FREE REVISION PACK

# Parallel-Plate Capacitors & Dielectrics

AQA A-level Physics · 7408 · Specification 3.7.4.2

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

| 7 | 7 | ≈ 10 min |
|---|---|---|
| QUESTIONS | TOTAL MARKS | SUGGESTED TIME* |

## Contents


| Q | LEVEL | FOCUS | SOURCE | MARKS |
|---|---|---|---|---|
| 1 | Easy | How a polar molecule lines up in a field | AQA June 2023 · A-level Paper 2 · Q18 | 1 mark |
| 2 | Easy | Capacitance of a bigger capacitor with a dielectric | AQA June 2025 · A-level Paper 2 · Q17 | 1 mark |
| 3 | Easy | Relative permittivity from equal capacitances | AQA June 2018 · A-level Paper 2 · Q24 | 1 mark |
| 4 | Medium | Inserting a dielectric into an isolated capacitor | AQA June 2017 · A-level Paper 2 · Q18 | 1 mark |
| 5 | Medium | Bigger plates, closer together | AQA June 2017 · A-level Paper 2 · Q20 | 1 mark |
| 6 | Medium | Halving the separation with the battery connected | AQA June 2022 · A-level Paper 2 · Q20 | 1 mark |
| 7 | Hard | Field after pulling isolated plates apart | AQA June 2018 · A-level Paper 2 · Q23 | 1 mark |


**Key ideas to have ready**

- $C = A\varepsilon_0\varepsilon_r / d$: bigger or closer plates, or a dielectric, increase C.
- A dielectric's polar molecules line up with the field, reducing the field inside and increasing C.
- Battery still connected: V is fixed. Disconnected (isolated): Q is fixed.
- $E = V / d$. For isolated plates, moving them apart doesn't change E.

**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.

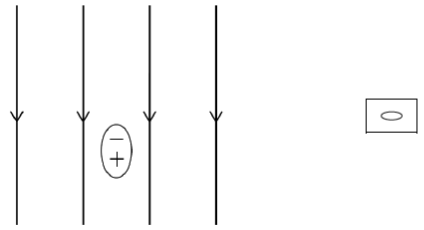
AQA June 2023 · A-level Paper 2 · Q18

**1** A polar molecule is in an external electric field.

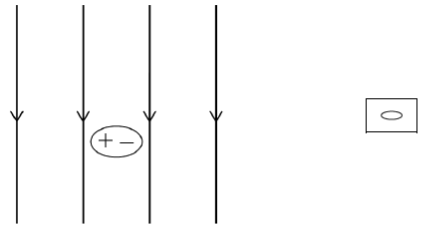
Which diagram shows the orientation of the polar molecule?

**[1 mark]**

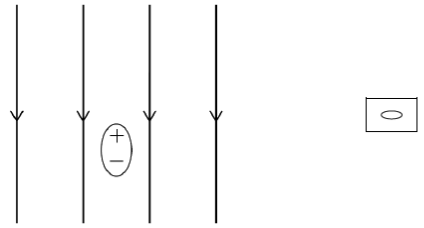
**A**



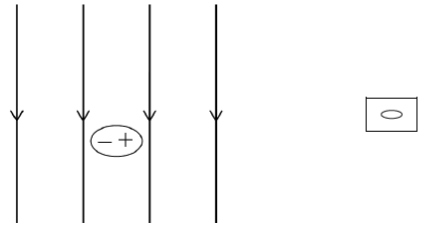
**B**



**C**



**D**

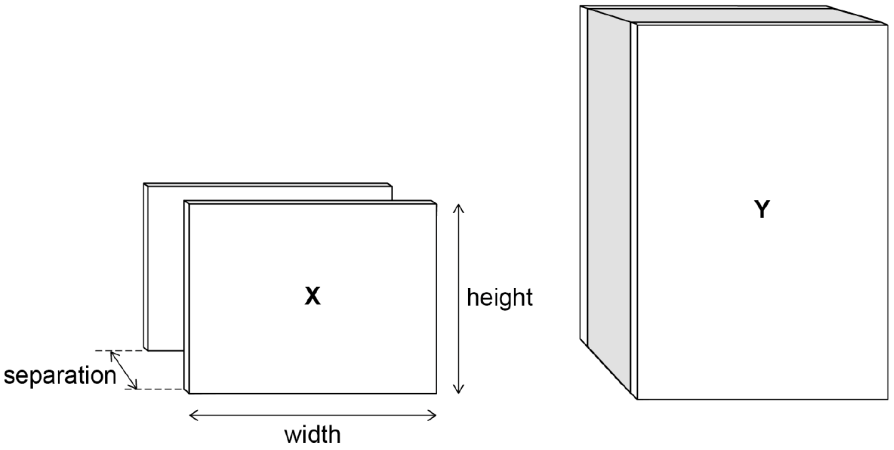


AQA June 2025 · A-level Paper 2 · Q17

**2** A parallel-plate capacitor **X** with the plates separated by air has a capacitance of $100\ \mu F$.

Another parallel-plate capacitor **Y** has plates that are double the height of the plates of **X**.

The plates of **Y** have the same separation and the same width as the plates of **X**.
The space between the plates of **Y** is filled with a material of dielectric constant $3.0$




What is the capacitance of **Y**?

**[1 mark]**

**A** $67\ \mu F$ ⬭

**B** $150\ \mu F$ ⬭

**C** $600\ \mu F$ ⬭

**D** $1200\ \mu F$ ⬭

AQA June 2018 · A-level Paper 2 · Q24

**3** A parallel-plate capacitor has square plates of length $l$ separated by distance $d$ and is filled with a dielectric.

A second capacitor has square plates of length $2l$ separated by distance $2d$ and has air as its dielectric.

Both capacitors have the same capacitance.

What is the relative permittivity of the dielectric in the first capacitor?

**[1 mark]**

**A** $\frac{1}{2}$ ⬭

**B** $1$ ⬭

**C** $2$ ⬭

**D** $8$ ⬭

## Medium

Two or three steps. Roughly a third to a half of students get these right.

Questions 4–6

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**4** A parallel-plate capacitor is fully charged and then disconnected from the power supply. A dielectric is then inserted between the plates.

Which row correctly identifies the charge on the plates and the electric field strength between the plates?

**[1 mark]**

| | Charge | Electric field strength | |
|---|---|---|---|
| **A** | Stays the same | Increases | ⬭ |
| **B** | Increases | Decreases | ⬭ |
| **C** | Increases | Increases | ⬭ |
| **D** | Stays the same | Decreases | ⬭ |

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**5** A capacitor consists of two parallel square plates of side $l$ separated by distance $d$. The capacitance of the arrangement is $C$.

What is the capacitance of a capacitor with square plates of side $2l$ separated by a distance $\frac{d}{2}$?

**[1 mark]**

**A** $C$ ⬭

**B** $2C$ ⬭

**C** $4C$ ⬭

**D** $8C$ ⬭

AQA June 2022 · A-level Paper 2 · Q20

**6** A parallel plate capacitor is connected across a battery and the energy stored in the capacitor is $E$.
Without disconnecting the battery, the separation of the plates is halved.

What is the energy now stored in the capacitor?

**[1 mark]**

**A** $0.5E$ ⬭

**B** $E$ ⬭

**C** $2E$ ⬭

**D** $4E$ ⬭

**Hard** Several steps, often with a trap built in. Fewer than 3 in 10 students get these right. **Question 7**

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**7** An air-filled parallel-plate capacitor is charged from a source of emf. The electric field has a strength $E$ between the plates. The capacitor is disconnected from the source of emf and the separation between the isolated plates is doubled.

What is the final electric field between the plates?

**[1 mark]**

**A** $2E$ ○

**B** $E$ ○

**C** $\frac{E}{2}$ ○

**D** $\frac{E}{4}$ ○

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