

# Revision Time!

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1. What was the name of the model of the atom suggested by Geiger and Marsden's experiment?
2. Where are the neutrons in an atom?
3. What charge is carried by an electron?
4. How many electrons and protons are there in a neutral atom?
5. Using the Periodic Table, find out the proton number of oxygen and the nucleon number of nitrogen.
6. Complete the sentence: as the mass defect increases, the stability of the atom \_\_\_\_\_.
7. What type of radiation is the most penetrating?
8. What type of radiation is the best ionizer?
9. What type of radiation is negatively charged?
10. What type of radiation is a fast moving electron?
11. What type of radiation is an electromagnetic wave?
12. Carbon-14 has a half-life of 5700 years. What fraction of it's original activity will a sample have after 11400 years?



13. Iodine-132 is used to investigate problems with the thyroid gland, which absorbs iodine. It is a gamma emitter. Explain why the element iodine is chosen.
14. Why is useful that iodine-132 gives out gamma radiation?
15. Iodine-132 has a half-life of 13 hours. Why would it be a problem if the half-life was:
  - i. A lot shorter?
  - ii. A lot longer?
16. Alpha radiation is the most ionizing of radiation. Explain why it is.
17. Imagine that alpha radiation damages a cell on the outside of your body. Why is this less risky than internal damage? Give two reasons.
18. Explain fully how miners developed lung cancers.
19. In what units is radiation dose measured?
20. On what two factors does radiation dose depend?
21. Where do cosmic rays come from?
22. Explain the difference between irradiation and contamination.
23. There is a risk from radon gas building up in houses. Which of these are good ways to reduce the risk?
  - A. stop breathing
  - B. move house
  - C. wear a special gas mask
  - D. adapt the house
24. Which of these will test whether something is radioactive?
  - A. burn it
  - B. put in acid
  - C. put it by a Geiger counter
  - D. look at it through a microscope
25. The count rate of a radioisotope drops from 600 counts per minute to 150 counts per minute in six days. Calculate its half-life.
26. Why does a radioisotope emit radiation?
27. Name three types of radiation a radioisotope may emit.

28. Look at these isotopes:

- carbon-11
- boron-11
- carbon-12
- nitrogen-12

- a) Which two are isotopes of the same element?
- b) Which ones have the same number of particles in the nucleus?
- c) Do any of them have identical nuclei?
- d) A nucleus of carbon-14 has
  - i. How many protons?
  - ii. How many neutrons?

29. A radioisotope has a half-life of four minutes. How long will it take for  $\frac{7}{8}$ ths of a sample of the isotope to decay?

30. What kind of radiation should a source emit if it is to be used for monitoring the thickness of a) card b) sheets of steel?

31. What is the name given to a radioisotope, which is injected into a fluid so that its flow can be monitored?

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search ID: shr0542

"I THINK HE KNOWS SOMETHING THAT WE  
DON'T KNOW ABOUT THE URANIUM MOLECULE."

32. Why should a source, which emits alpha radiation, not be used to check the flow of blood through the body?

33. The treatment of cancer with radiation is called ..... ?

34. Which type of radiation is used to sterilize surgical equipment?

35. Which radioactive isotope of carbon is used to date objects that were once alive?
36. What happens to a nucleus when it undergoes fission?
37. What happens to a nucleus when it undergoes fusion?
38. What is an uncontrolled nuclear reaction?
39. What is a controlled nuclear reaction
40. Name a substance from which control rods in a nuclear reactor are made.
41. How is the energy produced in a nuclear reactor removed?
42. Give an advantage of using nuclear fusion reactions to supply out energy needs.
43. Where are fusion reactions taking place at present?
44. Why are there no fusion power stations?



# CAN YOU EXPLAIN?

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- Proton
- Neutron
- Electron
- Nucleus
- Proton number
- Nucleon number
- Isotopes
- Radiation
- Background radiation
- Natural sources of radiation
- Artificial sources of radiation
- Radioactivity
- Alpha particle
- Beta particle
- Gamma ray
- $E=MC^2$
- Mass defect
- Binding energy
- Half-life
- Fission
- Fusion

# RADIOACTIVITY CROSSWORD



Across		Down	
3	The mass of the alpha particle	1	Half of a radioisotope gone?
5	Name of a radioactivity counter designer	2	Good stopper of ionising radiation!
8	Symbol for the radioactive element proactinium	3	Protons in boron
10	Name of a nuclear fuel element	4	Any charged particle
12	Definitely with radioactive materials!	5	Penetrates where other radiations cannot reach!
14	Only stops alpha radiation	6	Surname of a famous scientist
15	Radioactive gas from minerals underground	7	Radioactivity results from this sort of change
18	1cm of it stops most beta radiation	8	Symbol of a deadly radioactive element with 94 protons
20	Mass 1/200 and charge -1	9	Big molecules, but they don't like radiation!
22	X has a half-life of 5 days. So what g of X is left of 32g after 20 days.	11	Cant get through paper
23	The result of too high a dose of radiation	13	These sort of atoms give out radiation
26	In a radiation badge monitor	16	Mass of 1 and an electric field has no effect on it
27	Not the part of the sea to dump nuclear waste	17	Symbol for the element named in honour of Marie Curie
28	The +ve charge on an alpha particle	19	If you don't keep radioisotopes behind this, you will end up in a coffin of it!
32	This process splits atoms in a nuclear reactor releasing lots of energy	20	Symbolic of boron and the start of the 103 <sup>rd</sup> element
33	Radio-isotopes used in medicine	21	Means "given out" e.g. atomic radiation
35	The number of neutrons in boron-11	23	These are easily damaged or killed by radiation
36	Protons + neutrons in nucleus	24	Scene of terrible nuclear disaster in Russia
40	Radiation all around us	25	Chemical symbol for a very "radiant" radioactive element discovered by Marie Curie
41	A good gamma emitter with a mass of 60 used in cancer treatment	29	Tungsten oxide?
43	The first city in the world to be devastated by an atomic bomb	30	No mass and no charge but plenty of effect
45	Describes a beta particle in one word!	31	An alpha particle has 1 proton and 2 neutrons. Right or wrong?
46	After 21 minutes only 1/8 <sup>th</sup> was left, so what's the half-life in minutes?	34	"ello" that Geiger counter detects radiation!
		37	In 24 minutes the count rate of a radioisotope fell from 6000 cpm to 375 cpm. What is its half-life in minutes?
		38	What atomic radiation can do to particles
		39	This is how a biologist might describe what happens to radioactive atoms!
		42	Neutrons in an alpha particle
		44	A lot of fusion going on here!

## Answers to Radioactivity Crossword.

	Across		Down
3	four	1	life
5	geiger	2	lead
8	Pa	3	five
10	uranium	4	ion
12	Danger	5	gamma
14	Paper	6	rutherford
15	radon	7	nuclear
18	aluminium	8	Pu
20	beta	9	DNA
22	two	11	alpha
23	cancer	13	radioactive
26	film	16	neutrons
27	bed	17	Cm
28	two	19	lead
32	fission	20	Bi
33	tracer	21	emission
35	six	23	cells
36	mass	24	chernobyl
40	background	25	Ra
41	cobalt	29	WO
43	Hiroshima	30	gamma
45	electron	31	Wrong
46	seven	34	Click
		37	six
		38	ionise
		39	decay
		42	two
		44	sun

## Answers to Questions

1. (nuclear atom)
2. (nucleus)
3. (-1)
4. (same number)
5. (8, 14)
6. (increases)
1. (gamma)
8. (alpha)
9. (beta)
1. (beta)
11. (gamma)
12. (half)
25. (3 days)
26. (to become more stable)
27. (alpha, beta, gamma)
28. (carbon-11/12); ( $C^{11}$  &  $B^{11}$ ); (no); (6); (8)
29. (12 minutes)
30. (a-beta, b-gamma)
31. (tracer)
32. (it causes cell damage)
33. (radiotherapy)
34. gamma)
35. ( $C^{14}$ )
36. (spills)
37. (joins with another nucleus)
38. (energy released too quickly)
39. (energy released at a steady rate)
40. (boron)
41. (using pressurized water)
42. (cleaner- no radioactive waste)
43. (sun)
44. (too high a starting temperature for the reaction)