

OCR (B) Physics GCSE

Topic 1.1 - What are the Risks and Benefits of Using Ionising Radiation?

Flashcards

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List the order of the electromagnetic spectrum in order of increasing wavelength



List the order of the electromagnetic spectrum in order of increasing wavelength

Gamma, X Ray, UV, Visible, Infrared,
Microwaves, Radio



What is the highest frequency electromagnetic wave?



What is the highest frequency electromagnetic wave?

Gamma waves



What is the highest energy
electromagnetic wave?



What is the highest energy electromagnetic wave?

Gamma waves



What properties are shared by all electromagnetic waves?



What properties are shared by all electromagnetic waves?

- They are all transverse waves
- They all travel at the same speed
(3×10^8 m/s)
- They can travel through a vacuum



A wave transmits energy from...



A wave transmits energy from...

...source to absorber.

e.g. from a light source to the eye



What range of frequencies of electromagnetic waves can be detected by the human eye?



What range of frequencies of electromagnetic waves can be detected by the human eye?

400-700 nanometres



What can happen when radiation strikes an object?



What can happen when radiation strikes an object?

It can be...

- transmitted
- reflected
- absorbed



When low energy radiation is absorbed,
it usually causes...



When low energy radiation is absorbed by an object,
it usually causes...

Heating



When high energy radiation is absorbed,
it can lead to...



When high energy radiation is absorbed, it can lead to...

Ionisation (the removal of electrons from atoms/molecules).



How are electrons arranged in atoms?



How are electrons arranged in atoms?

Electrons are found in 'energy levels' or 'shells' at different distances from the nucleus.



How does electromagnetic radiation affect electron arrangement in atoms?



How does electromagnetic radiation affect electron arrangement in atoms?

Absorption or emission of electromagnetic radiation can cause electron arrangement to change. (It can remove electrons from the atom or move electrons further from the nucleus).



How do atoms become ions?



How do atoms become ions?

By losing an outer electron.



What are the effects of body cells absorbing radiation?



What are the effects of body cells absorbing radiation?

Large amounts can damage cells.
Smaller amounts cause mutation, causing cells to divide rapidly, which can lead to **cancer**.



Gamma rays are emitted from...



Gamma rays are emitted from...

The nuclei of atoms.



What is emitted when electrons in atoms lose energy?



What is emitted when electrons in atoms lose energy?

X rays, UV and visible light



What types of radiation can cause ionisation?



What types of radiation can cause ionisation?

Gamma, X-rays and high energy UV (as these have sufficient energy).



Atmospheric oxygen interacts with
ultraviolet radiation to produce...



Atmospheric oxygen interacts with ultraviolet radiation to produce...

Ozone.



Describe the function of atmospheric ozone.



Describe the function of atmospheric ozone.

Ozone absorbs UV radiation from the sun, protecting the Earth and living organisms from harmful rays.



How does infrared radiation interact with molecules?



How does infrared radiation interact with molecules?

It is emitted and absorbed by molecules.



How does UV radiation affect body tissue?



How does UV radiation affect body tissue?

UV radiation can cause cancer when skin is exposed to it.

It can cause blindness if eyes are overexposed to UV radiation.



How do X-rays affect body tissue?



How do X-rays affect body tissue?

X-rays are ionising so they can damage or kill cells and cause mutations that could lead to cancer.



How do gamma rays affect body tissue?



How do gamma rays affect body tissue?

Gamma rays are even more ionising than X-rays, so they can cause cell mutations (which can lead to cancer) and cell death.



How are radio waves produced? (Higher)



How are radio waves produced? (Higher)

When there is an oscillating current in an electrical circuit.



How are radio waves detected? (Higher)



How are radio waves detected? (Higher)

When the waves cause an oscillating current in a conductor.



State and explain a use of radio waves



State a use of radio waves

Communications, because radio waves are long wavelength and can travel long distances without losing quality.



State and explain a use of microwaves



State and explain a use of microwaves

Cooking, as microwaves are absorbed by and heat fat/water in foods.



State and explain uses of infrared radiation



State and explain uses of infrared radiation

Cooking food (as it transfers thermal energy) infrared cameras, short range communication.



State and explain uses of visible radiation



State and explain uses of infrared radiation

Illuminating (i.e. seeing) and fibre optics, as they reflect best in glass (other waves have wavelengths that are too long/short).



State and explain uses of UV radiation



State and explain uses of UV radiation

Sterilisation, as it kills bacteria, energy efficient lamps, as it radiates low heat but high energy, and sun tanning etc.



State and explain uses of X rays



State and explain uses of X rays

Medical imaging and treatment, because they are very high energy and can easily penetrate body tissues.



State and explain uses of gamma rays



State and explain uses of gamma rays

Gamma rays are used in medical treatments, such as radiotherapy in the treatment of cancer.

