



QUESTION WORKBOOK

Forced vibrations and resonance

Periodic motion · Year 13

AQA 3.6.1.4 · CIE 17.3 · OCR A 5.3.3

10 questions · 30 marks

NAVY SCREEN EDITION

SECTION A · Warm-up

A1 Distinguish between free vibrations and forced vibrations. [2]

A2 Define resonance. [2]

A3 State the condition for resonance to occur. [2]

SECTION B · Standard

B1 A mass–spring system has a spring constant of 100 N m^{-1} and a mass of 0.25 kg . Calculate its natural frequency, and state the driving frequency that would cause resonance. [3]

- B2** Sketch and describe how the amplitude of a driven system varies with driving frequency. [3]

- B3** A simple pendulum of length 0.50 m is used as a driven oscillator ($g = 9.81 \text{ m s}^{-2}$). Calculate its natural frequency, and state the driving frequency needed for resonance. [4]

- B4** Describe how increasing the amount of damping changes the resonance peak. [3]

SECTION C · Stretch

- C1** A system has a natural frequency of 50 Hz. Describe what happens to its amplitude as the driving frequency is slowly increased from well below 50 Hz to well above it. [4]

C2 Explain why resonance can be dangerous for a structure such as a bridge, and state one way engineers reduce the risk. [4]

C3 Give one useful example and one problematic example of resonance. [3]
