FREE REVISION PACK

# Alternating Current & Oscilloscopes

AQA A-level Physics · 7408 · Specification 3.7.5.5

Easy | Medium | Hard | Multiple choice · past-paper questions

| 6 | 6 | ≈ 10 min |
|---|---|---|
| QUESTIONS | TOTAL MARKS | SUGGESTED TIME* |

## Contents


| Q | LEVEL | FOCUS | SOURCE | MARKS |
|---|---|---|---|---|
| 1 | Easy | Frequency and phase from two traces | AQA June 2024 · A-level Paper 2 · Q14 | 1 mark |
| 2 | Easy | Choosing the volts per division | AQA June 2024 · A-level Paper 2 · Q13 | 1 mark |
| 3 | Easy | rms voltage and frequency from a trace | AQA June 2019 · A-level Paper 2 · Q29 | 1 mark |
| 4 | Medium | Mean power from an rms current | AQA November 2021 · A-level Paper 2 · Q24 | 1 mark |
| 5 | Hard | Peak and peak-to-peak mains voltage | AQA November 2021 · A-level Paper 2 · Q23 | 1 mark |
| 6 | Hard | ac power in a bigger resistor | AQA June 2022 · A-level Paper 2 · Q24 | 1 mark |


**Key ideas to have ready**

- For a sinusoidal ac: $V_{rms} = V_0 / \sqrt{2}$ and $I_{rms} = I_0 / \sqrt{2}$. Peak-to-peak = 2 × peak.
- Mean power in a resistor = $I_{rms}^2 R = V_{rms}^2 / R = \frac{1}{2} I_0^2 R$. UK mains 230 V is an rms value.
- Oscilloscope: period = number of horizontal divisions × time-base setting; f = 1/T. Peak voltage = vertical divisions × Y-gain.
- Phase difference between two traces = (horizontal offset ÷ period) × 2π.

**How to use this pack**

1. The questions are grouped into levels (Easy, Medium and Hard). Work through them in order, and check your answers at the end of each level before moving on.
2. Every question is multiple choice with one correct answer. Write down your working anyway; that is how you find mistakes.
3. The separate mark scheme uses the same numbers and explains every answer.

Levels are based on how students did in AQA's examiner reports where that information exists, plus our own difficulty rating. *About 1.5 minutes per question.

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## Easy

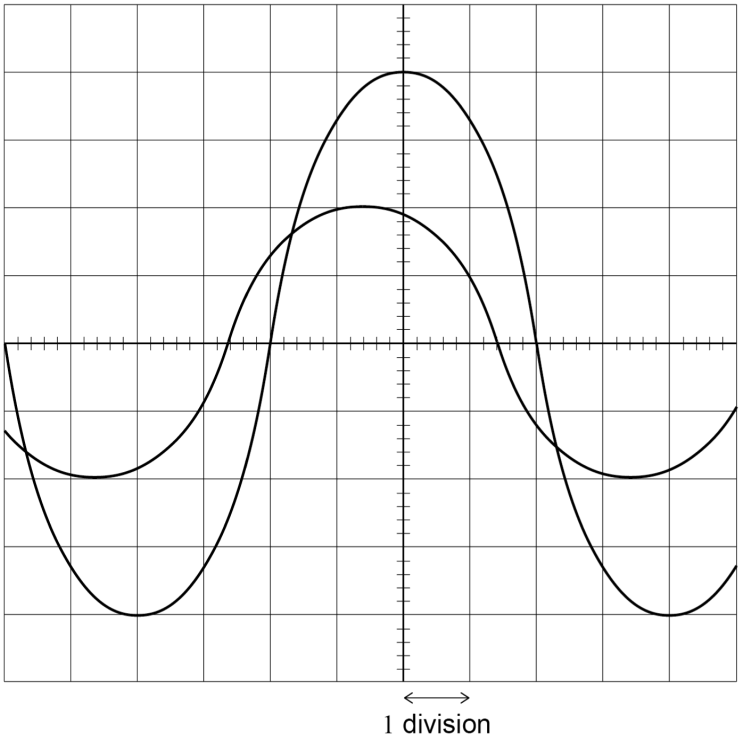
Definitions and one-step ideas. Most students get these right.

Questions 1–3

Only **one** answer per question is allowed. For each question, completely fill in the circle alongside the appropriate answer.

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**1** Two signals that have the same frequency are displayed simultaneously on an oscilloscope.
The display is shown with the time-base set to $5\ \text{ms div}^{-1}$.




Which row shows the frequency of both signals and the phase difference between them?

**[1 mark]**

| | Frequency of both signals / Hz | Phase difference / rad | |
|---|---|---|---|
| **A** | 50 | $0.30\pi$ | ⬭ |
| **B** | 50 | $0.15\pi$ | ⬭ |
| **C** | 25 | $0.30\pi$ | ⬭ |
| **D** | 25 | $0.15\pi$ | ⬭ |

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**2** A signal generator supplies a sinusoidal root mean square voltage of 7.0 V.
The sinusoidal voltage is displayed on an oscilloscope screen.
The screen has eight vertical divisions.

Which volts/division setting will display the tallest complete waveform?

**[1 mark]**

**A** $1.5\ \text{V div}^{-1}$ ⬭

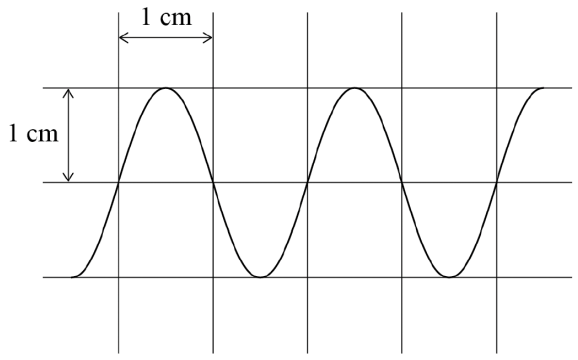
**B** $2.0\ \text{V div}^{-1}$ ⬭

**C** $2.5\ \text{V div}^{-1}$ ⬭

**D** $3.0\ \text{V div}^{-1}$ ⬭

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**3** The figure shows an oscilloscope trace of a sinusoidal ac voltage.




The time base setting is $5\ \text{ms cm}^{-1}$ and the Y-voltage gain is $10\ \text{V cm}^{-1}$.

Which row describes the ac voltage?

**[1 mark]**

| | rms voltage / V | Frequency / Hz | |
|---|---|---|---|
| **A** | 14 | 50 | ⬭ |
| **B** | 14 | 100 | ⬭ |
| **C** | 7 | 50 | ⬭ |
| **D** | 7 | 100 | ⬭ |

**Medium** Two or three steps. Roughly a third to a half of students get these right. **Question 4**

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**4** In a resistor of resistance $R$, a steady current $I$ dissipates a power $P$.

In a resistor of resistance $\frac{R}{2}$ there is an alternating current of root mean square value $3I$.

What is the mean power dissipated in the resistor of resistance $\frac{R}{2}$?

**[1 mark]**

**A** $9P$ ⬭

**B** $\frac{9}{2}P$ ⬭

**C** $\frac{9}{4}P$ ⬭

**D** $\frac{3}{2}P$ ⬭

**Hard** Several steps, often with a trap built in. Fewer than 3 in 10 students get these right. **Questions 5–6**

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**5** Mains electricity is rated 230 V in the UK.

Which is correct?

**[1 mark]**

**A** The mean voltage is 163 V. ⬭

**B** The peak voltage is 230 V. ⬭

**C** The root mean square voltage is 325 V. ⬭

**D** The peak-to-peak voltage is 650 V. ⬭

AQA June 2022 · A-level Paper 2 · Q24

**6** Power $P$ is dissipated in a resistor of resistance $R$ carrying a direct current $I$.

A second resistor of resistance $2R$ carries an alternating current with peak value $I$.

What is the power dissipated in the second resistor?

**[1 mark]**

**A** $\sqrt{2}P$ ⬭

**B** $P$ ⬭

**C** $2P$ ⬭

**D** $4P$ ⬭

**End of questions.** Check your answers with the matching mark scheme. More free packs and 1-to-1 tuition: **www.getbetteratphysics.co.uk**