Edexcel GCSE Physics

Topic 6.28P-6.35P - Using Radiation

Flashcards

Give example uses of radioactivity.

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- Household fire alarms (smoke)
- Irradiating food
- Sterilisation of equipment
- Tracing and gauging thicknesses of materials
- Diagnosis and treatment of cancer

How do smoke alarms work?

How do smoke alarms work?

- A radioactive substance is in the alarm which emits alpha radiation
- The emitted alpha particle ionises the air in the detector and causes a current to flow between the plates
- When smoke interferes with the radiation, the air is no longer ionised and so no current can flow
- This reduction in current flow triggers the alarm

State **two** uses of nuclear radiation in the field of medicine.

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1. Examining of internal organs
2. Radiotherapy in the treatment of cancer

What is the role of beta radiation in tracers?

What is the role of beta radiation in tracers?

- The tracer is inserted in your body, and targets a specific part of the body
- The radioactive substance in the tracer releases beta radiation which can be detected by external machines

How is beta radiation used to determine thickness?

How is beta radiation used to determine thickness?

- A beta source is placed above the material and a detector is placed below it
- If there is an increase in radiation detected by the detector, too much radiation is passing through the material, and so it is too thin
- If there is a decrease in radiation is detected, then the material blocks too much radiation, and so it is too thick

Why is ionising radiation dangerous?

Why is ionising radiation dangerous?

- It can damage tissue and kill cells
  - It can cause cell mutations

What is a consequence of cell mutation?

What is a consequence of cell mutation?

Cancer.

What precautions should people take when using ionising radiation?

What precautions should people take when using ionising radiation?

- Avoid handling the source directly (use tongs)
- Wear radiation protective clothing
- Keep the radiation in lead containers to reduce the amount of radiation that can escape
- Keep exposure time to a minimum

Does a long half life or a short half life make a source more dangerous?

Does a long half life or a short half life make a source more dangerous?

If it has a long half life then it would remain highly radioactive for longer therefore making it more dangerous.

What precautions are taken to reduce harm for doctors and patients using ionising radiation?

What precautions are taken to reduce harm for doctors and patients using ionising radiation?

- Only a small dose is given to the patient so they are not exposed to too much.
- The radiation used has a short half life so it won't remain highly radioactive for long. This reduces the risk to the doctors using it as well as the patient.
- Doctors and patients (when applicable) wear protective clothing

What is radioactive contamination?

What is radioactive contamination?

The presence of unwanted radioactive nuclei on other materials.

What is irradiation?

What is irradiation?

- The process of exposing a material to nuclear radiation
- The material does **not** become radioactive

How is a radioactive tracer used in medicine?

How is a radioactive tracer used in medicine?

- The tracer is placed inside the body (it can be in a drink, eaten or injected)
- The tracer releases gamma radiation which is detected by a detector which moves around the body
- This can then be used to produce a picture of the patient's body

How does a PET scanner work?

How does a PET scanner work?

- PET (positron emission tomography) uses a tracer, which is injected into the patient's body
- The scanner detects the gamma rays which are released by the trace
- Multiple images are taken and this is used to form a 3D image of the patient's body

Isotopes are used in PET scanners. What is important about where they are produced and why?

Isotopes are used in PET scanners. What is important about where they are produced and why?

They must be produced near the hospital because the isotopes used have a short half life so must be used soon after production.