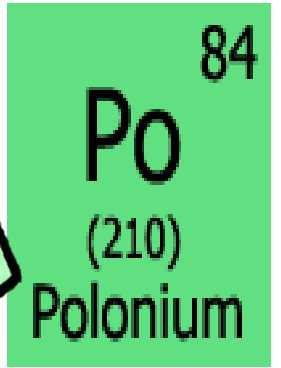
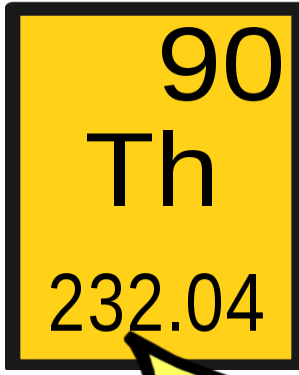
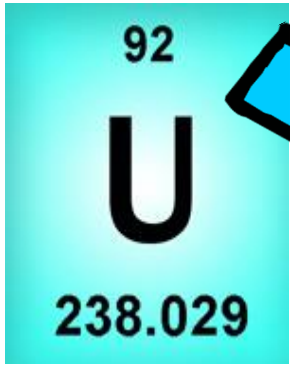


Rules:
 With each statement, vote true or false. If your vote is correct and you can justify your answer, move along the board. If your vote is incorrect, move towards the centre. Drop into the middle and you are out. To win, be the first to go full-circle. You decide if you take the long route around the edge or the fast-track routes nearer the middle.



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FALSE

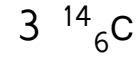


TRUE

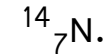


1 The mass number is the total number of protons and electrons.

2 Isotopes are atoms of the same element that have the same atomic number but different mass numbers.



is an isotope of



4 Positive ions are formed when atoms gain electrons.

5 An atom of uranium 238 has 92 protons and 146 neutrons.

6 There are 2 chlorine isotopes in nature, chlorine-35 and chlorine-36. They exist in equal amounts.

7 Henri Becquerel invented radioactivity.

8 A radioactive substance can not be made 'un-radioactive'.

9 Atoms are radioactive when they have too many electrons.

10 There is radiation all around us. This is called background radiation.

11 When a radioactive atom decays, it can emit alpha, beta or delta radiation.

12 Alpha decay means that a radioactive atom emits 2 protons and 2 neutrons.

13 Alpha particles have a 2- charge.

14 When a radium atom decays, it emits an alpha particle from its nucleus.

15 When an atom emits an alpha particle, the mass number decreases by 2 and the atomic number decreases by 4.

16 $^{14}_6\text{C}$
to
 $^{14}_7\text{N}$ represents beta decay.

17 A beta particle is a slow moving electron.

18 During beta decay a proton turns into an electron.

19 The symbol for a beta particle is β_{-1}

20 The symbol for an alpha particle is $^2_4\alpha$.

21 Gamma radiation is a particle.

22 The difference between an alpha particle and a helium atom is that the helium atom also has 2 electrons.

23 An alpha particle has a mass of 4.

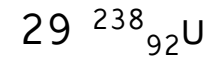
24 A beta particle has a mass of 1.

25 Gamma radiation can travel the furthest.

26 Alpha particles are harmless because they are stopped by dust in the air or paper.

27 Beta radiation is stopped by a thin piece of metal such as aluminium.

28 Gamma radiation is high energy electromagnetic radiation.



to

234_{90}Th
represents gamma decay.

30 Alpha radiation is less ionising than beta radiation.

31 Gamma radiation is the most dangerous type of radiation.

32 A Russian called Alexander Litvinenko died in 2006 because he ingested a beta source.

33 An alpha particle can only travel a few cm because it has such a large mass.

34 People who were trapped in basements when the bomb was dropped on Hiroshima survived because they were protected from alpha radiation by the thick walls.

35 Alpha particles are attracted to positively charged metal plates.

36 Beta particles are attracted to positively charged metal plates.

37 Alpha particles are deflected less than beta particles.

38 If you want to destroy a tumor, you should place a gamma source close to the tumor.

39 During an X-ray, you are given a lead shield to protect your other organs from receiving any X-rays.

1	False- it's the number of protons and neutrons
2	True
3	False- in an isotope the mass number differs not the atomic number
4	False- atoms lose electrons to form positive ions
5	True
6	False- the average atomic mass is 35.5. If the isotopes existed in equal amounts, it would be 36.
7	False- he discovered it
8	True- radioactive atoms decay naturally
9	False- its because the nucleus is unstable
10	True
11	False- alpha, beta or gamma (not delta)
12	True
13	False- the charge is 2+
14	True
15	False- the mass number decreases by 4 and the atomic number by 2
16	True – the mass number remains the same and the atomic number increases by 1 during beta decay.
17	False- it is a fast moving electron
18	False- a neutron turns into a proton and electron
19	True
20	False- mass number 4 and atomic number 2
21	False- it is electromagnetic radiation

22	True
23	True
24	False- electrons have a mass close to 0
25	True
26	False- when ingested they cause the most harm as they cannot escape
27	True
28	True
29	False- its alpha decay because the mass number decreases by 4 and the atomic number by 2
30	False- alpha radiation is most ionising as it has the highest charge
31	False- the mass number decreases by 4 and the atomic number by 2
32	False- it was an alpha source. Beta would have escaped from the body and done less damage.
33	True
34	False- they were protected from the gamma radiation
35	False- because they are positive, they are attracted to negative plates
36	True
37	True (because they are heavier than beta particles)
38	False- gamma radiation would leave the body
39	True