GET BETTER AT PHYSICS · MARK SCHEME

# Damping & Resonance: tiered multiple choice

Edexcel IAL Physics · Unit 5 (WPH15) · Specification points 148, 151–153 · 5 questions · 5 marks

1 mark per correct letter | Worked reasoning for every question

**How students did** = from Pearson examiner reports, where available

## Answer key

| Q1 | Q2 | Q3 | Q4 | Q5 |
|---|---|---|---|---|
| B | D | C | D | A |

## Easy

Questions 1–5

**1** **B**

What happens at resonance · Edexcel IAL June 2025 · Unit 5 · Q2

At resonance the driving frequency equals the natural frequency, the amplitude is a maximum and energy is transferred to the oscillator most efficiently. The mass oscillates at the driving frequency; its frequency is not at a 'maximum'.

**2** **D**

Why ductile materials help in earthquakes · Edexcel IAL January 2025 · Unit 5 · Q2

A ductile material can undergo a lot of plastic deformation. Plastic deformation absorbs energy from the oscillations (it is not returned), so the amplitude of the forced oscillations is reduced.

**How students did:** Examiners reported that more than 70% of students got this right in January 2025.

**3** **C**

Amplitude when the energy of oscillation quadruples · Edexcel IAL January 2021 · Unit 5 · Q5

The energy of an oscillation is proportional to the amplitude squared ($E = \frac{1}{2}kA^2$). If the energy increases by a factor of 4, the amplitude increases by $\sqrt{4} = 2$.

**How students did:** 66% of students got this right in January 2021.

**4** **D**

Effect of adding mass to a damped paper cone · Edexcel IAL January 2025 · Unit 5 · Q8

The air resistance on the cone is unchanged, but the heavier pendulum has more energy for the same amplitude. Air resistance removes a smaller fraction of its energy each swing, so the amplitude decreases more slowly. The period of a simple pendulum does not depend on its mass.

**How students did:** Examiners reported that fewer than 70% of students got this right in January 2025. Examiners thought many students had not met this damped-pendulum situation before.

**5** **A**

Why steel frames absorb earthquake energy · Edexcel IAL October 2024 · Unit 5 · Q2

Steel is ductile: it can deform plastically. Plastic deformation does work on the material and the energy is not returned, so energy is removed from the building's oscillations.

**How students did:** Examiners reported that fewer than 60% of students got this right in October 2024.

**End of mark scheme.** Answers from Pearson's published mark schemes; explanations written for this pack. Pearson Edexcel material is © Pearson Education Ltd. More free packs and 1-to-1 tuition: **www.getbetteratphysics.co.uk**

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