GRAYS TUITION CENTRE – Online Tutoring

WEEK: 15

Week Beginning: 29/06/20

Subject: SCIENCE

Year: GCSE

Lesson Objective:

- To understand the risks associated with using radiation
- To understand what is meant by irradiation and contamination
- To be able to explain the seriousness of Irradiation and Contamination depending on the radioactive source

Keywords/ Concepts

- **Radiation**
- **Irradiation**
- **Contamination**

Class Worksheets

- CGP Worksheet: Irradiation and Contamination

Homework

- Revision Resources on Irradiation and Contamination

Additional Notes

Irradiation and Contamination

Time to find out how to reduce the risks associated with working with radioactive sources.

There are Risks to Using Radiation

Ionising radiation can enter living cells and ionise atoms within them. This can damage the cells (which can cause things like cancer) or kill them off completely. That's why it's important that you know the precautions to take when working with any sources of radiation.

Exposure to Radiation is called Irradiation

1) Objects near a radioactive source are irradiated by it. This simply means they're exposed to it.
2) Irradiating something does not make it radioactive (and won't turn you into a superhero).
3) Keeping sources in lead-lined boxes and standing behind barriers when using sources are common ways of reducing the effects of irradiation.
4) In some industries, the source may be in a different room and remote-controlled arms are used to handle it.

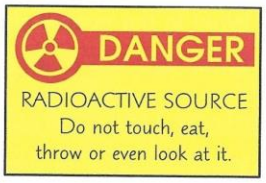
Contamination is Radioactive Particles Getting onto Objects

1) If unwanted radioactive atoms get onto or into an object, the object is said to be contaminated. E.g. if you touch a radioactive source without wearing gloves, your hands would be contaminated.
2) These contaminating atoms might then decay, releasing radiation which could cause you harm.
3) Contamination is especially dangerous because radioactive particles could get inside your body.
4) Gloves and tongs should be used when handling sources, to avoid particles getting stuck to your skin or under your nails.
5) Some industrial workers wear protective suits to stop them breathing in particles.

The Seriousness of Irradiation and Contamination Depends on the Source

Contamination or irradiation can cause different amounts of harm, based on the radiation type.

1) Outside the body, beta and gamma sources are the most dangerous.
2) This is because beta and gamma can penetrate the body and get to the delicate organs.
3) Alpha is less dangerous because it can't penetrate the skin and is easily blocked by a small air gap (p.196).
4) High levels of irradiation from all sources are dangerous, but especially from ones that emit beta and gamma.
5) Inside the body, alpha sources are the most dangerous, because they do all their damage in a very localised area. So contamination, rather than irradiation, is the major concern when working with alpha sources.



6) Beta sources are less damaging inside the body, as radiation is absorbed over a wider area, and some passes out of the body altogether. Gamma sources are the least dangerous inside the body, as they mostly pass straight out — they have the lowest ionising power, p.196.

The more we understand how different types of radiation affect our bodies, the better we can protect ourselves when using them. This is why it's so important that research about this is published. The data is peer-reviewed (see p.1) and can quickly become accepted, leading to many improvements in our use of radioactive sources.

Top tip number 364 — if something is radioactive, don't lick it...

Make sure you can describe how to prevent irradiation and contamination, and why it's so important that you do.

Q1 State one way of preventing irradiation. [1 mark]

Q2 For a gamma source, is contamination or irradiation a larger concern? [1 mark]

Irradiation and Contamination

1 Workers in a nuclear power station take many precautions to prevent unnecessary exposure to radiation. Suggest **two** methods that could be used to reduce their exposure to radiation when dealing with highly radioactive substances.

Grade 4-6

1. .....

2. .....

[Total 2 marks]

2 A scientist is reviewing the safety procedures to be used in her lab. She is concerned about **contamination** and **irradiation**.

Grade 6-7

2.1 Explain the difference between contamination and irradiation.

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[2]

2.2 Give **two** ways in which the scientist can protect herself against contamination when handling a radioactive sample with a low activity.

1. .....

2. .....

[2]

[Total 5 marks]

3* Radium-226 is an alpha source that was used in clocks until the 1960s to make the hands and numbers glow. Explain whether a clockmaker should be more concerned about irradiation or contamination when repairing old clocks that contain radium.

Grade 7-9

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[Total 6 marks]