

**AS90732 Version 2**

**Describe selected properties and applications of EMR, radioactive decay, sound and ultrasound**

**Level 3, 4 Credits**

This achievement standard involves describing selected properties and applications of electromagnetic radiation (EMR), radioactive decay, sound and ultrasound, and solving related problems using formulae, graphs and diagrams.

Achievement	Achievement with Merit	Achievement with Excellence
Describe selected properties and applications of EMR, radioactive decay, sound and ultrasound.	Explain selected properties and applications of EMR, radioactive decay, sound and ultrasound.	Discuss selected properties and applications of EMR, radioactive decay, sound and ultrasound.

Properties will be selected from

**EMR**

- wave propagation
- wave type
- wavelength
- frequency
- period
- wave velocity
- amplitude
- two point source interference
- reflection
- refraction
- diffraction
- EMR spectrum
- absorption

Applications will be limited to the aspects of the application, which relate to the properties, e.g.

- shadows and eclipses
  - types of shadows
  - types of eclipses
  - effect of size of light source
- radio wave transmission
  - AM & FM
- radio receivers
  - aerials
- microwave oven
  - need for water
  - function of metal walls
  - function of metal mesh in doors
- optical, radio and infrared telescopes
- photographic imaging in different parts of the spectrum
  - x-rays of luggage
- medical diagnosis and treatment
  - different parts of body absorbing X-rays in varying degrees
- radar
- speed guns
- remote controls
  - IR
  - RF

□ The description, explanation and discussion of properties and applications of the phenomena will also involve solving problems using formulae, graphs or diagrams. Recall and use of the following formulae is expected:

- $c = f \lambda$
- $v = f \lambda$
- $v = d / t$
- $f = 1 / T$
- If other formulae are required, they will be provided

□ **Radioactive decay**

- alpha particles
- beta particles
- gamma rays
- conservation of atomic and mass number in alpha, beta and gamma decay
- half life
- isotopes
- ionisation
- penetration

□ Applications will be limited to the aspects of the application, which relate to the properties, e.g.

- Geiger counters
  - radiation therapy
- radiometric dating
  - estimating age of wood & fossils
  - why dating may not be accurate
- irradiation of food
- sterilisation
  - medical instruments
- medical diagnosis and treatment
  - as tracers
- smoke detectors
  - use of americium
  - penetrating power
  - ionising potential
- density and thickness measurements
  - inspecting welding joints
  - thickness of sheets

□ **Sound and ultrasound**

- wave propagation
- wave type
  - transverse
  - longitudinal
- wavelength
- frequency
- period
- wave velocity in different media
- amplitude
- pitch
- loudness
- reflection
  - echo location e.g. use by bats & in “fish finders”
  - effect of different surfaces – soundproofing (absorption, reflection)
  - ultrasound to detect kidney or gall stones
- diffraction
- transmission
- absorption

□ Applications will be limited to the aspects of the application, which relate to the properties, e.g.

- acoustics
- ultrasound scanning
- Doppler effect
- animal communication

- The description, explanation and discussion of properties and applications of the phenomena will also involve solving problems using formulae, graphs or diagrams. Recall and use of the following formulae is expected:
  - $c = f \lambda$
  - $v = f \lambda$
  - $v = d / t$
  - $f = 1 / T$
  - If other formulae are required, they will be provided
  
- Use of graphs or diagrams could include reading information directly from graphs (including interpolation and extrapolation), drawing graphs from given information, or extracting information from a diagram.
  
- Standard form, correct units and sensible rounding is expected in solving problems.

#### Terms

*Describe* requires the student to recognise, name, draw, give characteristics of or an account of.

*Explain* requires the student to provide a reason as to how or why something occurs.

*Discuss* requires the student to show understanding by linking scientific ideas. It may involve students in justifying, relating, evaluating, comparing and contrasting, analysing.