

P2 Radioactivity Quiz

1. Name one man-made source of background radiation.

Nuclear power stations, nuclear weapons testing, nuclear accidents, radiotherapy, X-rays

2. What are isotopes?

Atoms of the same element with the same atomic number but different mass numbers.
(Same number of protons but different number of neutrons)

3. What is the plum pudding model of an atom?

The mass is evenly distributed and positive particles are spread throughout the atom.
Electrons are embedded in the mass of positive charges.

4. What did the gold foil experiment reveal about the atomic structure?

The atom is mainly empty space with a tiny positive nucleus that is surrounded by negative electrons which orbit the nucleus at some distance

5. Define half-life.

Time taken for the count rate to decrease by half

6. What type of radioactive isotope would be most suitable for irradiating food?

A gamma emitter to pass through the food packaging. One with a long half-life so the level of radiation is constant over a number of years

7. Why are some people worried about eating irradiated foods?

They think it might cause cancer or illness

8. Why does beta decay not cause a change in mass number?

A neutron is converted into a proton and electron. The proton has the same mass as the neutron. Only the atomic number increases by one.

9. What is alpha decay?

When a helium nucleus, made of two protons and two neutrons, is emitted from the nucleus of an atom. The mass number decreases by four and the atomic number by two.

10. Which type of radiation should be used to control the thickness of aluminium sheets?

Beta, as alpha would never penetrate and with gamma the count rate would remain unchanged even if the thickness changed

11. Define radioactive.

An unstable nucleus that decays

12. Alpha particles are unlikely to cause harm outside the body but are likely to kill if inside the body. Why?

Alpha particles cannot penetrate into the body. As they are the most ionising, they damage cells and tissues, cause cancer, DNA mutations, kill cells once inside the body

13. How does a smoke detector work?

A radioactive source emits alpha particles which ionise the air inside a sensor which causes a small electric current. Smoke getting into the sensor changes the current which sets off an alarm. Beta or gamma emitters are not used as neither particle would be stopped by smoke

14. Which two types of radiation would pass through a sheet of card?

Beta and gamma

15. Which two types of radiation would be deflected by an electric field?

Alpha and beta

16. Which type of radiation has the greatest range in air?

Gamma

17. Give two reasons to justify the use of nuclear power stations.

No greenhouse gases produced, a lot of energy produced for a small mass of fuel, reliable, only a small volume of waste produced

18. Which type of radioactive isotope would a doctor inject into a patient's bloodstream?

A gamma emitter with a short half-life as gamma rays are least dangerous inside the body, can penetrate the body and be picked up by a tracer; short half-life so safe levels are soon reached

19. What is used inside a badge that monitors radiation?

Photographic paper/X ray film which goes darker as the level of radiation increases

20. What makes thorium and uranium different elements?

The different number of protons inside the nucleus

21. What is a beta particle?

A fast moving electron

22. Why are people worried about radioactive waste that is buried underground?

Increased risk of illness or cancer for people who live nearby especially if there is a leakage as safe levels are not reached for hundreds or thousands of years

23. How does fission of uranium nuclei take place in nuclear reactors?

A uranium atom is hit by a neutron. The uranium nucleus splits into smaller nuclei and releases further neutrons and energy. The released neutrons go on to cause further fission and large amounts of energy

24. What is the role of control rods inside a nuclear reactor?

To absorb excess neutrons so that the chain reaction slows down or is stopped

25. List natural sources of background radiation.

Radon gas, rocks, food and drink, cosmic rays

26. How do you stop gamma rays?

With several metres of lead or concrete

27. How do you stop beta particles?

Approximately 3mm of aluminium